Lehigh Permanente Quarry Reclamation Plan Amendment Conditions of Approval Compliance

2013-2014 Annual Report Information Package

SANTA CLARA COUNTY, CALIFORNIA

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TABLE OF CONTENTS

ANNUAL REPORT TABLE

APPENDIX A - 2013-2014 STORMWATER AND EROSION CONTROLS REPORT

APPENDIX B - 2013-2014 WET SEASON EROSION CONTROL INSPECTION REPORTS

APPENDIX C - RECLAMATION PLAN AMMENDMENT AND FINAL CONDITIONS OF APPROVAL ANNUAL WORKER TRAINING

APPENDIX D - 2013-2014 LIST OF BIOLOGICAL SURVEY REPORTS SUBMITTED TO COUNTY

APPENDIX E - WATER QUALITY MONITORING MEMO

APPENDIX F - SEDIMENTATION BASIN 13A AND 13B BIOLOGICAL MONITORING MEMO

APPENDIX G - UPDATED STORMWATER POLLUTION PREVENTION PLAN

APPENDIX H - RWQCB NPDES PERMIT NO. CA0030210 AND CEASE AND DESIST ORDER NO. R2-2014-0011

APPENDIX I - NON-LIMESTONE COVER MATERIAL VERIFICATION MEMO

APPENDIX J - ANNUAL GREENHOUSE GAS INVENTORY REPORT

APPENDIX K - IMPROVED RECLAMATION PLAN BOUNDARY DEMARCATION MEMO

APPENDIX L - 2014-2015 MAP OF EXISTING AND PROPOSED STOCKPILES

APPENDIX M - MAPS OF PAST 24 MONTHS SURFACE MINING AND RECLAMATION ACTIVITY AND FUTURE 24 MONTHS ESTIMATED ACTIVITY

APPENDIX N - REVEGETATION TEST PLOT PROGRAM - FINAL MONITORING REPORT

APPENDIX O - FINANCIAL ASSURANCE COST ESTIMATE TRANSMITTAL

APPENDIX P - FEASIBILITY OF WATER TREATMENT FOR DISCHARGES FROM THE PERMANENTE QUARRY CONTAINING SELENIUM

APPENDIX Q - EAST MATERIALS STORAGE AREA CONDITION NO. 79 – MODIFICATIONS TO BEST MANAGEMENT PRACTICES

APPENDIX R - BAY AREA AIR QUALITY MANAGEMENT DISTRICT AUTHORITIES TO CONSTRUCT

APPENDIX S – BOULDER REMOVAL MEMO

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All COAs								
COA	**Requirement**	**Summarized Description**	**Annual Report Requirement (Yes/No)**	**Frequency**	**Required Submittal Date**	**Date Submitted**	**Comments**	**Appendix**
1	The conditions supersede all previous COAs	The following conditions of approval (COAs) shall supersede and replace all previous COAs from the 1985 Reclamation Plan approval.	No	Maintain	NA	NA	Noted.	
2	All activity must be consistent with the following COAs	All development, operations, and reclamation that occur under this RPA shall be consistent with the approved plans, unless modified by these conditions.	No	Maintain	NA	NA	Noted.	
3	RPA Re-Submittal. Final conformed documents to SCC	Within 60 days of approval of the RPA, Mine Operator shall submit six (6) copies plus one electronic copy of a "Final" RPA, incorporating changes required per the conditions of approval for the RPA, Mitigation Monitoring and Reporting Program, and Final Environmental Impact Report.	No	One Occurrence	8/24/2012	8/24/2012	Documents were submitted on or before the required submittal date.	
4	Legal Descriptions to be submitted for all parcels subject to the RPA	Within 60 days following approval of the RPA, the Mine Operator shall submit to the Planning Manager or the Manager's designee (hereinafter referred to as Planning Manager), legal descriptions for all affected parcels of real property.	No	One Occurrence	8/24/2012	8/24/2012	Documents were submitted on or before the required submittal date.	
5	RPA Expiration Date	If reclamation is not complete on or before June 30, 2032, the Mine Operator shall file an application for an amendment to the reclamation plan prior to that date.	No	One Occurrence	NA	NA	Noted.	
6	Hillside open space will be the end use	The proposed end use following reclamation is hillside open space.	No	One Occurrence	NA	NA	Noted.	
7	Payment for all reasonable costs.	The Mine Operator shall be responsible for paying all reasonable costs associated with work by, or for, the Department of Planning and Development, in conjunction with, or in any way related to the conditions of approval identified in this RPA, the mitigations contained in the Mitigation Monitoring and Reporting Program, and the annual SMARA inspections and annual review of financial assurance cost estimates.	No	Maintain	NA	NA	Noted.	
8	Annual report	Mine Operator shall provide by October 1 of each year, the information requested by the Planning Manager that is needed for the preparation of the Annual Report. (See COA Text)	Yes	Annual	10/1/2014	10/1/2014	This document, and attached appendices, represents the Mine Operator's fulfillment of its 2014 COA 8 obligation.	
9	Planning manager ensures compliance	If at any time the Planning Manager determines that the Quarry is not in compliance with the RPA, Mitigation Monitoring and Reporting Program, or any condition of approval and as such is in violation of the RPA, the Director may take any and all actions necessary to ensure compliance with the Plan in accordance with applicable laws and regulations.	No	Ongoing	NA	NA	Noted.	
10	Copies of RPA, MMRP, and Conditions of Approval Maintained on Site	Copies of the RPA Mitigation Monitoring and Reporting Program, approved plans, conditions of approval shall be maintained at the premises of the Permanente Quarry, 24001 Stevens Creek Boulevard, at all times: one copy of all the documents shall be stored in the administration building at this location and one copy of all the documents shall be stored in the mine operations office.	No	Maintain	NA	NA	Copies of the RPA Mitigation Monitoring and Reporting Program, approved plans, conditions of approval are maintained in a binder in the quarry office with Dan Zacharisen. Additionally, a wall poster of the COAs is posted in the office.	

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11	Issue report summary of employee training performed	By October 1 of each year, starting in 2012, the Mine Operator shall provide to the Planning Manager a report summarizing the date of the annual training, topics reviewed, and list of all employees attending the training. The Mine Operator shall annually train all mining staff, including outside vendors, contractors, or consultants who are responsible for implementation of any part of the mine operations or reclamation at Permanente Quarry, on the requirements and provisions of the RPA, the conditions of approval, and the MMRP	Yes	Annual	10/1/2014	10/1/2014	Training for workers and subcontractors has been completed.	Appendix C: Reclamation Plan Ammendment and Final Conditions of Approval Annual Worker Training
12	SWPPP to County	Within 60 days following approval of the RPA, the Mine Operator shall submit to the Planning Manager a copy of its Storm Water Pollution Prevention Plan (SWPPP) of the approved RPA, which is hereby appended to the RPA by reference. The Mine Operator is responsible for providing the Department of Planning and Development with any and all updates to the SWPPP	No	Update	8/24/12. And as needed	5/16/2014	The SWPPP has been updated as of May 16, 2014. A copy of the updated SWPPP is provided as an appendix to this report.	Appendix G: Updated Stormwater Pollution Prevention Plan
13	Mitigation measures adopted as COAs	All mitigation measures contained within the Mitigation Monitoring and Reporting Program (MMRP) prepared for the project are adopted as conditions of approval .	No	Maintain	NA	NA	Noted.	
14	Update FACE	By August 1st of each year, or as required by the Santa Clara County SMARA Inspection Program, the Mine Operator shall submit annually Financial Assurance Cost Estimates (FACE) to the Planning Manager for review and approval, which shall serve as the basis for the amount of financial assurances required of the Mine Operator, account for disturbed and those lands to be disturbed in the following year by the surface mining operations, inflation, and reclamation of lands accomplished in accordance with the approved RPA.	Yes	Annual	8/1/2014	XX/XX/2014	Financial Assurance Cost Estimates have been submitted to the Planning Manager for review on August 29, 2014. See Appenddix O for proof of transmittal.	Appendix O: Financial Assurance Cost Estimate Transmittal
15	Submit copies of any violations, abatement notices, or any agency permit mod to SCC	Copies of all violations or abatement notices, requests for reports or information related to this RPA and its authorized uses by federal, state, or local jurisdictions/agencies, or subsequent modification of another agency's permit or submission of an application for any permit to another agency shall be provided to the Planning Manager within 10 business days of the County's request.	Yes	At County Request	NA	NA	No requests for copies of violations, abatement notices or agency permit modifications were received by Lehigh. No actions were needed to fulfill this COA. A SFBRWQCB NPDES permit and CDO were issued. See Appendix H.	Appendix H: RWQCB NPDES Permit No. CA0030210 and Cease and Desist Order No. R2-2014-0011
16	An invalidation of one condtion does not invalidate the remaining conditions.	If any of the RPA conditions of approval, or RPA approval, are held to be invalid that holding shall not invalidate any of the remaining conditions or limitations set forth.	No	Ongoing	NA	NA	Noted.	
17	If any conditions are invalidated, the Planning Commission can replace the invalidated condition with a feasible alternative.	IF any condition(s) of approval is invalidated by a court of law, and said invalidations would change the findings and/ or mitigation measures associated with the approval of this RPA, the amendment may be reviewed , at the discretion of the Planning Commission, and substitute feasible condition(s)/ mitigation measures.	No	Ongoing	NA	NA	Noted.	

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18	The Mine Operator will carry the cost of any action brought against the County.	As a condition of RPA approval, the Mine Operator agrees to defend, at the Mine Operator's sole expense, any action brought against the County by a third party, and indemnify the County against settlements and judgments arising from any such action.	No	Ongoing	NA	NA	Noted.	
19	The Mine Operator will reimburse the County for any legal costs incurred in its defense.	Upon demand from the County, the Mine Operator shall reimburse the County for any court costs and or attorney's fees which the County may be required by a court to pay as a result of any such action the Mine Operator defended or which it had control of the defense	No	Ongoing	NA	NA	Noted.	
20	The Mine Operator holds harmeless the County and its employees from any legal action taken to challenge the EIR or RPA.	The Mine Operator agrees to defend, indemnify and hold harmless the County, its agents, officers and employees, from any claim, action or proceeding against the County, to challenge any portions of the EIR certification, reclamation plan process or approval.	No	Ongoing	NA	NA	Noted.	
21	Approval of the ROA does not relieve or limit the Mine Operator's previous legal liabilities.	Neither the approval of the RPA or compliance with conditions of approval shall relieve the Mine Operator from any responsibility otherwise imposed by law for damage to persons or property, nor shall the issuance of any RPA or related permit serve to impose any liability upon the County of Santa Clara, its officers, employees or agents for injury or damage to persons or property.	No	Ongoing	NA	NA	Noted.	
22	Maintain demarcation of EMSA, Rock Plant, and WMSA RPA Boundaries	Within 60 days of RPA approval, the RPA limit of disturbed area surrounding the northern and eastern edges of the EMSA, the northern and western edges of the WMSA, and the perimeter of the Rock Plant area shall be clearly demarcated in the field and shall remain in place until final reclamation has been completed. On an annual basis, demarcation shall be modified to encompass the RPA boundaries nearest the areas subject to surface mining and reclamation, as shown on aerials submitted per Condition #23. Demarcated areas shall be located and marked in the field by a licensed land surveyor or registered civil engineer authorized to practice land surveying. Demarcation shall use orange construction fencing or other brightly colored material acceptable to the Planning Manager.	Yes	Annual	8/24/2012, and annually with updates	10/1/2014	The RPA limits have not changed and the demarcations of these boundries have been maintaned. See Appendix K: Improved Reclation Plan Boundary Demarcation Memo	Appendix K: Improved Reclamation Plan Boundary Demarcation Memo

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23	GPS and Aerial Data prepared by Licensed Surveyor to SCC for Review and Approval.	At the same time as the proposed Annual Report each year, the operator shall submit to the Planning Manager a surveyed coordinate list file obtained by Global Positioning System (GPS), prepared by a licensed land surveyor or registered civil engineer authorized to practice land surveying, to be reviewed and approved by the County Surveyor, identifying the limits of reclamation, with aerial photographs of the RPA area, annotated to illustrate (a) where surface mining and reclamation activity occurred within the prior 24 months and (b) areas where mining and reclamation activities will occur in the next 24 months. Existing topographic data shall be included with the aerial photographs, and the operator shall provide projected topographic data demonstrate how the topography will look two years later. The aerial photographs must be flown and taken biennially between June 1 and June 30 starting with June 2013. If requested by the Planning Manager or Planning Commission the materials shall be in a readable scale.	Yes	Annual	10/1/2012, and annually with updates	10/1/2014	The surveyed coordinate list file identifying the limits of reclamation has not changed since the 2012/2013 annual report. See Appendix M for mining activity occurring in the past 24 months and planned for the next 24 months. Aerial photos were flown in 2013 and the next biennial flight is due in June 2015.	Appendix M: Maps of Past 24 Months Surface Mining and Reclamation Activity and Future 24 Months Estimated Activity
24	Reclamation of Finished Slopes and Benches	Reclamation of finished slopes and benches shall commence at the earliest feasible date once the slopes and benches are established, as set forth in the RPA.	Yes	During Final Reclamation	NA	NA	No slopes or benches were finished during the time period covered by this report. No reclamations activities were required.	
25	Specification for Permanent Rock Fills	Rockfills, where used, should be spread in lifts not exceeding five-feet in thickness by tracked equipment, and compacted by track-walking or wheel-rolling using heavy dozers (Caterpillar D-9 or larger) and/or fully loaded rubber-tired hauling equipment, respectively. A minimum of three passes should be performed for each lift.	Yes	During Final Reclamation	NA	NA	No rockfills were required during time period covered by this report.	
26	Submit Site Plan showing Topsoil and Amendment Storage Areas	Within 60 days of RPA approval, Mine Operator shall submit a site plan identifying area(s) where topsoil, dirt, soil amendments shall be retained and used in the reclamation and re-vegetation process. Soil stored for reclamation purposes shall be clearly identified and marked in the field.	No	One Occurrence	10/1/2013 and annually with updates	10/1/2014	One new topsoil storage area has been installed in the EMSA. See the Stormwater and Erosion Control Report in Appendix A. A map of current and potential future stockpiles is provided in Appendix L.	Appendix L: 2014-2015 Map of Existing and Proposed Stockpiles Appendix A: 2013-2014 Stormwater and Erosion Controls Report
27	Stockpiles of topsoil or overburden protected from wind and erosion	The Mine Operator shall safeguard stockpiles of topsoil or overburden to be used for reclamation from wind and erosion by using controls including, but not limited to, hydroseeding, erosion control mats, and coir wattles (aka "straw wattles").	No	Maintain	NA	NA	All stockpiles of topsoil or overburden to be used for reclamation have been treated.	Appendix A: 2013-2014 Stormwater and Erosion Controls Report
28	Test Plot annual report	Reporting of the test plots for the re-vegetation criteria identified in the RPA shall be submitted to the County as part of the Mine Operator's annual report.	Yes	Annually to 2014	10/1/2014	10/1/2014	The final, re-vegetation test plot monitoring report is provided as an appendix.	Appendix N: Revegetation Test Plot Program - Final Monitoring Report
	Topsoil shall use amendments	The Mine Operator shall use soil amendments, in accordance with the RPA, to improve the effectiveness of the soils used for re-vegetation of final slopes. Re-vegetation shall satisfy the criteria identified in the RPA. (See COA Text)	Yes	During Final Reclamation	NA	NA	Final reclamation did not begin during the time period covered by this report. Data regarding soil effectiveness is not required at this time. Any reclamation requiring revegetation have considered the test-plot results for vegetatiive palette.	

All COAs

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29	Revegetation success criteria	Re-vegetation of all reclaimed slopes within the RPA Boundary shall meet the minimum success criteria listed in the approved RPA before any completed phase of reclamation may be deemed reclaimed by the County and Office of Mine Reclamation (OMR).	Yes	During Final Reclamation	NA	NA	Final reclamation did not begin during the reporting period.	
30	Change to Revegetation plan	The Planning Manager shall have authority to administratively review and approve minor revisions to the re-vegetation palette contained in the approved RPA.	Yes	During Final Reclamation	NA	NA	Any reclamation requiring revegetation have considered the test-plot results for vegetatiive palette.	
31	Removal of Equipment	Equipment, structures, nonessential roads, as identified in the RPA, shall be removed from the project area prior to that area being deemed reclaimed by the County and OMR	Yes	During Final Reclamation	NA	NA	Final reclamation did not begin during the time period covered by this report. No equipment, structures, or roads are yet required to be removed.	
32	Overburden requirements	Construction or demolition waste or any other foreign materials are prohibited from being stored in overburden or used in reclamation. Overburden shall be compacted, tested, and documented to demonstrate it will support post-mining uses. Regarding compaction, testing, and documentation of the overburden, documentation shall be submitted to the Planning Manager within 30 days of completion.	Yes	During Final Reclamation	NA	NA	No overburden placement has been completed to require compaction testing during this report period.	
33	Basin Clean out Reports showing quantities removed and disposition	Stilling basins shall be maintained in good conditions and cleaned of silt and debris as necessary. A report shall be submitted to the Planning Manager as part of the Annual Report, fully depicting total quantities of silt removed from the basins (reported in cubic yards or tons) and where such silt is placed on the site or off the site.	Yes	Annual	NA	10/1/2014	Sedimentation basins are routinely inspected and cleaned of vegetation and sediment when necessary to maintain good condition and proper function. Several sedimentation basins required cleanout during this report year. A table depicting the quantities of sediment removed from the sedimentation basins is provided in Appendix A.	Appendix A: 2013-2014 Stormwater and Erosion Controls Report
34	Provide all amended or newly issued permits from RWQCB and comply with such permits	The Mine Operator shall comply with the conditions of permits and plans required by and issued from the Regional Water Quality Control Board (RWQCB), including but not limited to approval of the Permanente Creek Restoration Plan and water discharge permits. The Mine Operator shall provide copies of all permits to the Planning Manager within 10 business days of issuance by RWQCB.	No	Ongoing	As Needed	10/1/2014	A new NPDES permit was issued on March 12, 2014. A copy of the permit is provided in Appendix H of this report.	Appendix H: RWQCB NPDES Permit No. CA0030210 and Cease and Desist Order No. R2-2014-0011
35	Criteria for Final reclamation completion	Reclamation shall be deemed complete by the County and State Office of Mine Reclamation (OMR) once reclamation has been performed to the terms of the approved RPA, and required monitoring and inspections have demonstrated compliance with the reclamation performance standards and mitigation measures as prescribed in the Mitigation, Monitoring and Reporting Program, including compliance with all pertinent permits or other requirements for reclamation issued by non-Santa Clara County public agencies, including but not limited to the RWQCB and the State Department of Fish and Game.	No	Final Reclamation	NA	NA	For Final Reclamation Completion.	

All COAs

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36	Provide all amended or newly issued permits from BAAQMD and comply with such permits	The Mine Operator shall comply with the conditions of permits required by and issued from the Bay Area Air Quality Management District (BAAQMD). Upon request by the County, the Mine Operator shall provide copies of all permits, and amendments to the Planning Manager within 10 business days of the request.	No	At County Request	As Needed	NA	Lehigh is in compliance with the conditions of permits and plans required by and issued by BAAQMD. No request by the County has been received by Lehigh for additional permit information. Lehigh received two new Authorities to Construct from the BAAQMD: one for the Selective Non-Catalytic Reduction (SNCR) System (Permit Application No. 25447), dated August 19, 2013, and one for the Cement Kiln Stack and Clinker Cooler Stack height adjustments (Permit Application No. 26247), dated June 18, 2014. The aforementioned Authorities to Construct are included as Appendix R.	Appendix R: Bay Area Air Quality Management District Authorities to Construct
37	Provide all amended or newly issued permits from SCC Department of Env Health and comply with such permits	The Mine Operator shall obtain and comply with all applicable permits required by the Santa Clara County Hazardous Materials Division of the Department of Environmental Health. The Mine Operator shall provide copies of all permits to the Planning Manager within 10 business days of issuance.	No	Ongoing	NA	NA	Lehigh is in compliance with the conditions of permits and plans required by and issued from the Santa Clara County Hazardous Materials Division of the Department of Environmental Health.	
38	Submit schedule of implementation for sedimentation control and boulder removal during the Summer and Fall of 2012	Within 30 days of final RPA approval, submit to the Planning Manager a detailed schedule describing the implementation actions to control sedimentation, remove limestone boulders, and stabilize slopes within the Permanente Creek Restoration Area in the Summer and Fall of 2012, consistent with the RPA.	No	One Occurrence	8/26/2012	8/26/2012	A memorandum documenting attempts to remove boulders during this report year is included as Appendix S. One boulder was moved 50 feet outside the creek centerline, but still within the 100-year floodplain. Slope stabilization measures have been installed and maintenance is ongoing.	Appendix S: Boulder Removal Memo
39	Boulder removal	By October 15, 2012, per the RPA, identified limestone boulders in the PCRA shall be removed. In addition, any limestone boulders identified in the future shall be removed. Submit to the Planning Manager by August 1, 2012, a report and map summarizing the field inspection and identification of all limestone boulders in the PCRA. Submit to the Planning Manager by December 15, 2012, a report and summarizing the actions to remove all limestone boulders in the PRCA, consistent with the "Best Management Practice for Removal of Limestone Boulders from Permanente Creek" (Attachment J to the RPA).	Ongoing	One Occurrence	12/15/2012	9/28/2012	Removal of boulder(s) identified as feasibly removed from Permanente Creek was completed in 2013. Slope stabilization measures have been installed and maintenance is ongoing. Refer to 2013 Annual Report.	
40	PCRA Phase III Restoration Plan	Prior to the start of Permanente Creek restoration activities in Phase III for PCRA subareas 3, 4, 5 and 7, as identified in the RPA, the Mine Operator shall submit to the Planning Manager a Permanente Creek Restoration Plan. The Restoration Plan shall include the elements of the Permanente Creek Long Term Restoration Plan (URS, March 11, 2011) to the extent set forth in the RPA. The Restoration Plan shall include, at minimum, engineered drawings for creek restoration, a riparian re-vegetation plan, hydrology / hydro-geomorphology studies supporting concepts to be used in creek restoration, and a long term monitoring and reporting program. The Creek Restoration Plan shall be reviewed and approved by the County prior to implementation.(See COA Text)	Yes	One time	NA	NA	Phase III was not initiated during the time period covered by this report.	

All COAs									
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41	Permits for Grading in Jurisdictional Waters	Prior to the start of any grading or any grading activity that affects jurisdictional resources of the California Department of Fish and Game, Regional Water Quality Control Board, or U.S. Army Corps of Engineers, the Mine Operator must provide to the Planning Manager proof of permits / clearances (or documentation that a permit is not needed).	Yes	Ongoing	NA	NA	There were no grading activities which affected jurisdictional waters during the time period covered by this report.	
42	EMSA Light Prohibition	No night lighting shall be allowed or permitted on the east-facing slope of the EMSA or any other location within the EMSA that would be visible from public locations on the Santa Clara Valley floor including roadways.	Yes	Ongoing	NA	7/26/2013	No lighting is allowed on any location within the EMSA that would be visible from public locations on the Santa Clara Valley floor. Signs are posted in Quarry vehicles and around the property.	
43	ORD Inventory EMSA	Within 90 days of final RPA approval, the Mine Operator shall submit to the County and BAAQMD a comprehensive inventory of all RPA-related off-road construction equipment expected to be used during any portion of the RPA period. (See COA Text)	Yes	One-time	9/24/2012	9/25/2012	Not applicable. See COA 45	
44		Within 90 days of final RPA approval, the Mine Operator shall provide a plan for approval by the Planning Manager and BAAQMD demonstrating that off-road equipment to be used for Reclamation of the EMSA would achieve an average 35 percent reduction in Diesel Particulate Matter (DPM) emissions (See COA Text)	Yes	Annual	9/24/2012	9/25/2012	Not applicable. See COA 45	
45	Caretakers Residence Control (in lieu of COA 43 and 44)	In lieu of Condition No. 43 and No. 44 (Mitigation Measures 4.3-3a and 4.3-3b), the Mine Operator may submit within 90 days of the RPA approval evidence establishing to the Planning Manager's satisfaction that there are legally binding restrictions precluding any occupancy of the caretaker's residence located at 2961 Stevens Creek Boulevard, Cupertino	No	One-time	9/24/2012	9/25/2012	Complete.	
46	Avian Species - Preconstruction Surveys	Ground disturbance into undisturbed areas and vegetation (tree and shrub) removal should occur between September 1 and January 30, outside of the breeding season for most bird species. If ground disturbance or tree and shrub removal occurs between February 1 and June 15, preconstruction surveys will be performed within 14 days prior to such activities to determine the presence and location of nesting bird species. If ground disturbance or removal of vegetation occurs between June 16 and August 31, pre-construction surveys will be performed within 30 days prior to such activities. The pre-construction surveys shall be submitted to the Planning Manager no later than five (5) business days prior to the start of such activities. If the tree removal or vegetation clearing shall occur during the non-nesting season, submit documentation both before and after tree removal / vegetation clearing confirmation completion of work within this time frame.(See COA Text)	No	Ongoing	As Needed	2/21/2014 3/13/2014 3/19/2014 3/24/2014 4/15/2014	All required biological resources surveys have been completed. See Appendix D.	Appendix D: 2013-2014 List of Biological Survey Reports Submitted to County
	Contract for Ornithologist to perform Avian Surveys	Thirty (30) days prior to the start of any ground disturbance into undisturbed areas or vegetation removal, the Mine Operator shall submit to the Planning Manager a copy of a contract with a qualified ornithologist to conduct pre-activity surveys.	No	One-time		9/25/2012	Lehigh continues to use WRA, Inc as a qualified orinthologist.	

All COAs								
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47	Avian Species - Use of Buffers for to Avoid Nests	If preconstruction surveys determine that active nests are found close enough to the land clearing and tree removal area to be disturbed by these activities, the ornithologist, in consultation with CDFG, will determine the extent of a construction-free buffer zone (typically 250 feet) to be established around the nest to prevent nest abandonment and direct mortality during construction.	No	Ongoing	As Needed	2/21/2014 3/13/2014 3/19/2014 3/24/2014 4/15/2014	All required biological resources surveys have been completed. See Appendix D.	Appendix D: 2013-2014 List of Biological Survey Reports Submitted to County
48	Bat Species - Non-Roosting Season	Removal of potential bat roost habitat (buildings, large trees, snags, vertical rock faces with interstitial crevices) or construction activities within 250 feet of potential bat roost habitat should occur in September and October to avoid impacts to bat maternity or hibernation roosts.	No	Ongoing	As Needed	2/21/2014 3/13/2014 3/19/2014 3/24/2014 4/14/2014	All required biological resources surveys have been completed. See Appendix D.	Appendix D: 2013-2014 List of Biological Survey Reports Submitted to County
49	Bat Species – Maternity Roosting Season	If removal of potential bat roost habitat cannot occur during September and October, bat roost surveys will be conducted to determine if bats are occupying roosts. The pre-construction surveys shall be submitted to the Planning Manager no later than five (5) business days prior to the removal of any potential habitat. (See COA Text)	No	Ongoing	As Needed	3/13/2014 4/14/2014	All required biological resources surveys have been completed. See Appendix D.	Appendix D: 2013-2014 List of Biological Survey Reports Submitted to County
50	Special Status Bat Species- Hibernation Season	During the November 1 to March 31 hibernation season, work shall not be conducted within 100 feet of any woodland habitat (as identified in the Draft EIR Figures 4.4-1 through 4.4-4), unless a qualified bat biologist determines that woodland areas do not provide suitable hibernating conditions for bats and they are unlikely to be present in the area. Submit a report by a qualified bat biologist to the Planning Manager verifying the absence of suitable habitat as described above if work is proposed within 100 feet of woodland habitat between November 1 and March 31	No	Ongoing	As Needed	2/21/2014 3/19/2014 3/24/2014	All required biological resources surveys have been completed. See Appendix D.	Appendix D: 2013-2014 List of Biological Survey Reports Submitted to County
51	Special Status Bat Species - Maternity Season Emergence	Any trees felled during vegetation removal will not be chipped or otherwise disturbed for a period of 48 hours to allow any undetected bats potentially occupying these trees to escape.	No	Ongoing	As Needed		All trees felled were left in place for 48 hours prior to removal or chipping.	
52	Bat Roost Replacement	All special-status bat roosts destroyed by the Project shall be replaced by the Mine Operator at a 1:1 ratio onsite with a roost suitable for the displaced species (e.g., bat houses for colonial roosters). The design of such replacement habitat shall be in consultation with CDFG. (See COA Text)	No	Ongoing	As Needed	NA	No special-status bat roosts have been destroyed. No mitigation for bat roost replacement has been warranted to date.	
53	San Francisco Dusky Footed Woodrat	Within 30 days prior to initial ground disturbance in woodland or scrub/chaparral communities, (as identified in the Draft EIR Figures 4.4-1 through 4.4-4), conduct pre-construction surveys for active woodrat stick nests that could be directly impacted. Surveys should take place in all suitable habitat types within the Project Area. Sixty (60) days prior to initial ground disturbance within woodland or scrub / chaparral communities, the Mine Operator shall submit to the Planning Manager a copy of a contract with a qualified biologist to conduct pre-activity surveys. (See COA Text)	No	Ongoing	As Needed	9/9/2013 9/13/2013 2/21/2014 3/13/2014 3/19/2014 3/24/2014 4/15/2014	All required biological resources surveys have been completed. See Appendix D.	Appendix D: 2013-2014 List of Biological Survey Reports Submitted to County

All COAs								
COA	**Requirement**	**Summarized Description**	**Annual Report Requirement (Yes/No)**	**Frequency**	**Required Submittal Date**	**Date Submitted**	**Comments**	**Appendix**
54	Proper Food Waste Disposal	To reduce indirect impacts on San Francisco dusky-footed woodrat by attracting urban-adapted predators, trash and food waste shall be disposed of in proper waste receptacles and emptied on a regular basis. Additionally, quarry personnel, contractors, and visitors shall not feed wildlife within the Permanente Property and appropriate site signage and employee education shall facilitate this condition	No	Ongoing	NA	NA	Proper waste recepticles are available onsite and are emptied on a regular basis. Signs have been posted.	
55	Introduction of Invasive Plants or Pathogens	If regulated or restricted plant materials are to be transported between the Project Area and a location in a non-infested county or state, the spread of the Sudden Oak Death pathogen shall be avoided by obtaining the necessary certificates of transport pursuant to the regulations (See COA Text)	Yes	Ongoing	NA	NA	No plant material was transported in or out of the Project Area.	
56	Sudden Oak Death Prevention	To reduce the possibility of spreading Sudden Oak Death to oak woodlands in the Study Area, the Mine Operator shall implement control measures (See COA Text)	No	Ongoing	NA	NA	All equipment which does not remain onsite, including: shoes, tools, and vehicles are decontaminated prior to, and after, any work in vegetated areas. Sanitation kits are kept at the Quarry office.	
57	Wetland Identification and Avoidance	A qualified wetland biologist shall physically delineate all federal and state waters and wetland features identified in the 2008 wetland delineation (WRA, 2008) before any Permanente Creek Reclamation Area (PCRA) activities begin, and when feasible, reclamation activities shall avoid filling these areas unless authorized by the appropriate permitting agencies. Prior to the start of PCRA activities, the wetland biologist shall submit a report to the Planning Manager showing the wetland areas delineated and the installation of all fencing and barriers (photos and map).(See COA Text)	No	One Occurrence and Ongoing	As Needed	7/31/2012	No wetlands were disturbed during the reporting period.	
58	Wetland Mitigation Plan	If filling of jurisdictional waters or wetlands is to be performed ~~not feasible~~, control measures shall be implemented: (See COA Text)	Yes	Ongoing	NA	NA	No wetlands were disturbed during the reporting period.	
59	PCRA Grading During Dry Season to Avoid California red Legged Frog Impact	To minimize disturbance to dispersing or foraging CRLF, all grading activity within PCRA subareas 4 through 7 shall be conducted during the dry season, generally between May 1 and October 15, or before the onset of the rainy season, whichever occurs first, unless exclusion fencing is utilized. Construction that commences in the dry season may continue into the rainy season if exclusion fencing is placed around the construction zone to keep the frog from entering the construction area.	Yes	Ongoing	NA	NA	Although no grading activity took place within PCRA subareas 4,5,6,or 7 during the reporting period, grading took place adjacent to PCRA Subarea 7 at Sedimentation Basin 13a and 13b. Pre-construction surveys, construction monitoring, and exclusion fence installation occurred. See Appendix F.	Appendix F: Sedimentation Basin 13a and 13b Biological Monitoring Memo.
60	CRLF Pre-construction survey	Pre-construction surveys for CRLF shall be conducted prior to construction activities within PCRA subareas 4 through 7. If CRLF are observed in the construction area or access areas, they shall be removed from the area by a USFWS permitted biologist and temporarily relocated to nearby suitable aquatic habitat	Yes	Ongoing	NA	NA	Although no grading activity took place within PCRA subareas 4,5,6,or 7 during the reporting period, grading took place adjacent to PCRA Subarea 7 at Sedimentation Basin 13a and 13b. Pre-construction surveys, construction monitoring, and exclusion fence installation occurred. See Appendix F.	Appendix F: Sedimentation Basin 13a and 13b Biological Monitoring Memo.

All COAs								
COA	**Requirement**	**Summarized Description**	**Annual Report Requirement (Yes/No)**	**Frequency**	**Required Submittal Date**	**Date Submitted**	**Comments**	**Appendix**
61	PRCA Work during Daylight hours for CRLF Avoidance	All restoration activities within PCRA subareas 4 through 7 shall cease one half hour before sunset and shall not begin prior to one half hour after sunrise. Additionally, restoration activities shall not occur during rain events, as CRLF are most likely to disperse during periods of precipitation	Yes	Ongoing	NA	NA	Although no grading activity took place within PCRA subareas 4,5,6,or 7 during the reporting period, grading took place adjacent to PCRA Subarea 7 at Sedimentation Basin 13a and 13b. All Construction took place on dry days and avoided the dawn and dusk hours. See Appendix F.	Appendix F: Sedimentation Basin 13a and 13b Biological Monitoring Memo.
62	Document History of Kaiser Permanente Quarry Mining District	The Mine Operator shall document the physical characteristics and their historic context of the contributing features of the Kaiser Permanente Quarry Mining District (See COA Text)	Yes	60 Days Prior to modification of conveyor	NA	NA	Lehigh is in the process of documenting the historical features of the Kaiser Permanente Quarry Mining District. The documentation is expected in the 2014/2015 annual report.	
63	Salvage Permanente Quarry Conveyor System	Prior to any of the following: modification, relocation, removal, or demolition of the Permanente Quarry Conveyor System, the Mine Operator shall salvage and/or relocate a representative portion of the Permanente Quarry Conveyor System and the remains of the early 1940s crusher, which constitute character-defining features that otherwise would be lost as a part of implementation of the Project. (See COA Text)	Yes		NA	NA	Lehigh is in the process of documenting the historical features of the Kaiser Permanente Quarry Mining District. The ddocumentation is expected in the 2014/2015 annual report.	
64	Prepare Public Information Prior to Conveyor Salvage	At least sixty (60) days prior to commencement of any work as described above Condition #63, the Mine Operator shall prepare public information programs to educate the general public on the historic nature of the potential Kaiser Permanente Quarry Mining District, (See COA Text)	Yes		NA	NA	No modification to the historic conveyor system took place during the 2013/2014 reporting period.	
65	Cease Activity if Cultural Resources Are Found	If cultural resources are encountered during Project implementation the Mine Operator shall notify the Planning Manager and all activity within 100 feet of the find shall stop until the cultural resource is evaluated by a qualified archaeologist and a Native American representative (See COA Text)	Yes	Ongoing	NA	NA	No cultural resources were encountered during the 2013/2014 reporting period.	
66	Cease Activity if Paleontological Resources Are Found	If a paleontological resource is encountered during implementation of the RPA the Mine Operator shall notify the Planning Manager, and all activity within 100 feet of the find shall stop until it can be evaluated by a qualified paleontologist (See COA Text)	Yes	Ongoing	NA	NA	No paleontological resources were encountered during the 2013/2014 reporting period.	
67	Notify County Coroner if Any Human Remains are Found	In the event that human skeletal remains are encountered, the Mine Operator is required to immediately notify the County Coroner.(See COA Text)	Yes	Ongoing	NA	NA	No human remains were encountered during the 2013/2014 reporting period.	
68	Avoidance of Slope Material Falling Into Creek in PRCA Areas	In all areas requiring the use of excavators for grading within the Permanente Creek Reclamation Area (PCRA) (e.g., access road in-sloping, installation/repair of sedimentation basins, and removal of slide debris), the Mine Operator and/or its contractor shall begin excavations from the top of slope and proceed downward. The Mine Operator and/or its contractor shall not undercut sloped materials unless no other option is feasible as determined by a registered geotechnical engineer (e.g., excessively sloped or otherwise inaccessible terrain). In all areas of the PCRA where excavations would occur in sloped materials, the Mine Operator and/or its contractor shall install barriers immediately downslope of the activity. (See COA Text)	Yes	Ongoing	NA	NA	No grading activity took place within PCRA during the reporting period.	

All COAs								
COA	**Requirement**	**Summarized Description**	**Annual Report Requirement (Yes/No)**	**Frequency**	**Required Submittal Date**	**Date Submitted**	**Comments**	**Appendix**
69	Submit Geotechnical Plan Review	Within thirty (30) days following approval of the RPA, submit a Geotechnical Engineer's Plan Review letter that confirms the RPA, as modified by other conditions of approval, conforms with the recommendations presented in Golder's Report (RPA Appendix C, dated November 2011).(See COA Text)	No	One Occurrence	7/26/2012	7/26/2012	Complete.	
70	Follow Geotechnical Design for EMSA Filling	The geotechnical design recommendations provided by Golder Associates (RPA Appendix C, November 2011) are being implemented as part of the ongoing stockpiling activities within the EMSA(See COA Text)	No	Ongoing	NA	NA	Noted.	
71	Prepare GHG Inventory for Reclamation Activities	the Mine Operator shall conduct an annual inventory of GHG emissions and shall report those emissions (See COA Text)	Yes	Ongoing	10/1/2014	10/1/2014	An annual report greenhouse gas emmissions inventory is provided in Appendix J.	Appendix J: Annual Greenhouse Gas Inventory Report
	Register with Climate registry	The Mine Operator shall become a reporting member of The Climate Registry	No	Ongoing		9/25/2012	Complete.	
72	GHG reduction Plan	The Mine Operator shall prepare, submit for County and BAAQMD approval, make available to the public, and implement a Greenhouse Gas Emissions Reduction Plan (GHG Plan) containing quantifiable strategies to ensure that the Project-related incremental increase of GHG emissions does not exceed 1,100 MT Co2e per year. (See COA Text) The Greenhouse Gas Emissions Reduction Plan shall be submitted to the Planning Manager within 90 days of final RPA Approval.	No	Ongoing	9/24/2012	9/25/2012	Complete.	
73	Obtain GHG Offsets	If the Mine Operator is unable to reduce the Project-related incremental increase of GHG emissions to below 1,100 MT Co2e per year per Condition #72, the Mine Operator shall offset all remaining Project incremental emissions above that threshold. (See COA Text)	Yes	Ongoing	NA	NA	The project produced less than 1,100 metric tons of CO2. See Appendix J.	Appendix J: Annual Greenhouse Gas Inventory Report
74	Verification of Non-Limestone-Containing Material Used as Cover in EMSA and WMSA	A California Certified Engineering Geologist shall be onsite during reclamation to verify that non-limestone run-of-mine rock is used as cover on the EMSA and WMSA. In addition, the Geologist shall observe and document activities associated with placing the final overburden on the Quarry Pit (i.e., ensuring that organic material is mixed to specifications).(See COA Text)	Yes	Ongoing	NA	NA	Final reclamation did not begin during the time period covered by this report. Lehigh is documenting that non-limestone overburden is being placed in the EMSA, and upon final placement, this requirement will be satisfied.	Appendix I: Non-Limestone Cover Material Verification Memo
75	The County may retain a third party geologist.	1. The County reserves the right to retain, if it deems necessary, at the expense of the Mine Operator, a third-party California-certified Engineering Geologist, to provide independent oversight or monitoring to implement Condition #74.	No	Ongoing	NA	NA	Noted.	
76	Water Quality Monitoring Program	Within ninety (90) days of RPA approval, the Mine Operator shall begin and continue throughout the backfilling and reclamation phases and for 5 years following completion of reclamation and for 5 years following the start of groundwater discharge from the Quarry Pit into Permanente Creek as described on page 4.10-39 of the Final Environmental Impact Report, a Verification and Water Quality Monitoring Program. (See COA Text)	Yes	Ongoing	10/1/2014	10/1/2014	See Appendix E.	Appendix E: Water Quality Monitoring Memo

All COAs								
COA	**Requirement**	**Summarized Description**	**Annual Report Requirement (Yes/No)**	**Frequency**	**Required Submittal Date**	**Date Submitted**	**Comments**	**Appendix**
77	Reclamation is Complete when all WQS are met	Reclamation of the Quarry Pit, EMSA, and WMSA areas shall not be considered complete until 5 years of water quality testing as described above demonstrate to the satisfaction of the Planning Manager that selenium in surface water runoff and any point source discharges has been reduced below all applicable water quality standards, including Basin Plan Benchmarks.	Yes		NA	NA	Final reclamation did not begin during the time period covered by this report.	
78	Stormwater BMPs	Within 90 days of RPA approval, the Mine Operator shall implement stormwater and sediment management controls in addition to general BMPs required by the SWPPP in active and inactive reclamation areas throughout Phase I, II, and III of the RPA. (See COA Text)	Yes	Ongoing	10/1/2014	10/1/2014	Stormwater and sediment management controls in addition to general BMPs required by the SWPPP in active and inactive reclamation areas have been installed and maintenance is ongoing.	Appendix A: 2013-2014 Stormwater and Erosion Controls Report Appendix B: 2013-2014 Wet Season Erosion Control Inspection Reports
79	Stormwater Monitoring Plan	Prior to the start of reclamation activities, the Mine Operator shall develop a Stormwater Monitoring Plan for sampling and testing stormwater, that would supplement preexisting surface water monitoring required by General Industrial Storm Water and Sand and Gravel NPDES Permit and any other applicable permits designed to specifically monitor surface water during reclamation activities in active and inactive excavation and backfill areas, and locations where water discharges to Permanente Creek. (See COA Text)	Yes	Ongoing	10/1/2012	8/24/2012	Water quality testing has been conducted in accordance with the Interim Stormwater Monitoring Plan. Because elevated selenium was observed, Lehigh identified the source and proposed modifications to the BMP's in the EMSA. See Appendix Q.	Appendix E: Water Quality Monitoring Memo Appendix Q: East Materials Storage Area Condition No. 79 – Modifications to Best Management Practices
80	Monitor BMP Effectiveness for EMSA	Within 30 days of RPA approval, sampling and testing shall occur within 24 hours after a qualifying rain event. For purposes of triggering Planning Commission review, the sampling shall occur at locations where water discharges to Permanente Creek. (See COA Text)	Yes	Ongoing	NA		Water quality testing has been conducted in accordance with the Interim Stormwater Monitoring Plan.	Appendix E: Water Quality Monitoring Memo
81	Monitor BMP Effectiveness for WMSA and Quarry	Within 30 days of the start of reclamation activities for Phase II, the Mine Operator shall conduct monthly water sampling and testing results in compliance with the Interim Stormwater Monitoring Plan (See COA Text)	Yes	Ongoing	NA		Water quality testing has been conducted in accordance with the Interim Stormwater Monitoring Plan. The Interim Treatment System (ITS) is being installed for runoff originating in the WMSA.	Appendix E: Water Quality Monitoring Memo Appendix P: Feasibility of Water Treatment for Discharges From The Permanente Quarry Containing Selenium
82	Design, Pilot Testing, and Implementation of Selenium Treatment Facility	Within 30 days of RPA approval, the Mine Operator shall begin designing a treatment facility (or alternative) and pilot system for discharge into Permanente Creek. (See COA Text)	Yes	Ongoing	NA	9/19/2014	Water quality testing has been conducted in accordance with the Interim Stormwater Monitoring Plan. A feasiibility report for the Interim Treatment System was composed 9/19/2014 and submitted to the County.	Appendix J: Water Quality Monitoring Memo Appendix P: Feasibility of Water Treatment for Discharges From The Permanente Quarry Containing Selenium

All COAs								
COA	**Requirement**	**Summarized Description**	**Annual Report Requirement (Yes/No)**	**Frequency**	**Required Submittal Date**	**Date Submitted**	**Comments**	**Appendix**
83	Construct of Onsite Water Detention Facility	The Mine Operator shall design and construct detention facilities that would 1) manage increased runoff caused by the reclaimed Quarry pit, (See COA Text)	Yes		NA	NA	Final reclamation did not begin during the time period covered by this report. No excess runoff was caused by the reclaimed Quarry Pit.	
84	Stormwater Control to Avoid Ponded Water and Selenium Accumulation	The Mine Operator shall incorporate drainage features into the final drainage design for the Quarry pit area to eliminate the potential for surface ponding on the floor of the Quarry pit once it has reached its final elevation (990 amsl).(See COA Text)	Yes		NA	NA	Final reclamation did not begin during the time period covered by this report.	
85	Mosquito Control for Ponded Water	Any body of water created during the operation of the quarry, both during excavation and processing the material, shall be maintained to provide for mosquito control and to prevent creation of any health hazards or public nuisance.	Yes	Ongoing	NA	NA	All bodies of water created during the operation of the quarry have been maintained to provide mosquito control and prevent the creation of any health hazards or public nuisance.	
86	Provide Plans for Riprap Energy Dissipaters	Sixty (60) days following RPA approval, the Mine Operator shall provide to the Planning Manager revised plans that show redesigned rip-rap energy dissipaters per the Association of Bay Area Governments (ABAG) standard for the 25 year storm for all discharge points on the reclamation plans.	No	Once	8/24/2012	8/24/2012	Complete.	
87	Prohibit Night Operations in EMSA	The Mine Operator shall prohibit all heavy equipment operations in the northeasterly 11.5 acres of the EMSA (as shown in Draft EIR, Figure 4.13-8) during nighttime hours (i.e., between 10:00 p.m. to 7:00 a.m.).	Yes	Ongoing	NA	7/26/2012	No nighttime equipment operations occur in the EMSA.	
88	Caretakers Residence Control or Prohibit EMSA Operations within 1600 feet	The Mine Operator shall either: (1) limit all operations in the EMSA within 1,600 feet of the caretaker's residence (as shown in Figure 4.13-8) to no more than one 8-hour shift per day, or (2) submit evidence establishing to the County's satisfaction that there are legally-binding restrictions precluding any occupancy of the caretaker's residence during the entirety of Phase 1 of the RPA.	No	Once	NA	7/26/2012	Complete.	
89	Signage within EMSA regarding Light Prohibitions and Noise restrictions (COA 42 and 87)	Within thirty (30) days of the RPA Approval, the Mine Operator shall post a sign inside all mine equipment operating in the EMSA area with the text from Condition #42 (Light and Glare) and Conditions # 87 and # 88 (Noise). The sign shall be posted prominently within view of the vehicle operator. Within 30 days of the RPA approval, the Mine Operator shall submit to the Planning Manager photo documentation demonstrating compliance of this.	No	Maintain	7/26/2012	7/26/2012	Complete - Signs are in place and in good condition.	

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APPENDIX A:

2013-2014 STORMWATER AND EROSION CONTROLS REPORT

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Lehigh Permanente Quarry Stormwater and Erosion Control Annual Report 2013-2014

SANTA CLARA COUNTY, CALIFORNIA

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August 30, 2014

ENVIRONMENTAL CONSULTANTS

TABLE OF CONTENTS

EXECUTIVE SUMMARY ii

1.0 INTRODUCTION 1

2.0 PURPOSE 1

3.0 REPORTING REQUIREMENTS 1

4.0 COMPLIANCE ACTIONS 1
4.1 Compliance Actions Reported in Previous Submittals 1
4.2 Compliance Actions Completed Since 2013 Annual Report Submittal 1
4.2.1 PCRA Subareas 2
Subareas 5 and 6 3
4.2.2 WMSA 4
4.2.3 North Quarry 4
East Quarry Wall Hydroseeding 4
Pond 4a 4
4.2.4 Crusher/Support Area 5
New Crusher 5
C-Station Sedimentation Basins 5
Sedimentation Basin 13b 5
4.2.5 EMSA 6
Pond 30 and 31a 6
Santa Clara Formation Stockpile 6
4.2.6 Surge Pile/Rock Plant 6
4.2.8 Sedimentation Basin Cleanout 7
4.3 Planned Future Compliance Actions 7
4.3.1 Planned Hydroseeding 7

5.0 SUMMARY 8

6.0 REFERENCES 9

LIST OF TABLES

Table 1. Sedimentation Basin Cleanout Quantities 7

LIST OF APPENDICES

Appendix A - 2013-2014 Report Year Compliance Actions and BMP Install Figures

EXECUTIVE SUMMARY

The purpose of this report is to document the stormwater and erosion control actions that have been completed to comply with the requirements of the Conditions of Approval for the Permanente Quarry Reclamation Plan Amendment during the period of July 1, 2013 to June 30, 2014.

Between July 1, 2013 and June 30, 2014, WRA, Inc. (WRA) oversaw the completion of several actions that fulfilled various Conditions of Approval at the Quarry. This report lists those actions completed and previously reported to Santa Clara County (the County) and describes those actions that have been initiated, and/or completed since the last submittal (August 30, 2013). Actions include installation of erosion control Best Management Practices (BMPs), to prevent soil erosion in areas of construction activity and topsoil stockpiling; maintenance and repair of previously installed BMPs; routine clean out of vegetation and sediment from sedimentation basins, check dams and stormwater ditches; diversions of water runoff to containment basins; and lining drainages with non-limestone materials. Figures depicting erosion control BMP installs and compliance activities from the 2013-2014 report year, are provided in Appendix A. Further actions are ongoing as dictated by the Reclamation Plan Amendment and the Conditions of Approval.

1.0 INTRODUCTION

The Reclamation Plan Amendment (RPA) for Lehigh Permanente Quarry (the Quarry) located at 24001 Stevens Creek Boulevard, in unincorporated Santa Clara County, amends and supersedes the previously approved 1985 Permanente Quarry Reclamation Plan for a 20-year period to satisfy the reclamation requirements of the Surface Mining and Reclamation Act of 1975. The RPA encompasses 1,238.7 acres within the Mine Operator's 3,510-acre ownership.

Reclamation activities will be implemented in three phases over an estimated 20-year period. The Quarry is currently in Phase I which involves reclamation activities in the East Material Storage Area (EMSA) and the Permanente Creek Restoration Area (PCRA) and continuation of existing mining activities in the Western Material Storage Area (WMSA) and Quarry Pit over approximately the next nine years.

2.0 PURPOSE

The purpose of this Compliance Actions Report is to document the stormwater and erosion control actions that have been completed to comply with the requirements of the Santa Clara County Conditions of Approval (COAs), Approved by Planning Commission, June 7, 2012 and modified by the Board of Supervisors on June 26, 2012. This Compliance Actions Report includes those actions that have been ongoing or completed since the last submittal and refer to past actions submitted in previous reports.

3.0 REPORTING REQUIREMENTS

Generally, the COAs call for an annual report to be completed by the County by December 1 of the year and for the mine operator, Lehigh Hanson (Lehigh), to present all data and compliance actions to the County by October 1. To inform the Annual Report, Lehigh wishes to present a report of the stormwater and erosion control actions carried out to date for the COAs. This report will serve to provide a record to the County and track the reclamation actions that have been completed to date.

4.0 COMPLIANCE ACTIONS

4.1 Compliance Actions Reported in Previous Submittals

Stormwater and erosion control actions taken to address COA compliance began immediately after RPA finalization in June 2012. Actions taken to address COA compliance are required to be reported annually as per COA #8. Lehigh submitted the first annual report of COA compliance actions in the 2013 Annual Report (WRA 2013). Lehigh also presented a Fall 2012 Compliance Actions report (WRA 2012) to document actions taken between the RPA approval and the end of 2012.

4.2 Compliance Actions Completed Since 2013 Annual Report Submittal

Actions to complete or advance the fulfillments of the COAs since the 2013 Annual Report submittal (August 31, 2013) are described below. All erosion control BMPs previously reported from the 2013 Annual Report and the Fall 2012 Compliance Actions report have been maintained and repaired as needed. To date no BMPs have been abandoned.

4.2.1 PCRA Subareas

The RPA calls for erosion control actions in all the Permanente Creek Restoration Area (PCRA) treatment areas within Phase 1, and Lehigh has begun erosion control assessments and work in all subareas. The first year of the approximately nine-year Phase 1 was 2012. Prior to November 29, 2012, erosion control actions were completed in subareas 4-7, and were started in Subareas 1 and 2. During the 2013-2014 report year, erosion control actions were completed in subareas 1-4, and all previously installed erosion controls were inspected for deficiencies and corrected as necessary. For a complete description of all previous erosion control actions in the PCRA Subareas, and associated figures and photographs, see the 2013 Annual Report (WRA 2013).

Subarea 1

No erosion control measures were deemed necessary in Subarea 1. Nearly all of Subarea 1 is located uphill of the existing access road. The upper portion is mostly vegetated and relatively flat, and therefore has minimal erosion potential. All of the parts of the subarea above the access road are heavily vegetated, and this vegetation provides better erosion control than can be installed through erosion control BMPs. Addittionally, the access road below acts as a barrier to sediment movement downslope. A portion of Subarea 1 extends below the access road, and adequate erosion protection controls (i.e., rock berms) are in place from efforts previous to the RPA and found to be adequate. No evidence of substantial erosion has been observed over the 2013-2014 period.

Subarea 2

Subarea 2 can be divided into the portions above and below the access road. The portion above the access road (and below the haul road) is protected by the existing berm on the downhill side of the access road. Although the berm had been breached in several locations prior to the 2013 Annual Report, the breaches were repaired in 2013 using staked-down straw bales with wattles wrapped around them. The BMPs used to repair the breaches in the berm have been routinely checked and are currently functioning properly. The access road berm along with existing vegetation is sufficient for preventing material from eroding into Permanente Creek from upslope of the access road.

The area below the access road is steep, loose, and sparsely vegetated. Because no topsoil exists, hydroseeding would likely be ineffective on these slopes. Wire-backed silt fences were installed in 2013 along the entire length of the lower Subarea 2 in a similar fashion as was carried out in Subareas 4-6 in 2012 to prevent material from entering Permanente Creek. The silt fence was installed at, or above, the toe of the slope along the uphill border of the riparian vegetation. It was installed in overlapping lengths as necessary to accommodate the heterogeneous topography and wildlife movement corridors. The silt fence BMPs within this area have been routinely checked during monthly erosion control inspections. Any breaches or deficiencies found have been corrected and currently functioning properly.

The area above the access road was hydroseeded in 2012 with the PCRA hydroseeding mixture, while the area below the access road was not hydroseeded. Based on continued observation of both areas over the last year, no substantial differences exist between the treated area and the untreated area. Both areas consist of a mixture of rock slopes, some places with pockets of boulder or scree fields, and pockets with more smaller-sized soil profiles (with filled interstitial spaces) where vegetation can be established. The attempt at hydroseeding resulted in no substantial change in the vegetation because in all areas where vegetation could be established, vegetation already exists from natural recruitment. In the areas where vegetation does not exist (i.e, scree and boulder fields without substantial soils), hydroseeding appears to have no benefit. Therefore, additional hydroseeding efforts were not completed in the areas below the access road. No substantial evidence of erosion or material movement to the creek has been observed over the 2013-2014 period.

Subarea 3

The Treatment Areas of PCRA Subarea 3 are mostly located in extremely steep terrain without feasible access. The upper portions of Subarea 3 within approximately 100 feet of the top of the haul road berm are less steep. Wire-backed silt fences were installed in 2013 as far down the slope as was safe and feasible to capture any materials originating from uphill. The silt fence BMPs installed in this subarea were routinely inspected during erosion control inspections throughout this report year. No deficiencies were observed during inspections. The lower portions of Subarea 3 were deemed unsafe to access, and the Mine Safety and Health Administration (MSHA) will not allow erosion control activity to take place there. The lowest accessible portions of Subarea 3 are heavily vegetated with a band of riparian vegetation, so it was deemed more effective to avoid this protective vegetation since it is more effective than any BMP's that would be installed otherwise. No debris slides or substantial erosion were observed over the 2013-2014 period.

Subarea 4

Erosion control BMPs were placed throughout much of Subarea 4 in prior years. An additional 100-150 feet of wire-backed silt fence was installed at the far west end of Subarea 4 in 2013. All areas have been inspected regularly and repaired as necessary throughout the past two report years. At the time of this report, BMPs are in good condition and functioning properly.

On June 3, 2014, during a monthly erosion control inspection, it was discovered that a midgrade limestone stockpile on the haul road above Subarea 4 had been overtopped, sending a small portion of approximately 3-inch diameter rock over the haul road berm. The rock was limited to an area within approximately 20 feet of the berm and none of the rock entered the riparian area or the creek. A wire-backed silt fence was installed below the stockpile to prevent limestone rock from entering the creek (see Figure 1a). No further movement of rock has been observed.

Subareas 5 and 6

The majority of Subareas 5 and 6 are extremely steep with limited access. No new erosion control measures were implemented in these subareas. At the time of this report, erosion control measures installed in the 2012 effort are in good condition and functioning properly after regular inspections and repair where necessary. No debris slides or substantial erosion were observed over the 2013-2014 period.

Subarea 7

The PCRA Subarea 7 treatment area can be divided into three portions: eastern, middle, and western. The western portion is composed of very steep hillsides adjacent to and below the existing crusher. This area is unsafe for access and moderately covered with vegetation. Any access to this portion would result in rocks falling downhill and further destabilizing the slopes, so any erosion controls would likely do more damage than leaving the area as is. The middle portion of Subarea 7 is almost completely covered in thick vegetation composed mainly of native buckwheat. Any activity in this area would likely disturb the existing vegetation and result in a more erosive hillside. The eastern portion of the PCRA Subarea 7 treatment areas adjacent to and below Pond 13 is protected by a haul road berm which acts as a barrier to any materials entering Permanente Creek.

Overall, the PCRA Subarea 7 treatment areas were determined to have adequate erosion protection, and any further erosion controls are not deemed appropriate. Regular inspections of this area are being completed to assure erosion does not occur.

4.2.2 WMSA

All stormwater and erosion control BMPs previously installed within the WMSA were routinely inspected and repaired as needed throughout the 2014 report year. Routine maintenance actions of existing BMPs included:

- Cleanout of haul road checkdams.
- Grading maintenance of the haul road.
- Repair of silt fences and removal of invasive vegetation around the 2013 topsoil stockpiles.

At the time of this report all BMPs are functioning and in good condition. Routine inspection is ongoing.

4.2.3 North Quarry

All stormwater and erosion control BMPs previously installed within the North Quarry were routinely inspected and repaired as needed throughout the 2014 report year. At the time of this report all BMPs are functioning and in good condition. In addition to the routine inspection and maintenance of existing BMPs, the following actions were taken this year.

East Quarry Wall Hydroseeding

The east Quarry wall was mined and regraded during this report year. An approximately 2-acre section of newly-graded slopes were hydroseeded with the erosion control seed mixture prior to the wet season of 2013-2014 (see Figure 1e). Monitoring of hydroseeded areas are ongoing to determine the effectiveness on these slopes.

Pond 4a

Construction of a selenium treatment plant is currently ongoing around Pond 4a at the southern portion of the North Quarry that borders PCRA Subarea 5. Erosion control BMPs in the form of silt fencing with straw wattles at the base, were installed at the limit of grade to prevent erosion into Subarea 5. During a monthly site visit by County inspector, Steve Beams, a breach in the berm south of Pond 4a was noticed. This berm breach was the result of removal of a water quality monitoring station. As per Mr. Beams request, a silt fence was installed to repair the breach in the berm. Additional erosion control BMPs were installed to slow potential waterflow in the vicinity of the newly installed silt fence. In addition to newly-installed BMPs, emergent vegetation consisting predominantly of cattail (*Typha sp.*) that grew in to pond 4a was removed, to maintain Pond 4a as a sedimentation basin (see Figure 1b).

4.2.4 Crusher/Support Area

All stormwater and erosion control BMPs previously installed within the North Quarry were routinely inspected and repaired as needed throughout the 2014 report year. At the time of this report all BMPs are functioning and in good condition. In addition to the routine inspection and maintenance of existing BMPs, the following actions were taken this year.

New Crusher

In 2013, the previous rock crusher was abandoned and a new rock crusher was installed approximately 1,000 feet to the east of its previous location. Construction surrounding the crusher relocation included cutting new roads and regrading existing slopes. Silt fences were installed on the hillside below the new crusher area to prevent sediment from running downhill from construction. Straw wattles were installed on newly-graded slopes followed by hydroseeding to prevent erosion (see Figure 1c). All BMPs surrounding the new crusher have been routinely inspected and repaired or replaced when necessary.

Quarry Office-Pit Access Road

A new access road was cut and graded just above the new crusher. The hillsides above the access road were hydroseeded with a native grass and shrub mixture. The hillsides below the new access road were divided into five, half-acre test plots and were hydroseeded with native grass and shrub mixture. The test plots are part of a study to analyze different treatment methods in combination with hydroseeding, to further inform the adaptive management of reclamation revegetation efforts.

C-Station Sedimentation Basins

A large sedimentation basin with 3 sub-basins was constructed below the C-Station in 2013 to capture mining fines that had previously been stockpiled around the C-Station (WRA 2013). These basins were routinely inspected throughout this report year and accumulated sediment was cleaned out when necessary. Sediment was deposited in the quarry pit. The non-limestone lined stormwater trenches upstream and downstream of the C-Station basins were also routinely inspected. Vegetation that grew into the trenches was removed when necessary (see Figure 1d).

Sedimentation Basin 13b

Sedimentation Basin 13b is located to the northeast of Pond 13 and serves as a sedimentation basin to contain stormwater runoff and prevent unmitigated runoff from entering Permanente Creek. Previously, a network of two consecutive sedimentation basins (13a and 13b), existed where Sedimentation Basin 13b resides currently. Sedimentation Basin 13a was removed in December 2013 and the area was regraded towards 13b. Sedimentation Basin 13b increased in capacity and will eventually be lined. Silt fence was installed between Pond 13 and Sedimentation Basin 13b to assure that no wildlife encroached into the construction area from Pond 13. This was left in place as requested by County inspectors to assure sediment did not run into Pond 13. During the removal of Sedimentation Basin 13a, sediment removed from the former sedimentation basin was placed off to the side to dry out prior to removal. Hay bales and wattles were installed below the wetted sediment slurry to assure that it would not run downhill to Pond 13. Silt fence was installed west of the biology exclusion fence to reduce any surface water flow and sediment movement into the creek from the hillsides north of Pond 13 and west of Sedimentation Basin 13b (Figure 1c).

4.2.5 EMSA

All stormwater and erosion control BMPs previously installed within the EMSA were routinely inspected and repaired as needed throughout the 2014 report year. Routine maintenance actions of existing BMPs included:

- Removal of sediment and vegetation from ditches and sedimentation basins.

At the time of this report all BMPs are functioning and in good condition. In addition to the routine inspection and maintenance of existing BMPs, the following actions were taken this year.

Pond 30 and 31a

Pond 30 is a managed sedimentation basin located in the eastern portion of the EMSA and is the last sedimentation basin in a series of basins and stormwater ditches designed to prevent sediment from entering Permanente Creek. Erosion control BMPs that were installed in previous years have been inspected regularly and fixed as needed. A new silt fence, accompanied by straw wattles and hay bales was installed this report year along the north side of the stormwater ditch, just opposite the EMSA haul road, to prevent silt from washing down the road and into the ditch. Vegetation that grew into Pond 30, Pond 31a and the ditch connecting the two was removed as needed and sediment from each of the sedimentation basins was removed as well (see Figure 1g). Additionally, the Pond 30 outfall to Permanente Creek was retrofitted with non-limestone boulders to prevent scouring and erosion to the creek.

Santa Clara Formation Stockpile

A new overburden stockpile to be used as topsoil for reclamation was created in the northwest portion of the EMSA. The Santa Clara formation consists of non-limestone materials. As per COA #27, this topsoil stockpile was safeguarded from erosion by installing silt fencing and straw wattles around the perimeter to prevent run-on and run-off (see Figure 1f). Two signs reading, “NON-LIMESTONE RECLAMATION MATERIAL DO NOT DISTURB” were installed at both ends of the stockpile. Additionally, the stockpile will be hydroseeded with an erosion control mixture this fall.

4.2.6 Surge Pile/Rock Plant

All stormwater and erosion control BMPs previously installed within the Surge Pile/Rock Plant area were routinely inspected and repaired as needed throughout the 2014 report year. Routine maintenance actions of existing BMPs included cleanout of Pond 17, a sedimentation basin that supports Rock Plant operations. At the time of this report all BMPs are functioning and in good condition. In addition to the routine inspection and maintenance of existing BMPs, the following actions were taken this year.

4.2.8 Sedimentation Basin Cleanout

As per COA #33, sedimentation basins are routinely inspected and cleaned of vegetation and sediment when necessary to maintain good condition and proper function. Several sedimentation basins required cleanout during this report year (see Figures 1b, 1d, 1g, and 1h). Among the sedimentation basins within the RPA boundary, Pond 4a only required vegetation removal. A table is provided below, depicting quantities of silt removed from the sedimentation basins within the RPA boundary that required silt removal.

Table 1. Sedimentation Basin Cleanout Quantities

Sedimentation Basin	Quantity of Silt Removed (Cubic Yards)	Location of Disposal
C-Station Sedimentation Basins	1,500	Quarry Pit – West Dump
Pond 13a and 13b	1,700	Quarry Pit – West Dump
Pond 17	750	Quarry Pit – West Dump
Pond 30	60	Base of EMSA (to be Covered by Non-Limestone)
Pond 31b	60	Sidecast Beside Pond to be Removed Later

4.3 Planned Future Compliance Actions

Beyond the routine inspection and maintenance of existing BMPs, actions are already planned to take place during the 2014-2015 for COA compliance. This is by no means a complete list of next year's actions, and actions taken during the upcoming year will follow the adaptive management process. Actions to complete or advance the fulfillments of the COAs that are planned to take place during the 2014-2015 report year are described below.

4.3.1 Planned Hydroseeding

In order to comply with COAs #27 and #78b, Lehigh plans to hydroseed topsoil stockpiles to be used for reclamation and reclaimed areas that directly or indirectly drain to Permanente Creek. Planned hydroseeding areas will receive either the erosion control seed mix or the hillside hydroseeding mix, based on whether the area is temporary or permanently reclaimed.

Areas to receive the erosion control seed mix include the newly-formed, temporary topsoil stockpile in the EMSA, and a small area below the old crusher foundation, where active mining is taking place. Additional erosion control BMPs including silt fencing and straw wattles are already installed around the EMSA topsoil stockpile to further protect against wind and erosion. In order to comply with COA #57, silt fencing will be installed below the old crusher hydroseeding area to further prevent erosion and any hydroseeding material from entering Permanente Creek.

Areas to receive the hillside hydroseeding mix include newly reclaimed area in the lower EMSA above Pond 30, a decommissioned road in the EMSA, and a newly reclaimed area to the north of the Quarry Offices, above the East Wall of the Quarry Pit.

4.3.2 Potential BMP Removal

Select BMP's, such as silt fences and straw wattles, are expected to be removed, rather than replaced after the 2014-2015 winter. Given the stability of the slopes as evidenced by lack of material accumulating at select BMP's and the increase in vegetation from hydroseeding and natural recruitment around those BMP's, some may not be necessary. BMP's will be evaluated based on local conditions and their potential to be effective. Those BMP's that are not necessary and require replacement (due to weathering) wil be removed rather than replaced.

5.0 SUMMARY

In the 2013-2014 report year, Lehigh took many erosion control actions to fulfill and comply with the requirements of the COAs and the RPA. Beginning in 2013, the County requires compliance reports to be submitted annually, and this report represents a portion of the overall annual report. Monitoring will continue to take place, and actions will continue to be implemented in all areas to keep within compliance.

6.0 REFERENCES

[WRA] WRA, Inc. 2013. Lehigh Permanente Quarry Reclamation Plan Amendment Conditions of Approval Compliance 2013 Annual Report, Santa Clara County, California. Prepared for Lehigh Southwest Cement Co. August 30.

[WRA] WRA, Inc. 2012. Permanente Quarry Reclamation Plan Amendment and Conditions of Approval Compliance – Fall 2012 Compliance Actions, Lehigh Permanente Quarry, Cupertino, Santa Clara County, California. Prepared for Lehigh Hanson. November.

APPENDIX A

2013-2014 REPORT YEAR COMPLIANCE ACTIONS AND BMP INSTALL FIGURES

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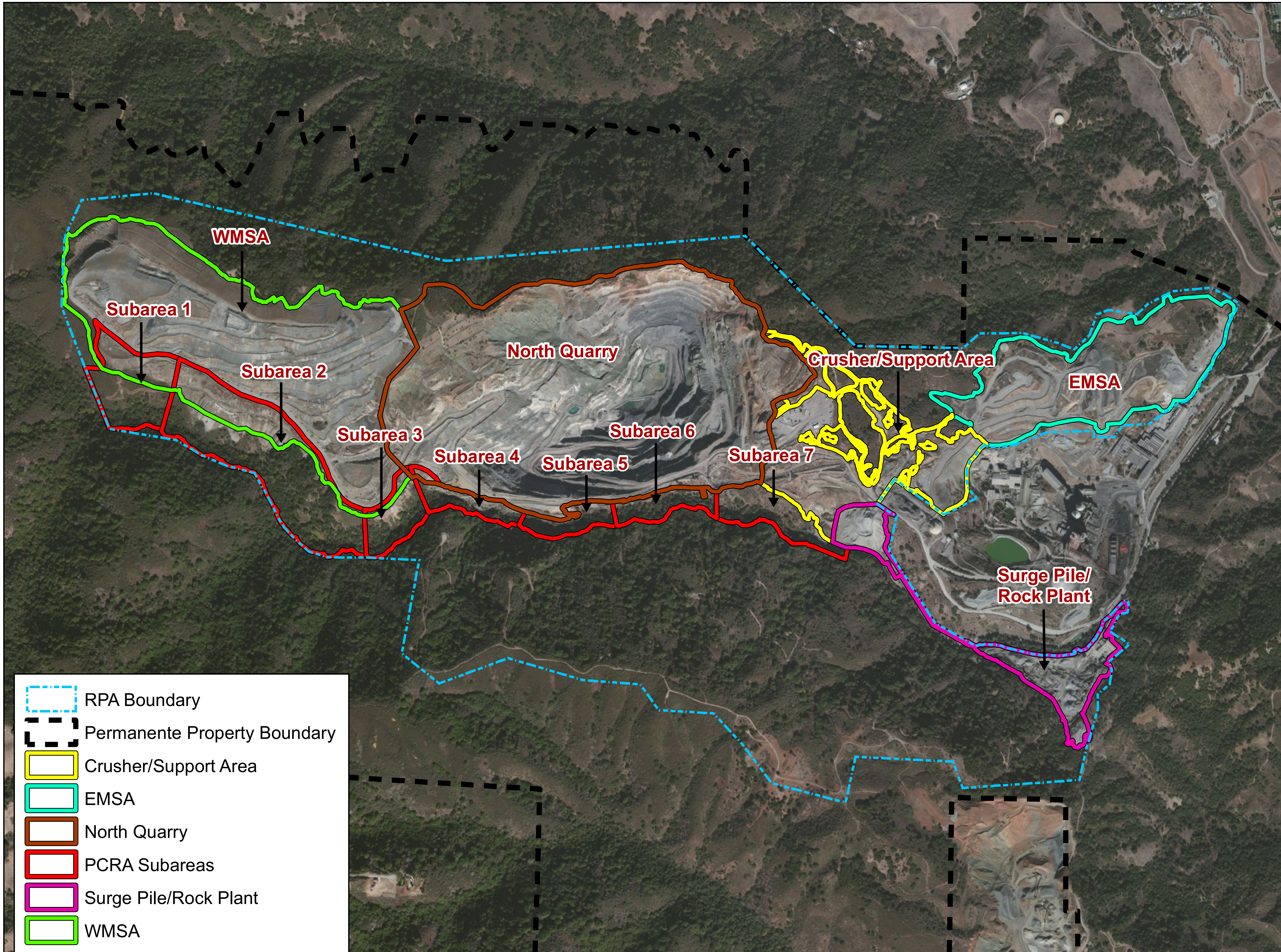

ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 1.

Soil Erosion Control
Annual Report 2014
Overview

N
W E
S

0 500 1,000 2,000
Feet

Date: September 2014
Map By: PK
Aerial: ESRI Streaming 2010

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2014\Erosion Control Annual Report 2014\Overview.mxd

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Lehigh Permanente Quarry, Santa Clara County, California

Figure 1a.

Soil Erosion Control Annual Report 2014 BMP Features

N
W E
S

0 50 100 200 Feet

Date: September 2014
Map By: PK

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2014\Erosion Control Annual Report 2014\Fig 1a.mxd

ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 1b.

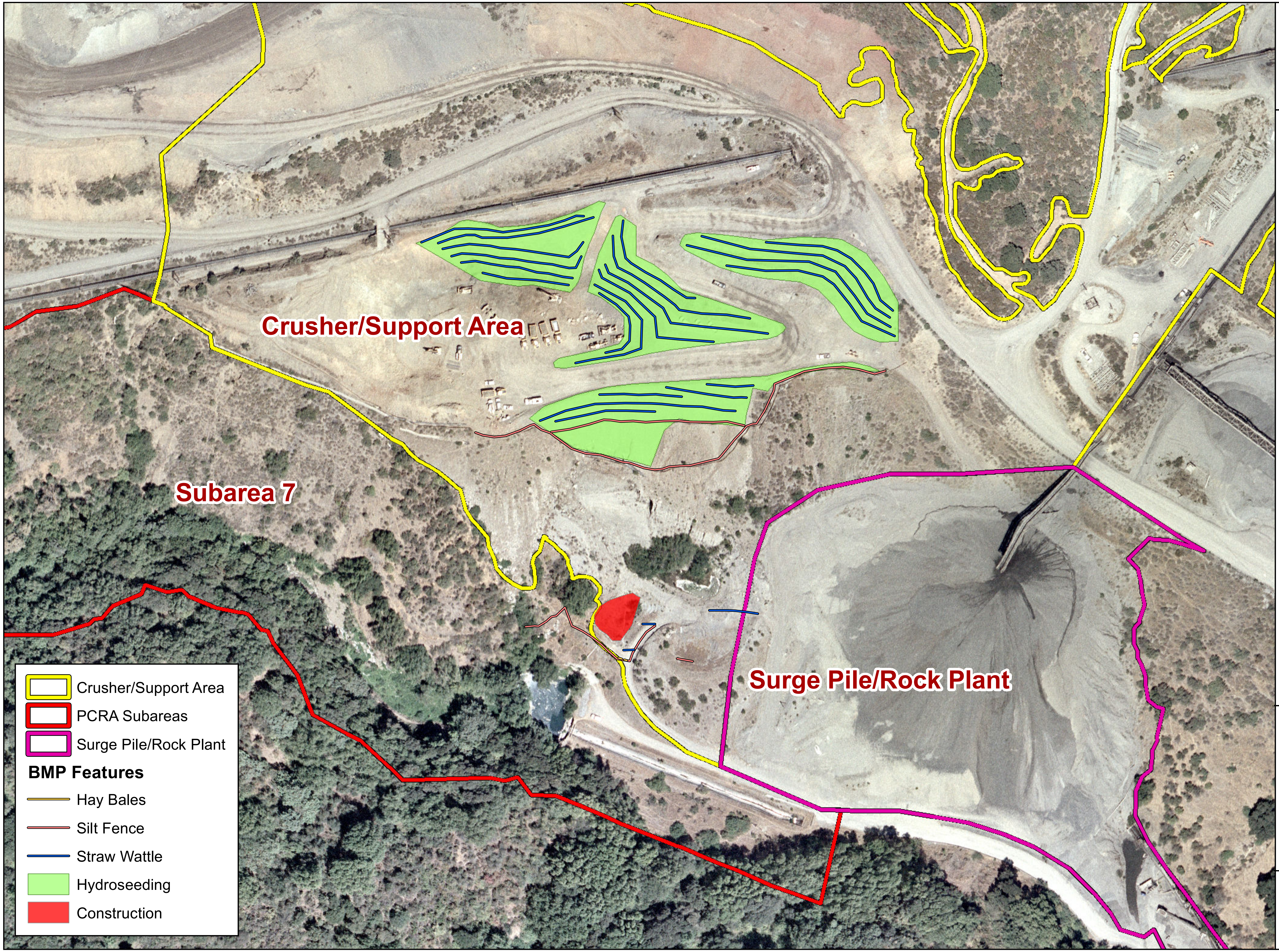
Soil Erosion Control
Annual Report 2014
BMP Features

N
W E
S

0 50 100 200
Feet

Date: September 2014
Map By: PK

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2014\Erosion Control Annual Report 2014\Fig 1b.mxd



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Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 1c.

Soil Erosion Control
Annual Report 2014
BMP Features

N
W E
S

0 50 100 200 Feet

Date: September 2014
Map By: PK

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2014\Erosion Control Annual Report 2014\Fig 1c.mxd

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Figure 1d.

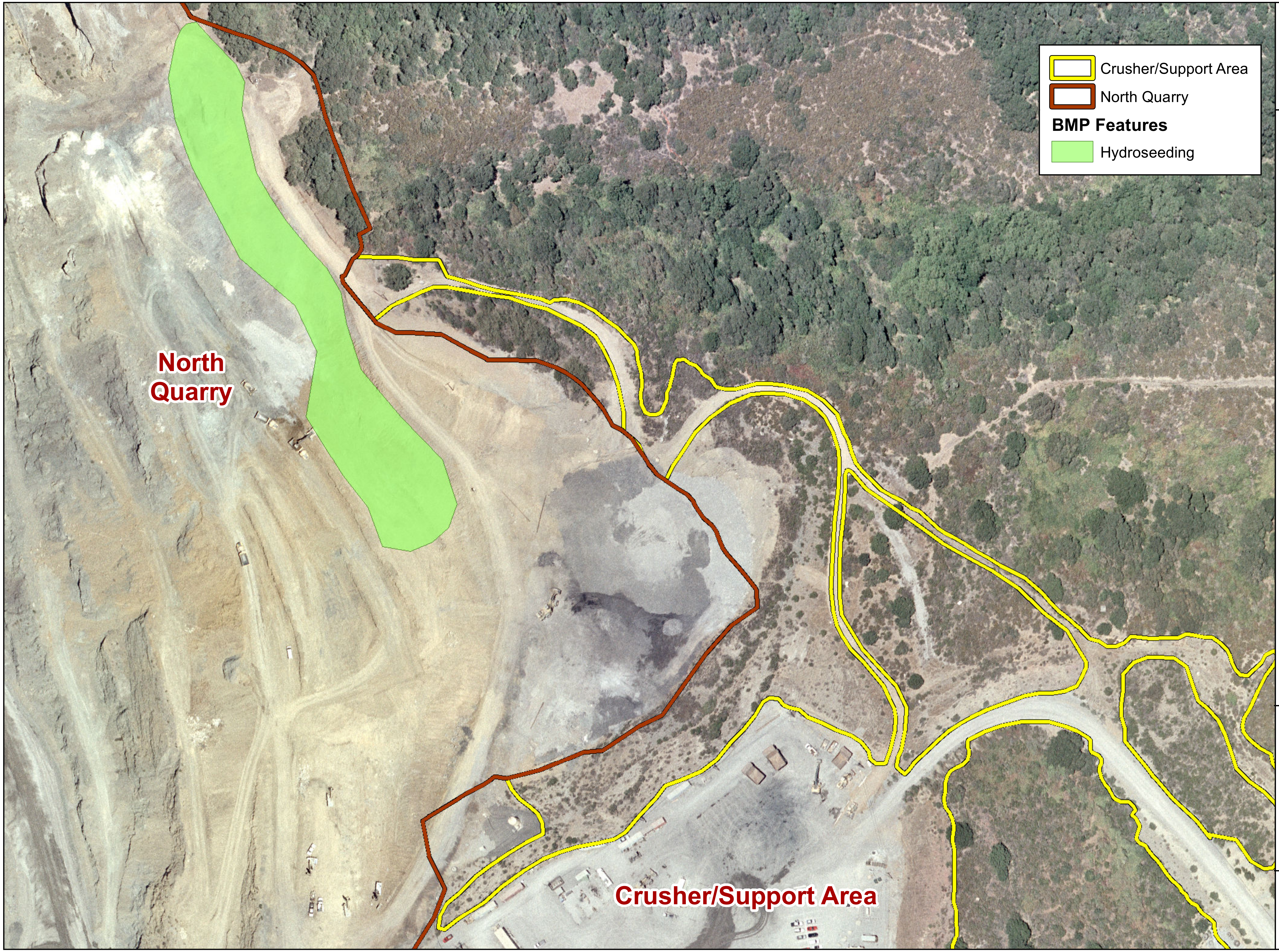
Soil Erosion Control Annual Report 2014 BMP Features

N W E S

0 50 100 200 Feet

Date: September 2014
Map By: PK

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2014\Erosion Control Annual Report 2014\Fig 1d.mxd



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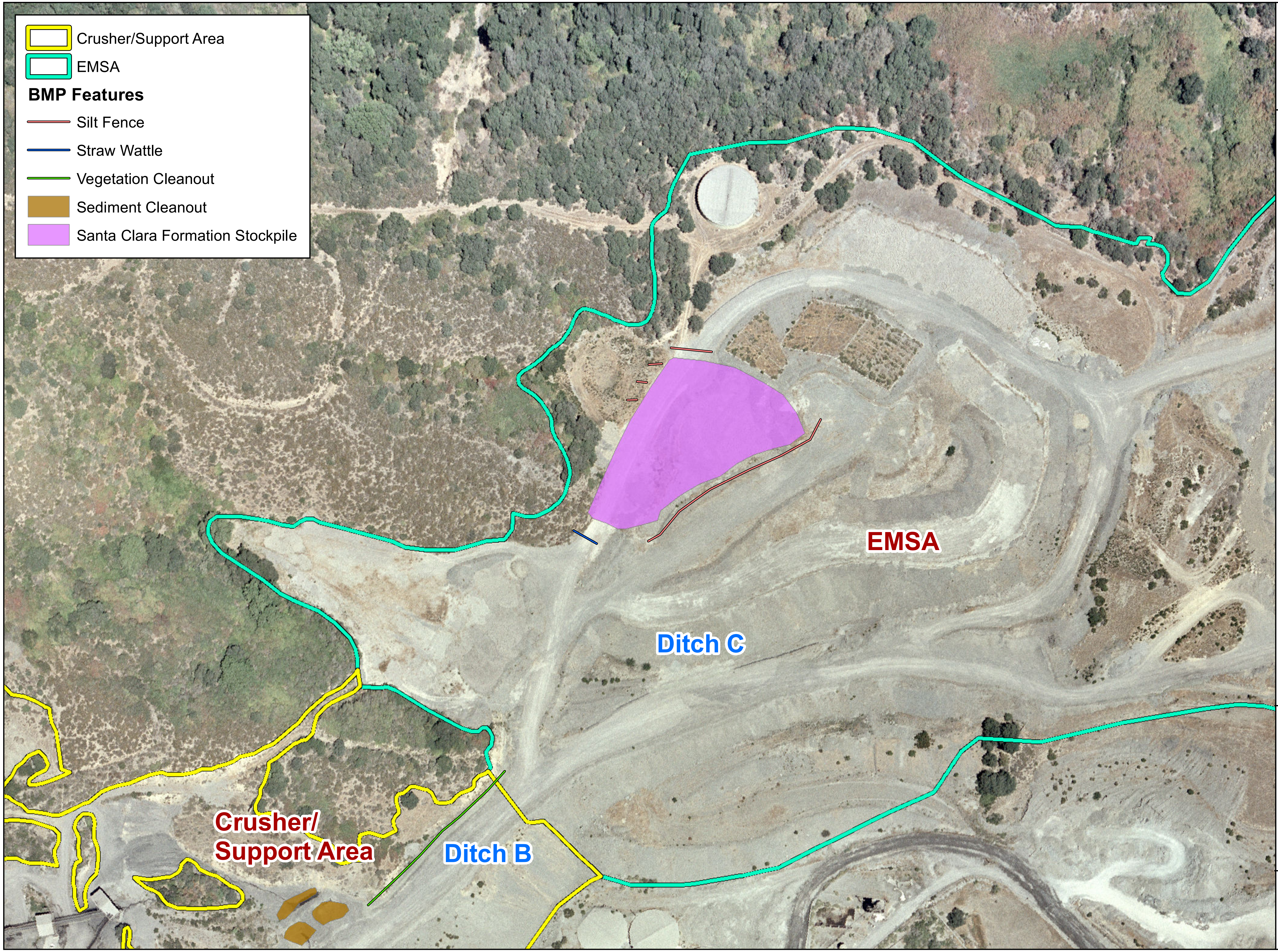
Lehigh Permanente Quarry, Santa Clara County, California

Figure 1e.

Soil Erosion Control Annual Report 2014 BMP Features

Date: September 2014
Map By: PK

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2014\Erosion Control Annual Report 2014\Fig 1e.mxd



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Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 1f.

Soil Erosion Control
Annual Report 2014
BMP Features

N
W E
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0 50 100 200
Feet

Date: September 2014
Map By: PK

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2014\Erosion Control Annual Report 2014\Fig 1f.mxd

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Figure 1g.

Soil Erosion Control Annual Report 2014 BMP Features

N
W E
S

0 50 100 200 Feet

Date: September 2014
Map By: PK

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2014\Erosion Control Annual Report 2014\Fig 1g.mxd

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Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 4a.

Soil Erosion Control
Annual Report 2014
BMP Features

N
W E
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0 50 100 200
Feet

Date: September 2014
Map By: PK

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2014\Erosion Control Annual Report 2014\Fig 1h.mxd

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APPENDIX B:

2013-2014 WET SEASON EROSION CONTROL INSPECTION REPORTS

Memorandum

To: Greg Knapp, Lehigh Hanson
Cc:

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: October 15, 2013
Subject: Permanente Quarry – Erosion Control Inspection

Per COA 78 of the Final Conditions of Approval, the Mine Operator shall:

> "…regularly inspect all stormwater and erosion controls, especially before and following qualifying rain events. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately." And
>
> "Ensure that all stormwater, erosion, and sediment control BMPs are installed, inspected, maintained, and repaired under the direction of either a California certified engineer, geologist, or landscape architect, a registered professional hydrologist, or a certified erosion control specialist."

WRA has been actively managing the inspections of stormwater, erosion, and sediment control BMPs in the RPA. WRA regularly reports on the inspections of the various BMP's to include:

- Check dams on the haul roads
- Erosion control blankets, straw wattles, and silt fence installations within the PCRA treatment areas.
- Berms where stockpiles are placed

On October 14, 2013, Scott Batiuk, WRA biologist, inspected the Permanente Quarry for erosion control deficiencies. No "qualifying event" (0.50 inches of precipitation in 24 hours) occurred prior to the inspection. Instead, the inspection was conducted to ensure the integrity of the BMPs in anticipation of future qualifying events. Deficiencies were recorded on the Erosion Controls Checklist (Appendix A) and Maps 1-6 (Appendix B).

Most erosion controls were intact and do not need repair. All deficiencies that were noted in the March 8, 2013, report were taken care of, including the maintenance of the haul road check dams. However, more erosion control netting has torn at the WMSA soil stockpile, and numerous check dams have since filled with sediment.

Deficiencies in erosion control measures during the October 14, 2013, inspection were limited to damage to the erosion control netting on the WMSA soil stockpile, hydroseeding needs on the eastern WMSA soil stockpile, minor repairs as needed to silt fencing and wattles, and check dams on the haul road requiring maintenance and replacement.

The erosion control netting on the western WMSA soil stockpile is torn in several places and should be repaired or hydroseeded. The eastern WMSA soil stockpile should be hydroseeded to prevent erosion. However, the silt fences at the base of both stockpiles are intact and in good condition.

Check dams along the main haul road southeast of the Crusher/Support Area and along the road between the Rock Plant and the Surge Pile are filling with sediment and should be cleaned out.

On the slopes northwest of the Surge Pile, some wattles have disconnected or rolled downslope and in one place, the silt fencing has slumped. This deficiency is minor, but the wattles and silt fence should be repaired to help prevent erosion.

Attention to all noted deficiencies should be given as soon as feasible. Plans were made to address all deficiencies in the near future.

The following actions should be completed:

1) Remove sediment from rock check dams along haul road and near rock plant.
2) Repair erosion netting or hydroseed the western WMSA soil stockpile. Hydroseed the eastern WMSA soil stockpile.
3) Repair wattles and silt fencing on the slope northwest of the Surge Pile.

If you have any questions regarding this inspection or the actions that should be taken, please do not hesitate to contact me or other WRA staff at your convenience.

APPENDIX A

EROSION CONTROLS CHECKLIST

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Permanente Quarry Erosion Controls Checklist

Per COA 78, inspections of BMPs should be conducted before and following qualifying rain events to ensure their integrity. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately.

This checklist should be used to inspect the BMPs installed through the PCRA areas as listed in the RPA and will serve as documentation for reporting purposes. Photo documentation should accompany both sufficient and deficient BMPs.

For erosion control measures (BMP's) installed in the PCRA, a map is produced on an annual basis at the end the fall season and may be used to determine the locations of the various BMP installations. This map can be marked up in the field with identification numbers that reflect the deficiencies.

Inspection Information				
Date and Time of Inspection: 10/14/13 9:30 am -		Date Report Written: 10/14/13		
Area Inspected (PCRA Subarea, WMSA, EMSA, Rock Plant, etc.): All areas				
Inspection Type: (Circle one)	Monthly	Pre-Storm	During Rain Event	Post-Storm

Inspector/Reviewer Information	
Inspector Name: Scott Batiuk	Inspector Title: WRA Biologist
Inspector Signature:	Date: 10/14/13
Reviewer Name: Megan Stromberg	Reviewer Title: QSD/P
Reviewer Signature:	Date: 10-18-13

Weather	
Estimate storm beginning: (date and time)	Estimate storm duration: (hours)
Estimate time since last storm: (days or hours) 23 (9/21/13)	Rain gauge reading and location for last storm (in): 0.49
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain in 24 hours)? (Y/N) If yes, summarize forecast:	

Silt Fencing

No	Yes	
☐	☒	Are any sections of the silt fence split, torn, slumping or undercut? Crusher/Support Area

Map ID/photo numbers: Map 2 Photos: 1, 2, 3
Deficiency ID # 2

☒ ☐ Do any sections of the silt fence have weathered fabric?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any sections of the silt sediment have sediment accumulation which reaches one-third of the barrier height?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are areas upgradient of the silt fence permanently stabilized? Crusher/Support Area

Map ID/photo numbers: Map 2 Photos 1, 2, 3
Deficiency ID # 2

☒ ☐ Are there any other areas in need of silt fencing?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Geotextiles and Mats

☒ ☐ Is erosion or scouring evident around or under matting?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☒ Do any areas of the installed blankets have washouts or breakage or are otherwise damaged? WMSA old stockpile

Map ID/photo numbers: Map 1 Photos 4-5
Deficiency ID # 1

☒ ☐ Are blankets uniformly in contact with the soil areas? WMSA old stockpile

Map ID/photo numbers: Map 1 Photos 4-5
Deficiency ID # 1

☒ ☐ Are blanket lap joints secure where they exist? WMSA old stockpile

Map ID/photo numbers: Map 1 Photos 4-5
Deficiency ID # 1

☐ ☒ Are blanket staples or pins flush with the ground?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there additional areas that need further installation of erosion control blankets?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Fiber Rolls

No Yes

☒ ☐ Are there any split, torn, unraveling, or slumping fiber rolls?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are there any washouts or breakages of fiber rolls? Crusher/Support Area

Map ID/photo numbers: Map 2 Photos 1, 2, 3

Deficiency ID #2

☒ ☐ Are there any rills or gullies adjacent to, along, or under fiber rolls?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are any portions of the fiber rolls where sediment has accumulated to one-third the designated sediment storage depth?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Hydromulch and Seeding

☒ ☐ Are hydroseeded areas scoured, disturbed, or otherwise have erosion?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☒ Do hydroseeded areas have constant cover?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☒ Do any other areas require further hydroseeeding?

Map ID/photo numbers: Map 1 Photos 4-6 ; Maps 3&4 Photo 7

Deficiency ID #5

Other Measures

☒ ☐ Are there any stockpiles that have uncontrolled run-on or run-off?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any breaks in the haul road berm allowing water to run into the PCRA or Permanente Creek Slopes?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are any sediment catchment ponds overflowing?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are any ditches or water conveyances damaged?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

BMP Deficiency Descriptions	
Deficiency ID Number	**Deficiency Description**
Photos 4 – 6 → 1. Map 1 →	Old (west) WMSA stockpile has torn matting in numerous places. Exposed areas are planned for hydroseeding. New (east) WMSA stockpile needs hydroseeding. There currently is no erosion control protection on the pile itself, but there are berms above it and berms and a silt fence below it
Photos 1 – 3 → 2. Map 2 →	Wattles have disconnected or rolled downslope in two places. Silt fencing bent toward downslope in one place. Notified Quarry management. Slope NW of surge pile in Crusher/Support Area
3.	Numerous check dams are nearly full with sediment. Along road between Surge Pile and Rock Plant. Map 5 Photos 8 – 14
4.	Basin below C-station in EMSA is functioning properly. No deficiency Map 6 Photos 15 – 17
5.	New crusher location recommended for hydroseeding. Map 3 & Map 4 Photo 17
6.	Check dams along main haul road Southeast of Crusher/Support Area are filling with sediment. Map 5 Photos 18 – 21
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	

* All areas were checked; only deficiencies and other notable features were recorded.

APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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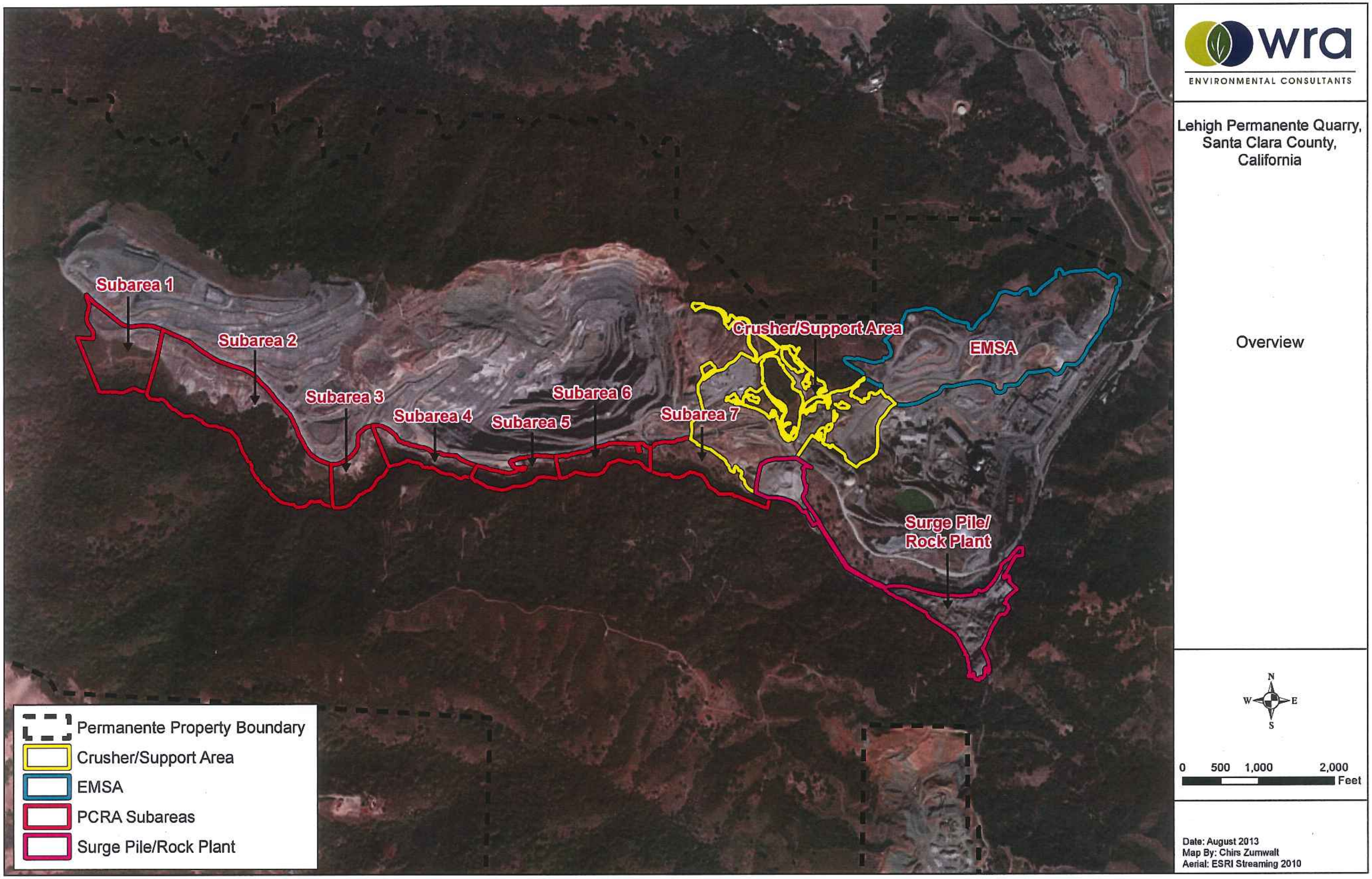

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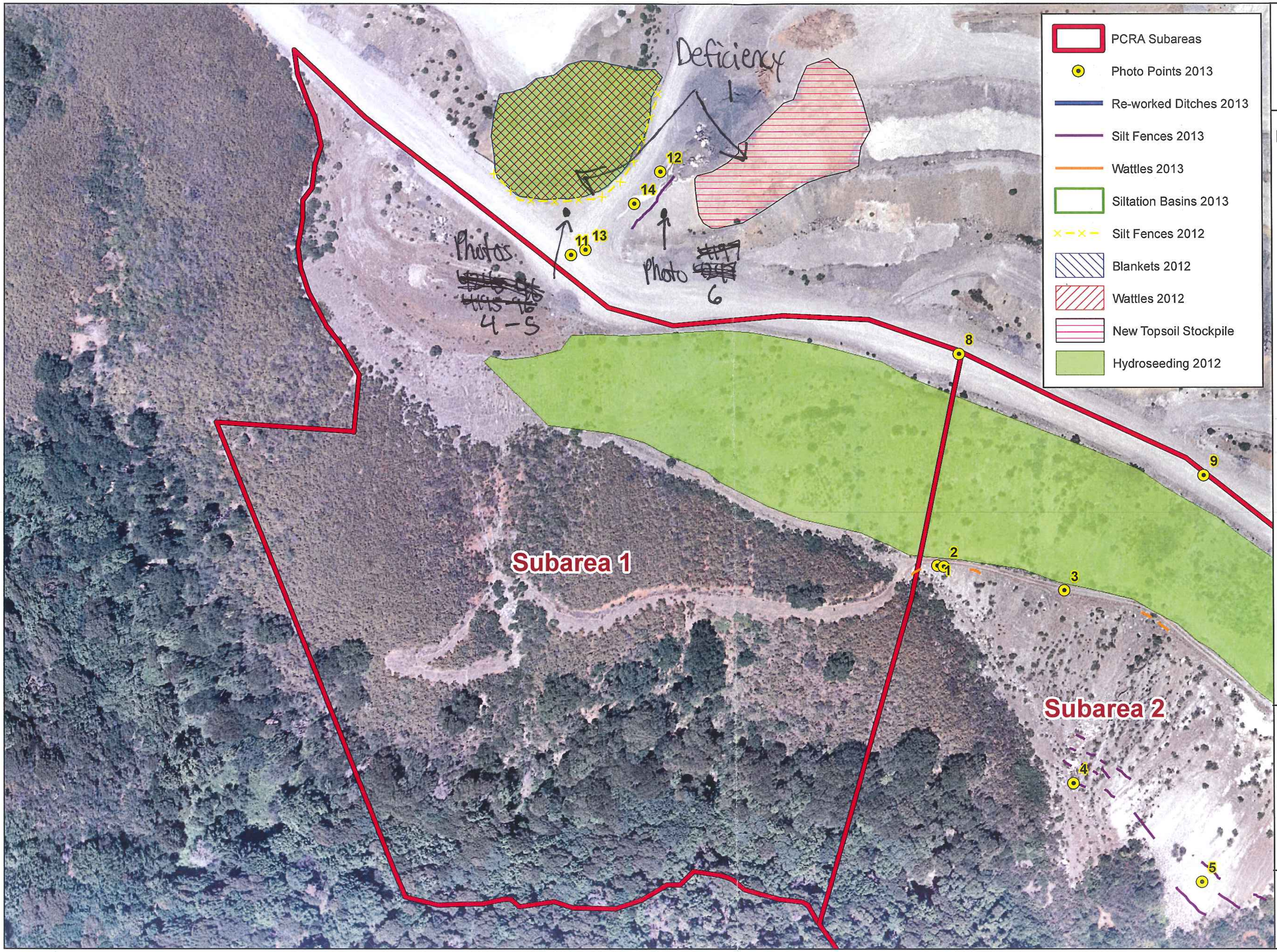


wra ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

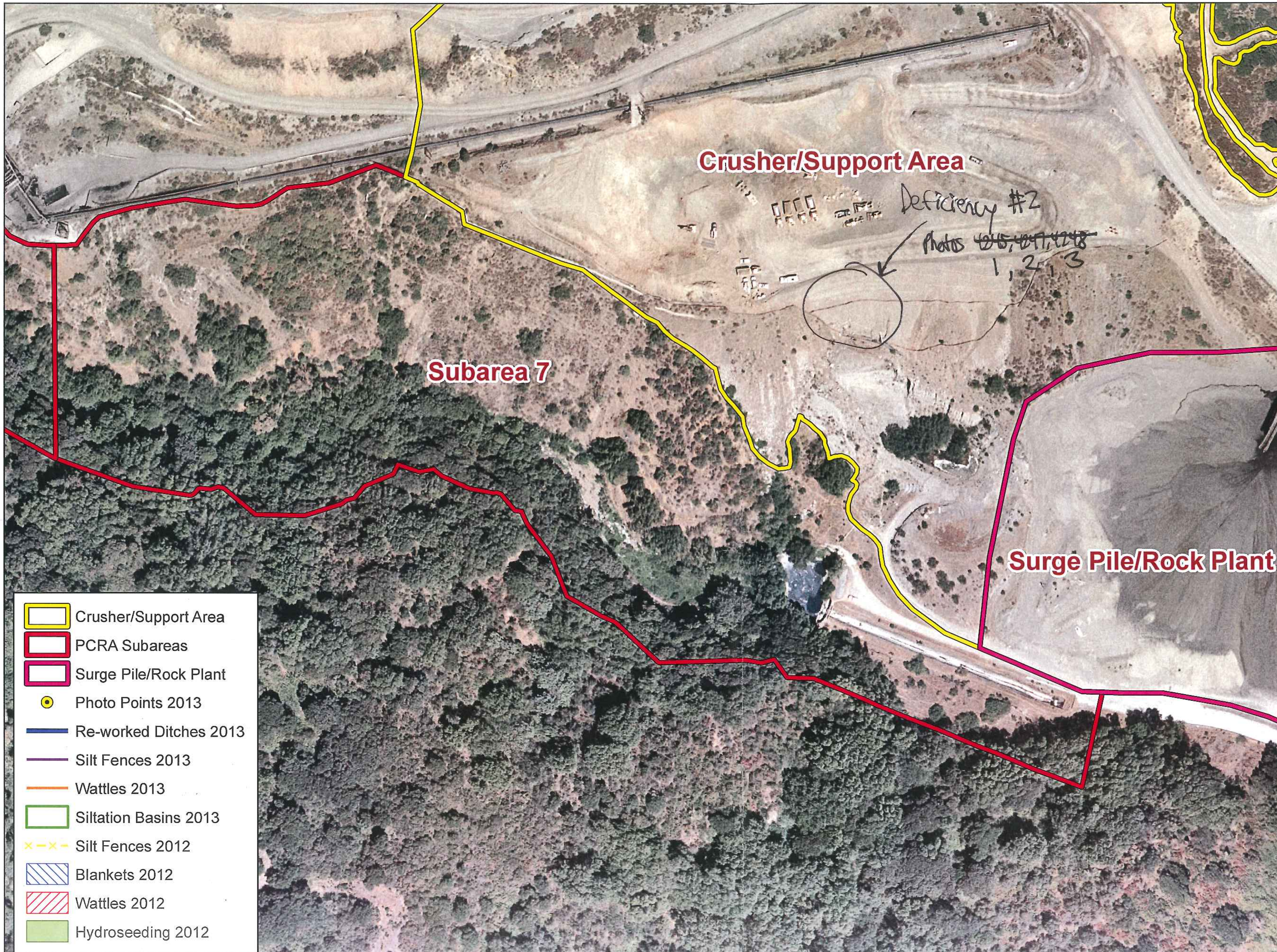
Figure 1a.

PCRA Erosion Control Installation Areas and Picture Points

Map 1

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1a.mxd



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Lehigh Permanente Quarry, Santa Clara County, California

Figure 1g.

PCRA
Erosion Control
Installation Areas
and Picture Points

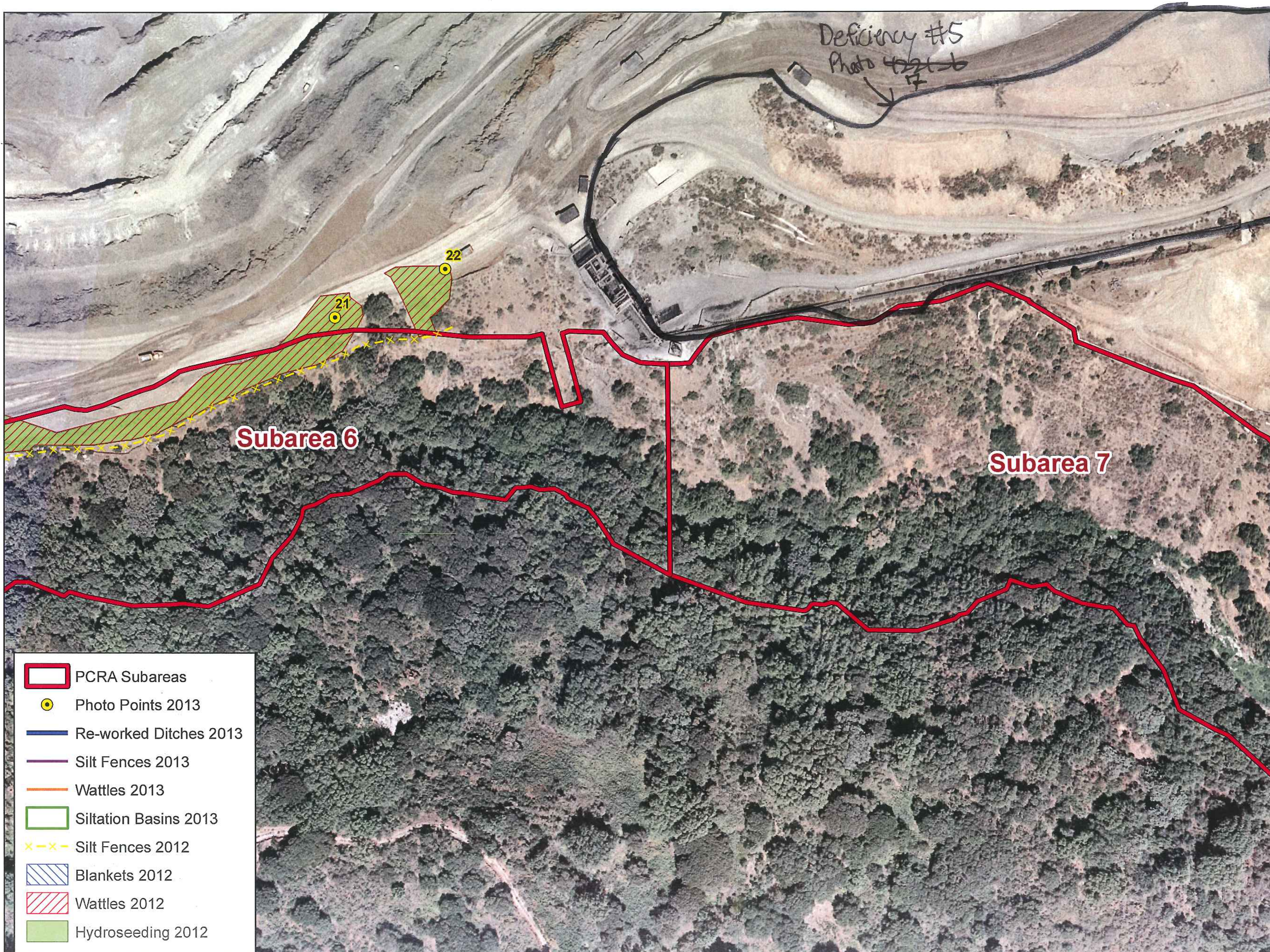
Map 2

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1g.mxd



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Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 1f.

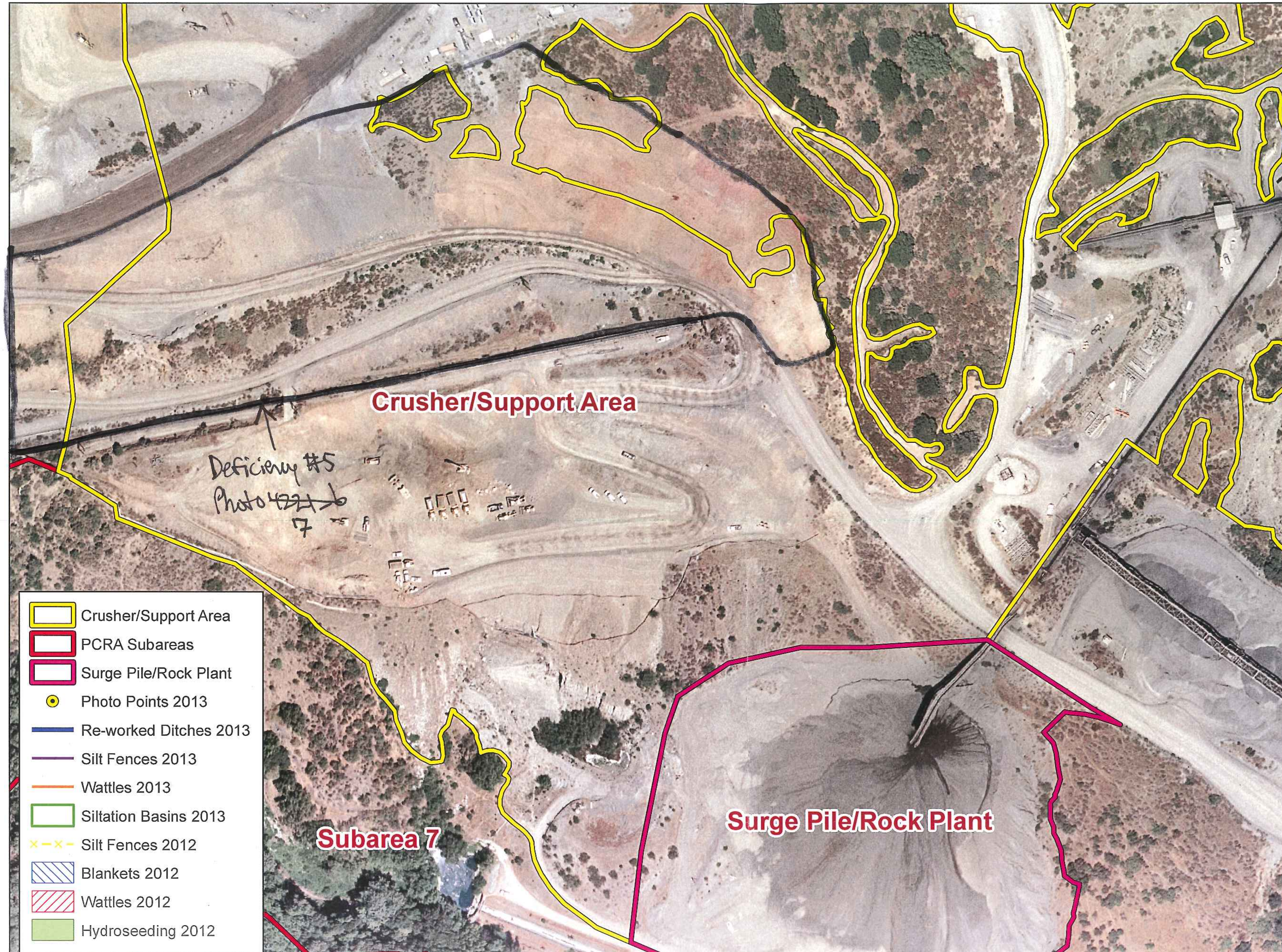
PCRA
Erosion Control
Installation Areas
and Picture Points

Map #3

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle



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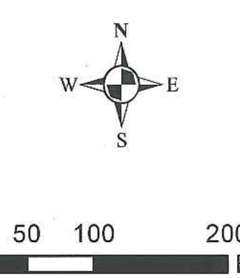
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 2a.

PCRA Erosion Control Installation Areas and Picture Points

Map 4



Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 2a.mxd

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 4a.mxd

WRA ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 4a.

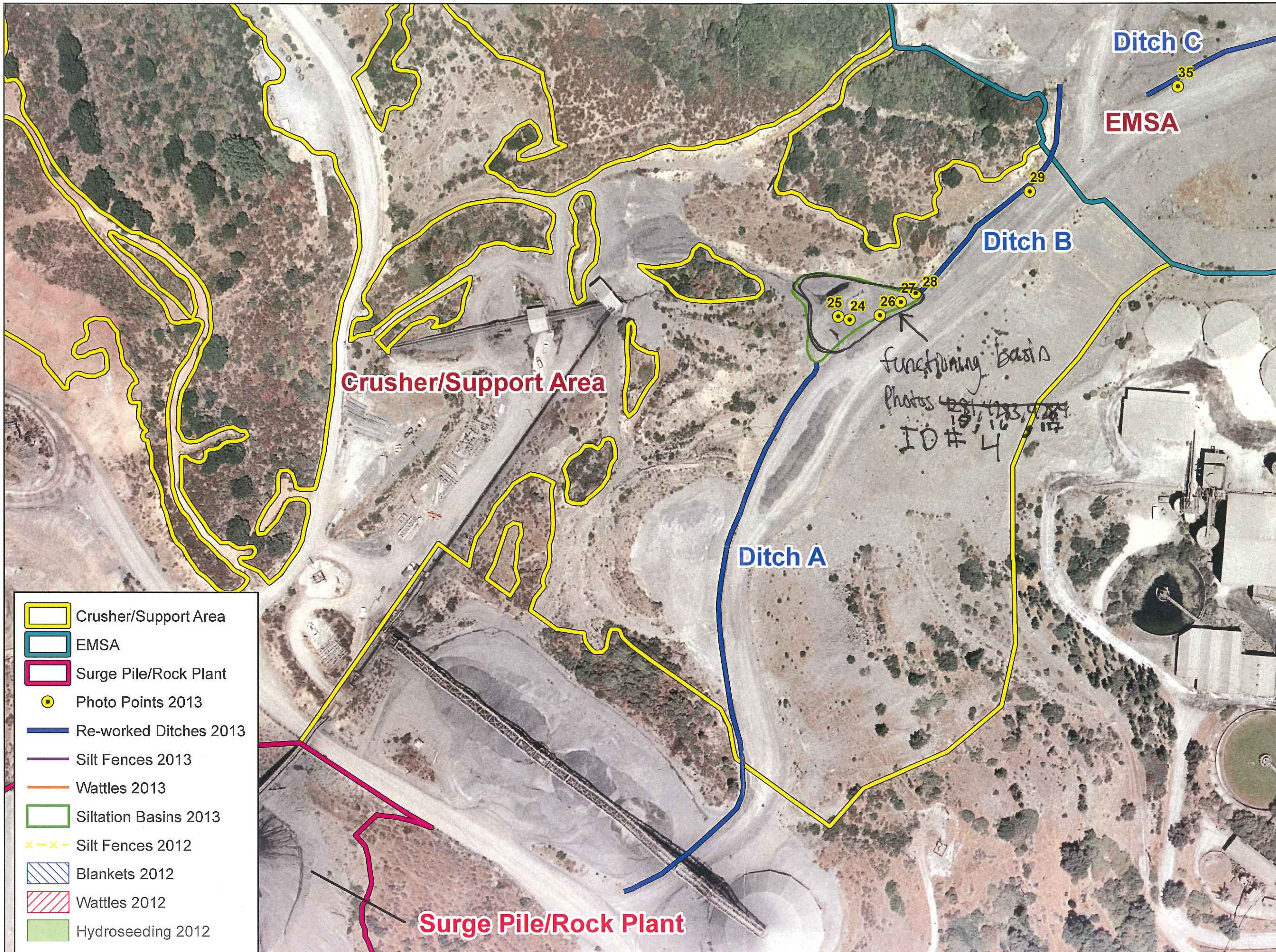
PCRA Erosion Control Installation Areas and Picture Points

Map 5

N W E S

0 50 100 200 Feet

Date: August 2013
Map By: Michael Rochelle



wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 2b.

PCRA
Erosion Control
Installation Areas
and Picture Points

Map 6

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 2b.mxd

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Memorandum

To: Greg Knapp, Lehigh Hanson
Cc:

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: November 21, 2013
Subject: Permanente Quarry – Erosion Control Inspection

Per COA 78 of the Final Conditions of Approval, the Mine Operator shall:

> "…regularly inspect all stormwater and erosion controls, especially before and following qualifying rain events. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately." And
>
> "Ensure that all stormwater, erosion, and sediment control BMPs are installed, inspected, maintained, and repaired under the direction of either a California certified engineer, geologist, or landscape architect, a registered professional hydrologist, or a certified erosion control specialist."

WRA has been actively managing the inspections of stormwater, erosion, and sediment control BMPs in the RPA. WRA regularly reports on the inspections of the various BMP's to include:

- Check dams on the haul roads
- Erosion control blankets, straw wattles, and silt fence installations within the PCRA treatment areas.
- Berms where stockpiles are placed

On November 19, 2013, Lauren Kerr, WRA biologist, inspected the Permanente Quarry for erosion control deficiencies. No "qualifying event" (0.50 inches of precipitation in 24 hours) occurred prior to the inspection. Instead, the inspection was conducted to ensure the integrity of the BMPs in anticipation of a qualifying event predicted to begin later that day. Deficiencies were recorded on the Erosion Controls Checklist (Appendix A) and Figures 1d, 1e, 4a, and 4b (Appendix B).

Most erosion controls are intact and do not need repair. The deficiencies that were noted in the October report were taken care of, except for maintenance of the check dams along the haul road and the road below the Surge Pile.

Deficiencies in erosion control measures documented on November 19, 2013, were limited to a low berm along the road adjacent to Permanente Creek; silt fence damage; and the need for check dam maintenance.

A portion of the berm on the south side of the road east of and below the Surge Pile and adjacent to Permanente Creek was built low. This low height increased the possibility of sediment entering Permanente Creek during a storm event. This deficiency was addressed that day by adding hay bales and straw wattles.

Check dams along the haul road east of the Crusher/Support Area and along the road between the Surge Pile and Rock Plant are filling with sediment and should be cleaned out.

In Subarea 4, there are two rupture points in the silt fencing. The damaged fencing should be replaced.

Attention to all noted deficiencies should be given as soon as feasible. The following actions should be completed:

1) Remove sediment from rock check dams along haul road and near rock plant.
2) Repair silt fencing Subarea 4.

If you have any questions regarding this inspection or the actions that should be taken, please do not hesitate to contact me or other WRA staff at your convenience.

APPENDIX A

EROSION CONTROLS CHECKLIST

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Permanente Quarry Erosion Controls Checklist

Per COA 78, inspections of BMPs should be conducted before and following qualifying rain events to ensure their integrity. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately.

This checklist should be used to inspect the BMPs installed through the PCRA areas as listed in the RPA and will serve as documentation for reporting purposes. Photo documentation should accompany both sufficient and deficient BMPs.

For erosion control measures (BMP's) installed in the PCRA, a map is produced on an annual basis at the end the fall season and may be used to determine the locations of the various BMP installations. This map can be marked up in the field with identification numbers that reflect the deficiencies.

Inspection Information				
Date and Time of Inspection: 11-19-13 11:00am - 3:30pm (approx)		Date Report Written: 11-21-13		
Area Inspected (PCRA Subarea, WMSA, EMSA, Rock Plant, etc.): All areas				
Inspection Type: (Circle one)	Monthly	Pre-Storm	During Rain Event	Post-Storm

Inspector/Reviewer Information	
Inspector Name: Lauren Kern	Inspector Title: Biologist
Inspector Signature:	Date: 11-21-13
Reviewer Name: Megan Strombers	Reviewer Title: QSD/P
Reviewer Signature:	Date: 11-25-13

Weather	
Estimate storm beginning: (date and time) 11-19-13	Estimate storm duration: (hours) 24 hour
Estimate time since last storm: (days or hours) None	Rain gauge reading and location for last storm (in): None > 6 months
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain in 24 hours)? Y/N If yes, summarize forecast: >0.5 in on 11-19-13 through 11-20-13 Cupertino forecast	

Silt Fencing

No Yes

☐ ☒ Are any sections of the silt fence split, torn, slumping or undercut? Subarea 4

Map ID/photo numbers: Map 1e, 1d, Photos 1 – 3
deficiency ID # 4

☒ ☐ Do any sections of the silt fence have weathered fabric?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any sections of the silt sediment have sediment accumulation which reaches one-third of the barrier height?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are areas upgradient of the silt fence permanently stabilized?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any other areas in need of silt fencing?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Geotextiles and Mats

☒ ☐ Is erosion or scouring evident around or under matting?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any areas of the installed blankets have washouts or breakage or are otherwise damaged?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are blankets uniformly in contact with the soil areas?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are blanket lap joints secure where they exist?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are blanket staples or pins flush with the ground?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there additional areas that need further installation of erosion control blankets?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Fiber Rolls

No Yes

☒ ☐ Are there any split, torn, unraveling, or slumping fiber rolls?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any washouts or breakages of fiber rolls?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any rills or gullies adjacent to, along, or under fiber rolls?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are any portions of the fiber rolls where sediment has accumulated to one-third the designated sediment storage depth?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Hydromulch and Seeding

☒ ☐ Are hydroseeded areas scoured, disturbed, or otherwise have erosion?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☒ Do hydroseeded areas have constant cover?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any other areas require further hydroseeeding?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Other Measures

☒ ☐ Are there any stockpiles that have uncontrolled run-on or run-off?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any breaks in the haul road berm allowing water to run into the PCRA or Permanente Creek Slopes?

Map ID/photo numbers: Map 4b; Photos 4 & 5 ______ ______ ______
deficiency ID # 1

☒ ☐ Are any sediment catchment ponds overflowing?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are any ditches or water conveyances damaged?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

BMP Deficiency Descriptions	
Deficiency ID Number	**Deficiency Description**
1.	A portion of the berm along Permanente Creek was constructed very low. Added BMPs to assure any additional water does not enter the creek. Figure 4b; Photos 4, 5.
2.	Rock plant check dams require maintenance; sediment removal and general repair (Figures 4a & 4b) Photos 6-8
3.	Check dams at belt need to be cleaned; high amount of sediment present. Figure 4a, Photos 9
4.	Silt fencing in sub area 4 has two rupture points that need repair. Figure 1e, 1d; photos 1-3.
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	

* all areas were checked; only deficiencies were noted.

APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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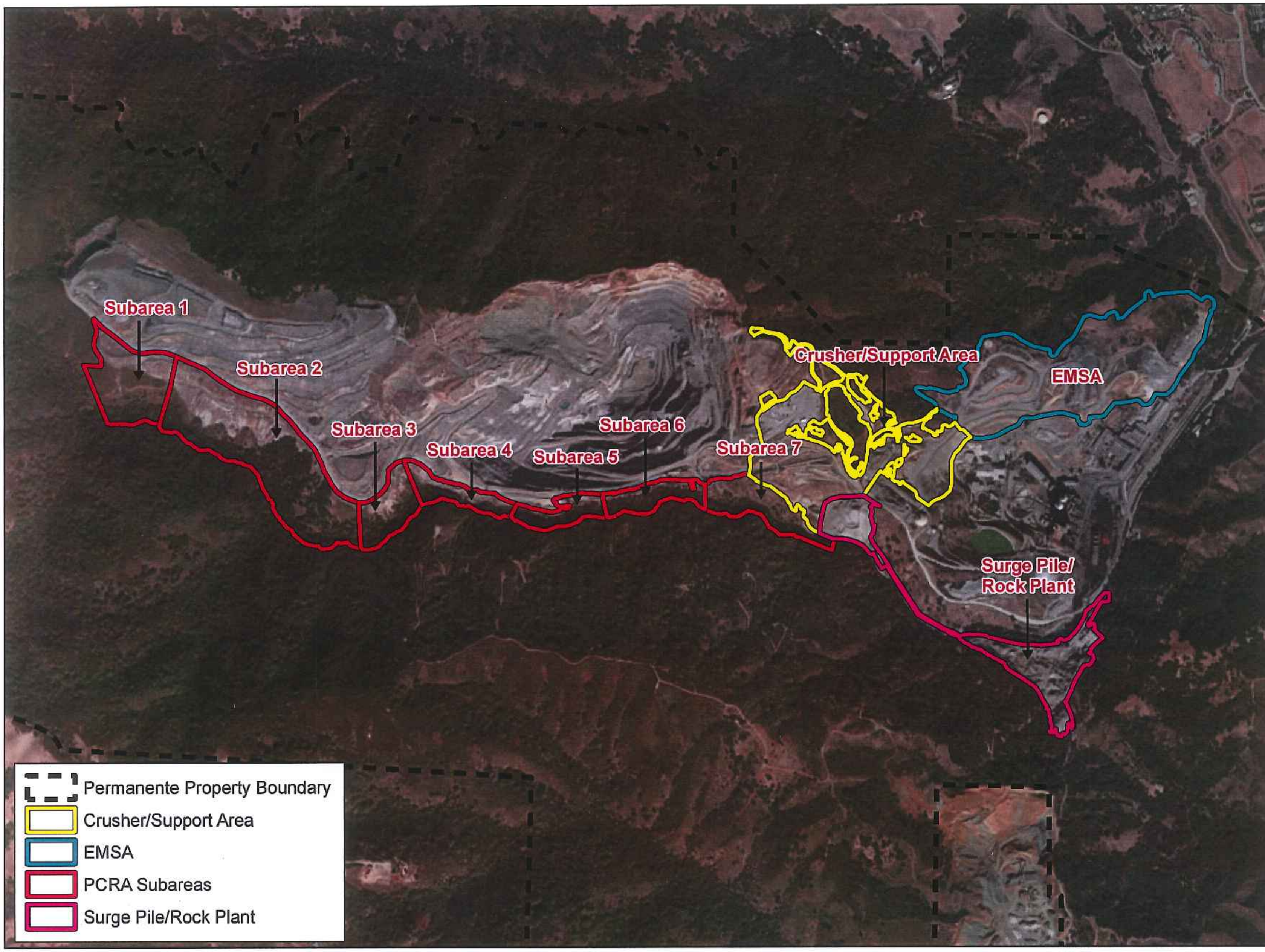


wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

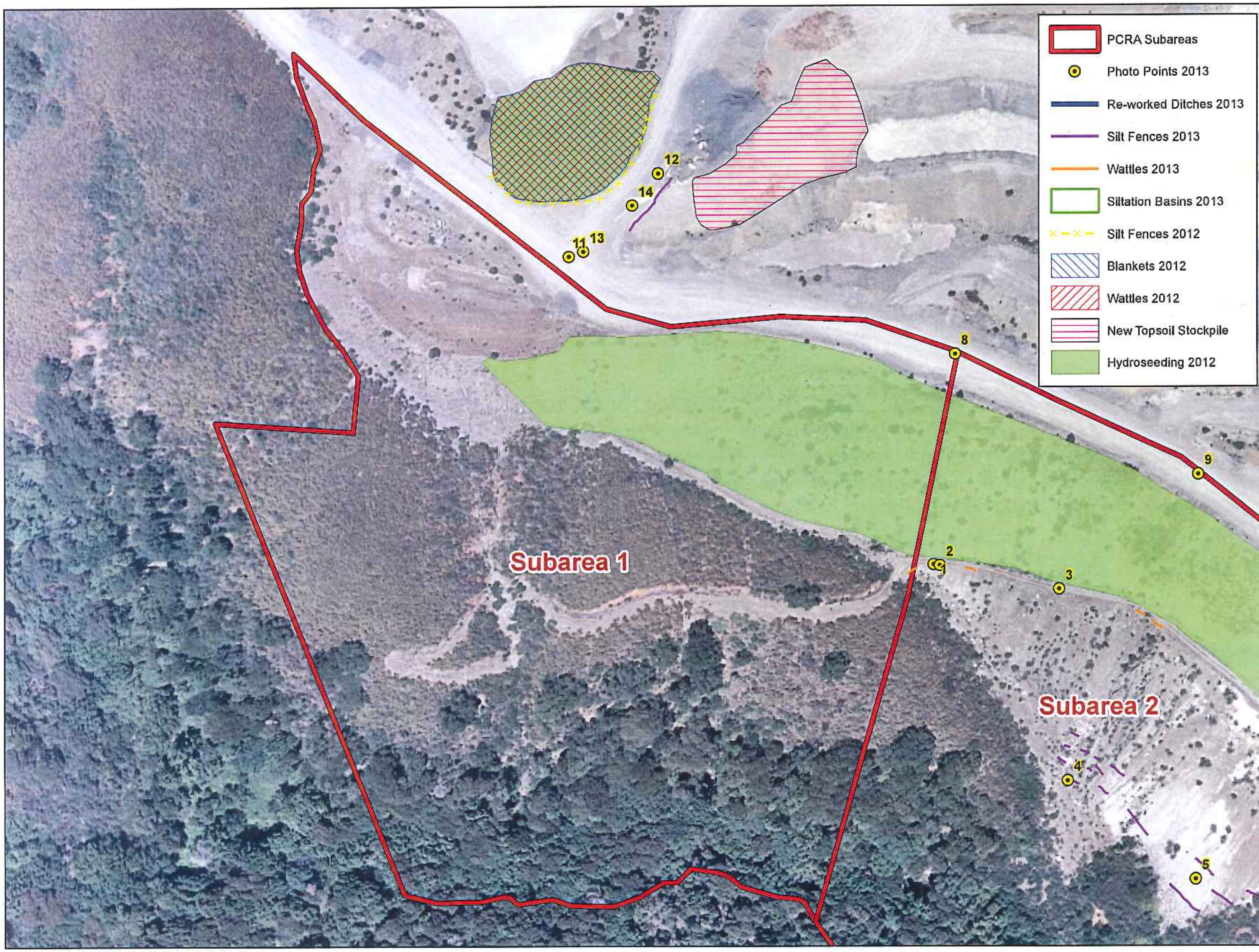
Overview

N
W E
S

0 500 1,000 2,000
Feet

Date: August 2013
Map By: Chirs Zumwalt
Aerial: ESRI Streaming 2010

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Overview.mxd



ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 1a.

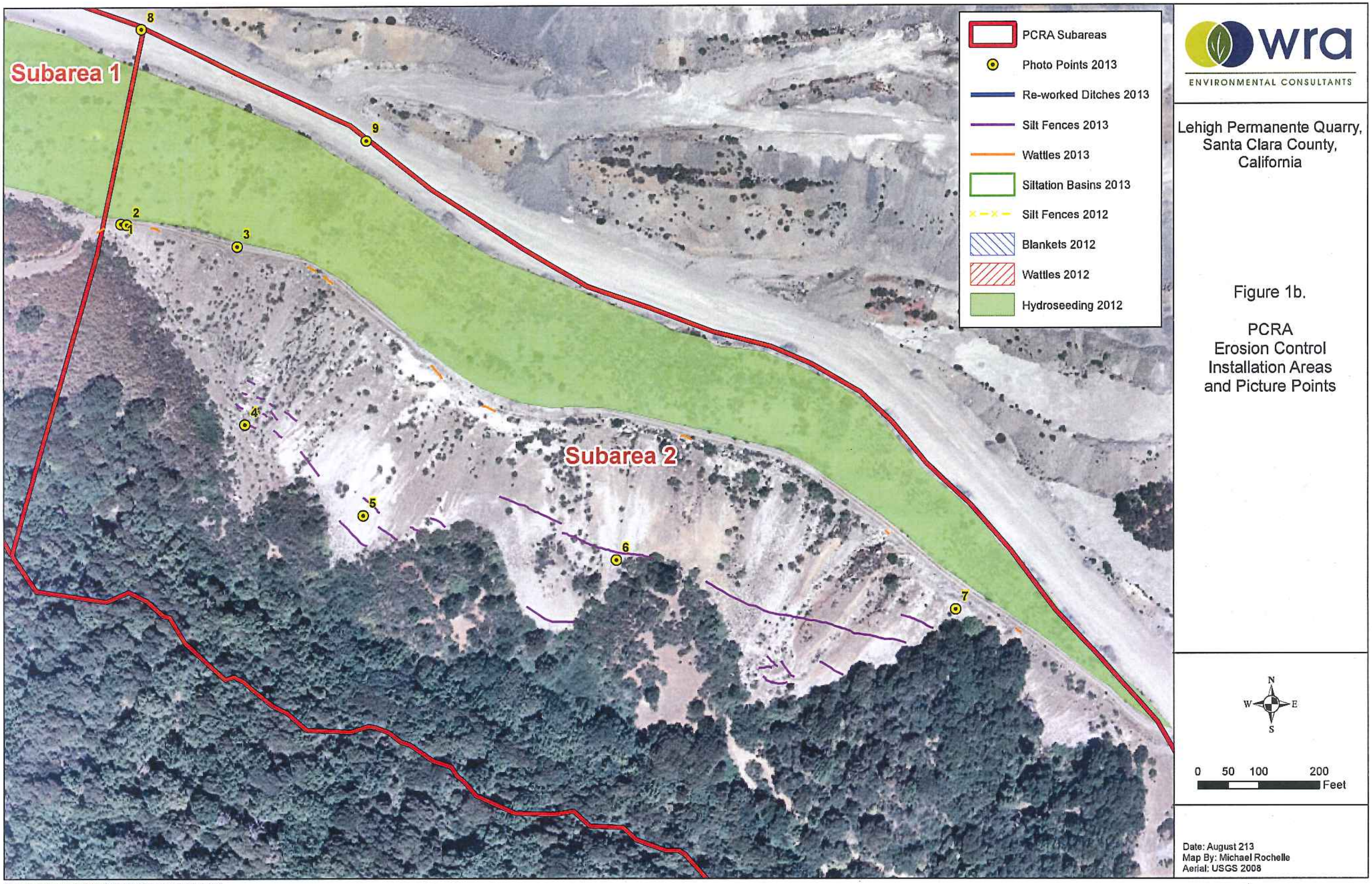
PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1a.mxd



wra
ENVIRONMENTAL CONSULTANTS

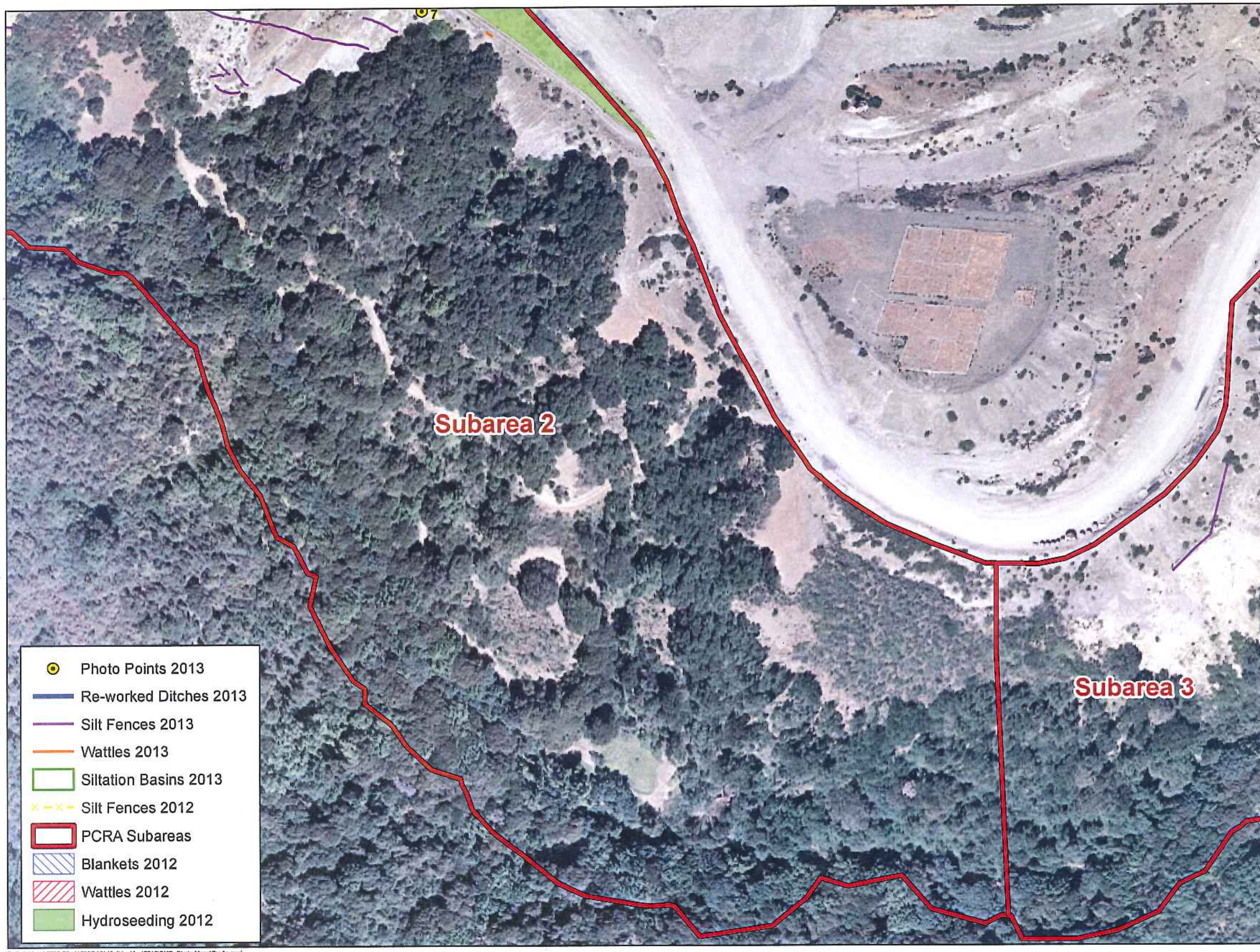
Lehigh Permanente Quarry, Santa Clara County, California

Figure 1b.

PCRA
Erosion Control
Installation Areas
and Picture Points

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1b.mxd



WRA ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 1c.

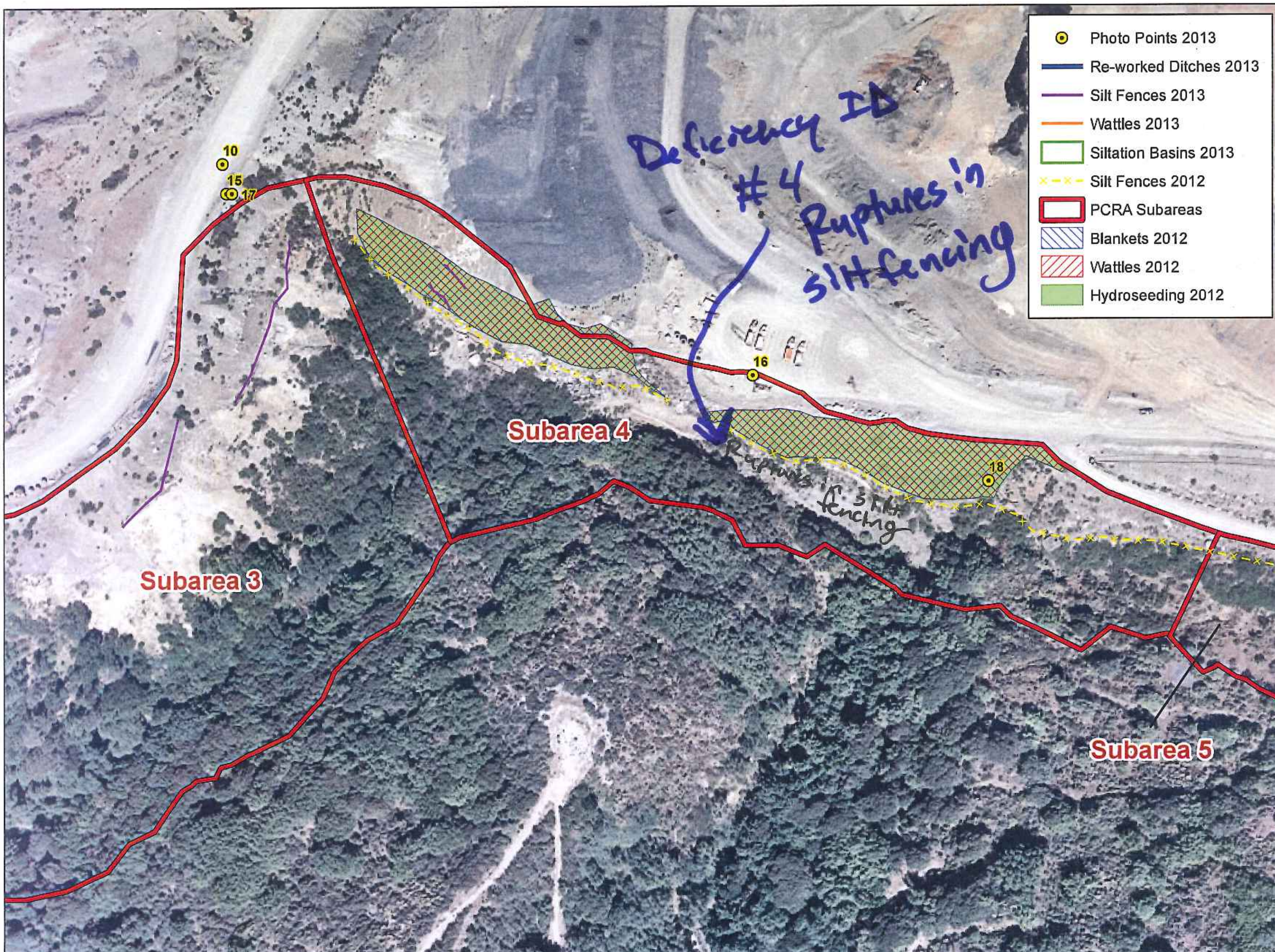
PCRA Erosion Control Installation Areas and Picture Points

N W E S

0 50 100 200 Feet

Date: August 2013
Map By: Michael Rochelle
Aerial: ESRI Streaming 2010

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1c.mxd



wra ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 1d.

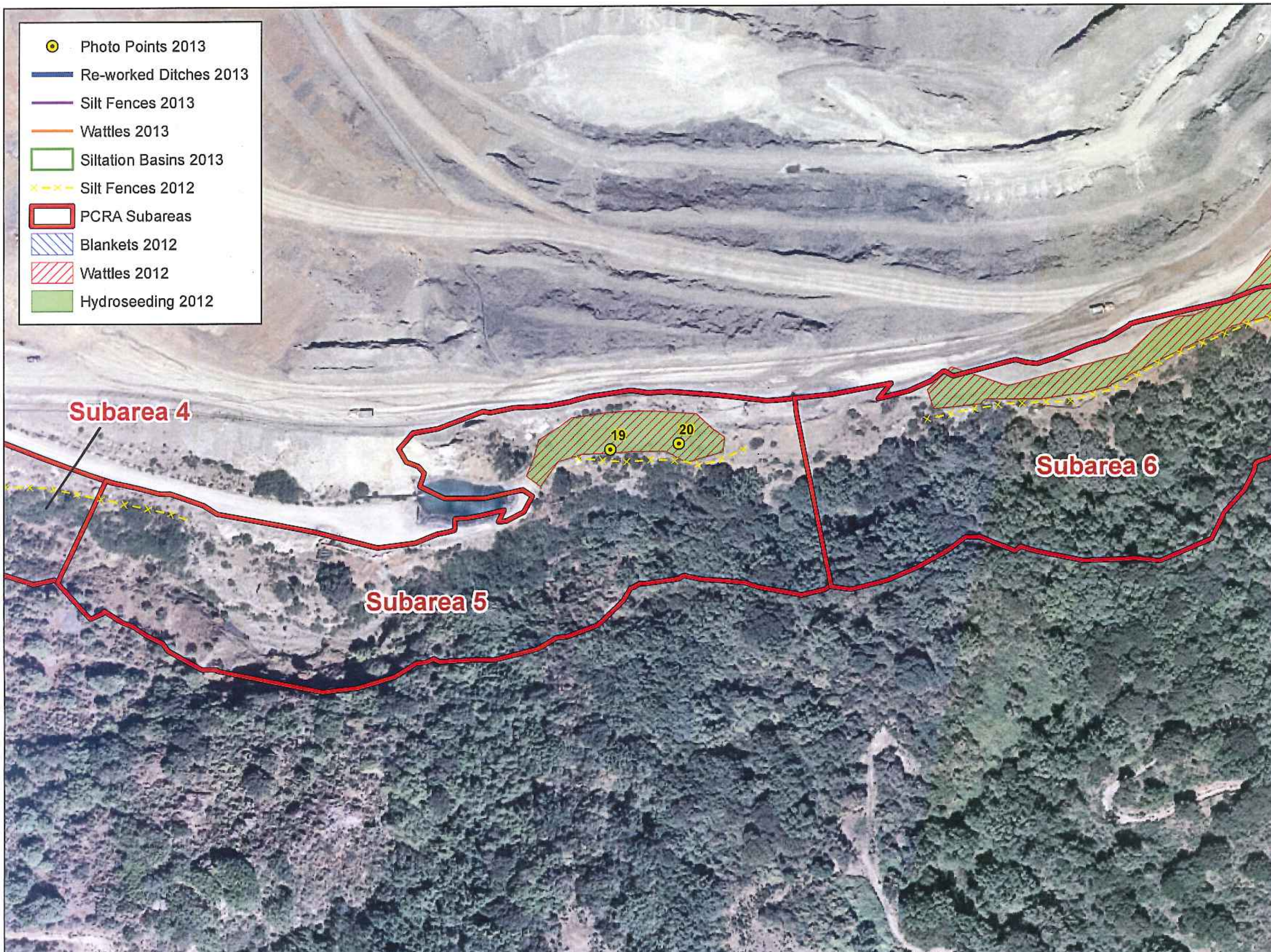
PCRA Erosion Control Installation Areas and Picture Points

N W E S

0 50 100 200 Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Aced 2000 Files\18000\18143-4\ArcMap\2013\BMP_Photo Maps\Fig 1d.mxd



wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 1e.

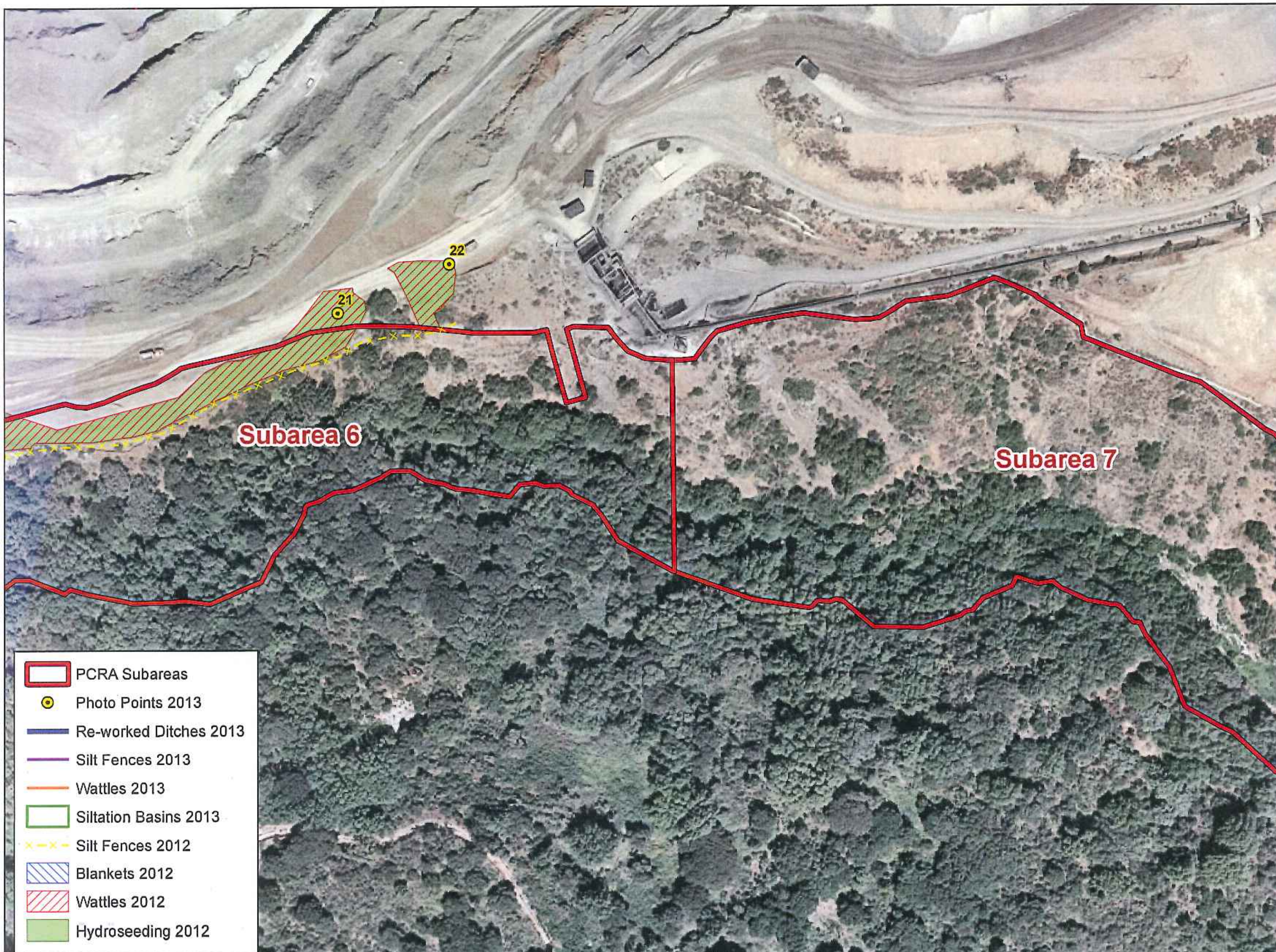
PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1e.mxd



wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

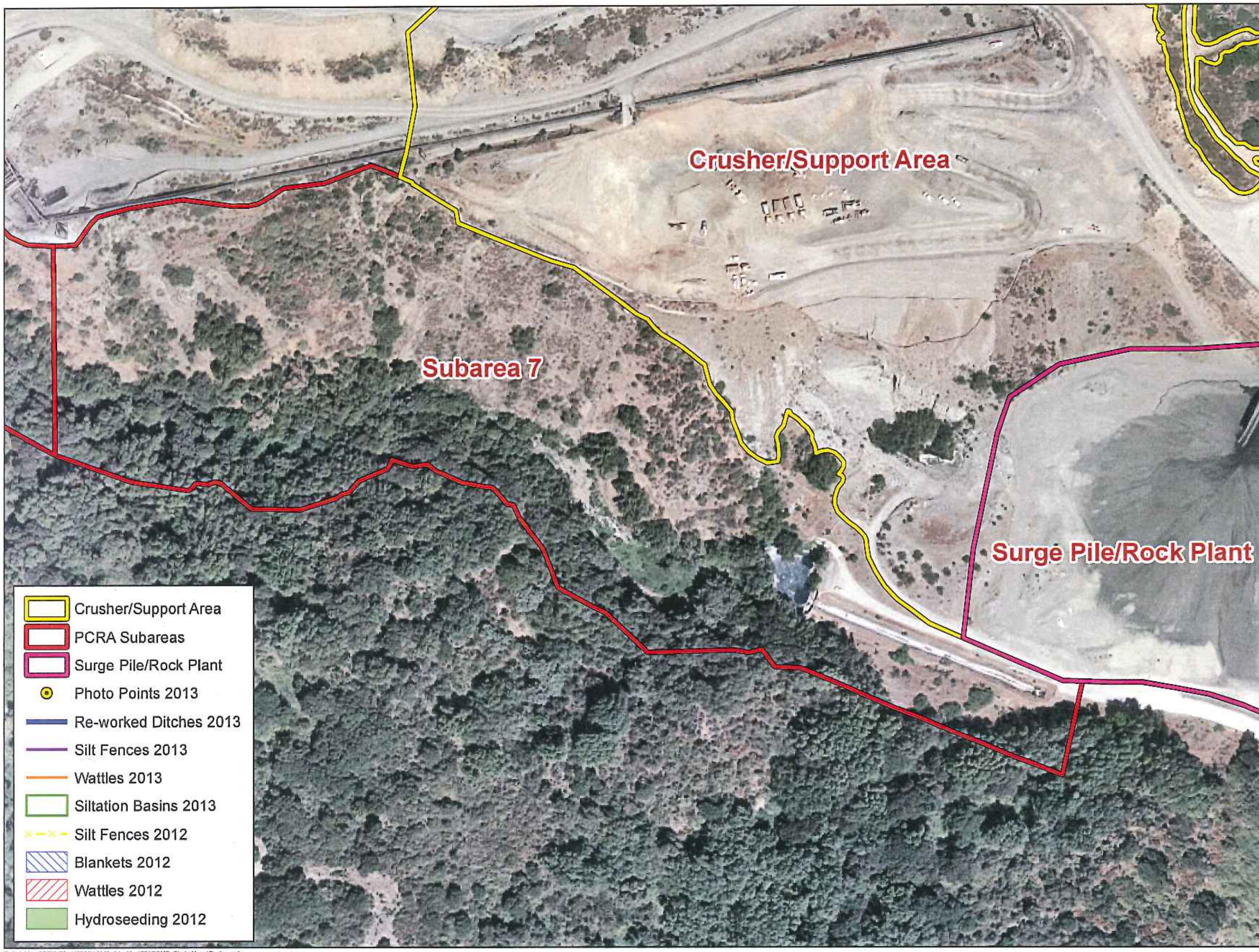
Figure 1f.

PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle



wra ENVIRONMENTAL CONSULTANTS

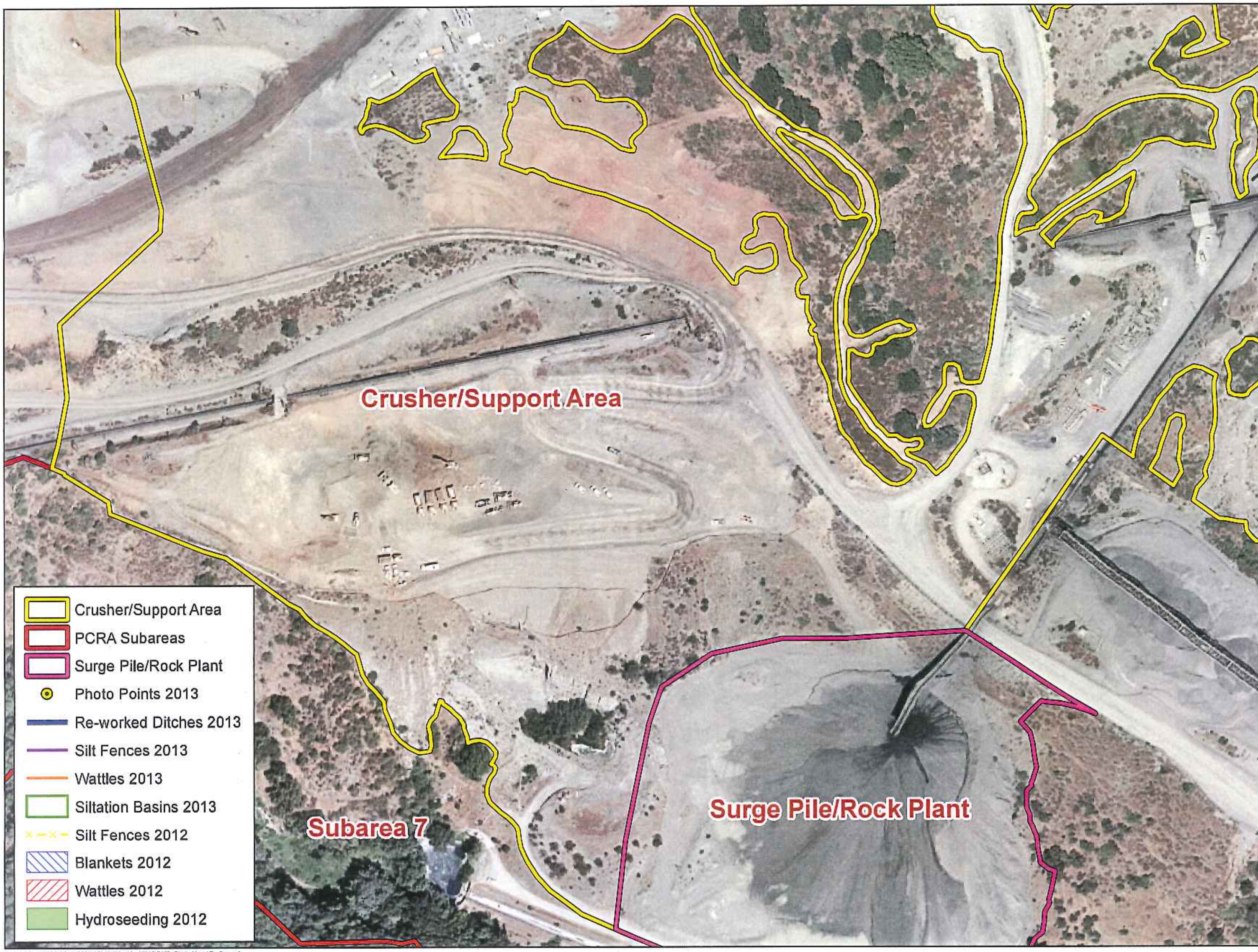
Lehigh Permanente Quarry, Santa Clara County, California

Figure 1g.

PCRA
Erosion Control
Installation Areas
and Picture Points

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1g.mxd



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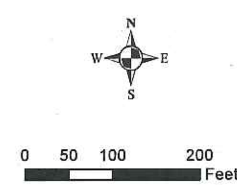
WRA ENVIRONMENTAL CONSULTANTS

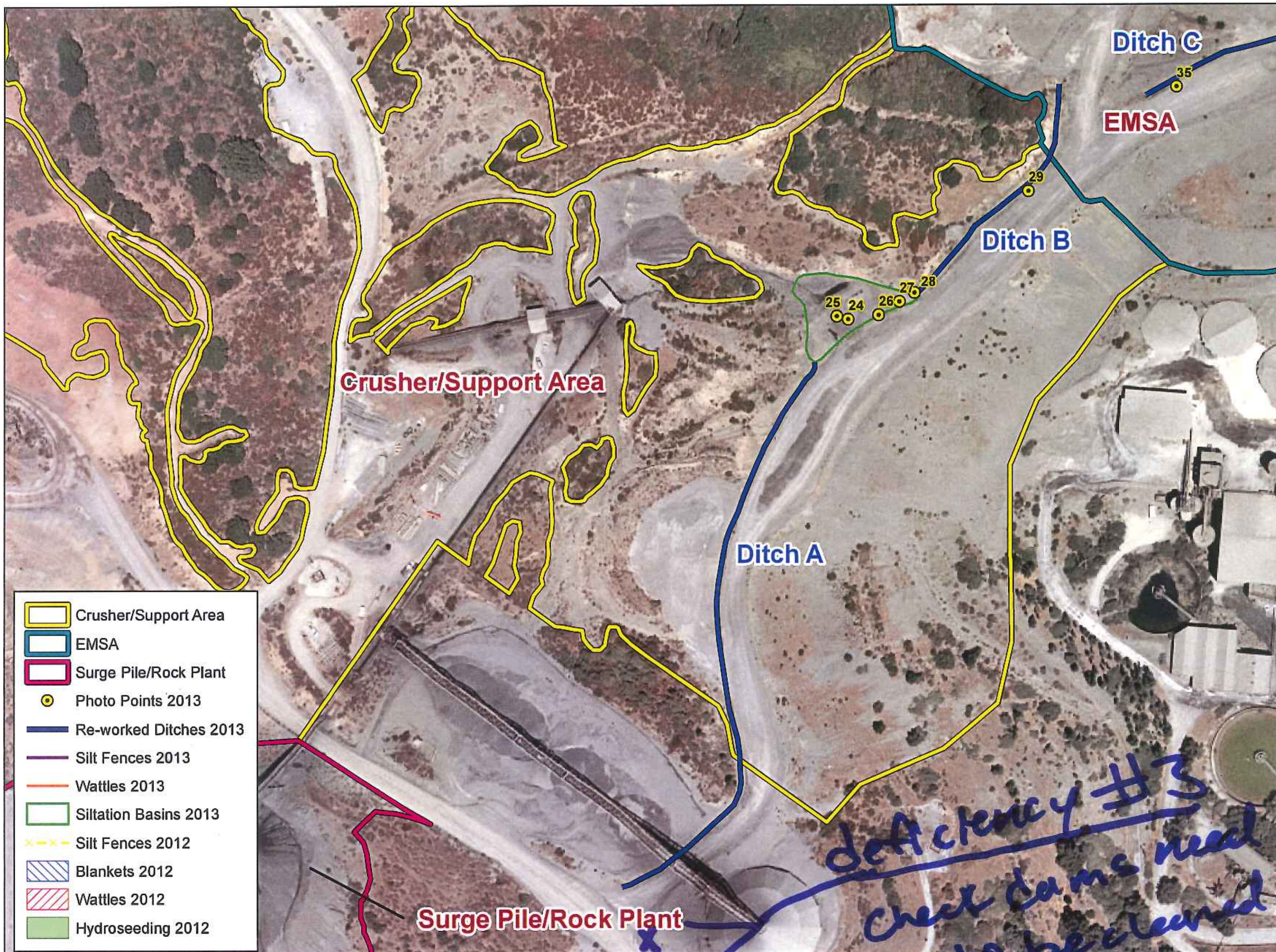
Lehigh Permanente Quarry, Santa Clara County, California

Figure 2a.

PCRA
Erosion Control
Installation Areas
and Picture Points



Date: August 2013
Map By: Michael Rochelle



deficiency #3
check dams need
to be cleaned

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 2b.mxd

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

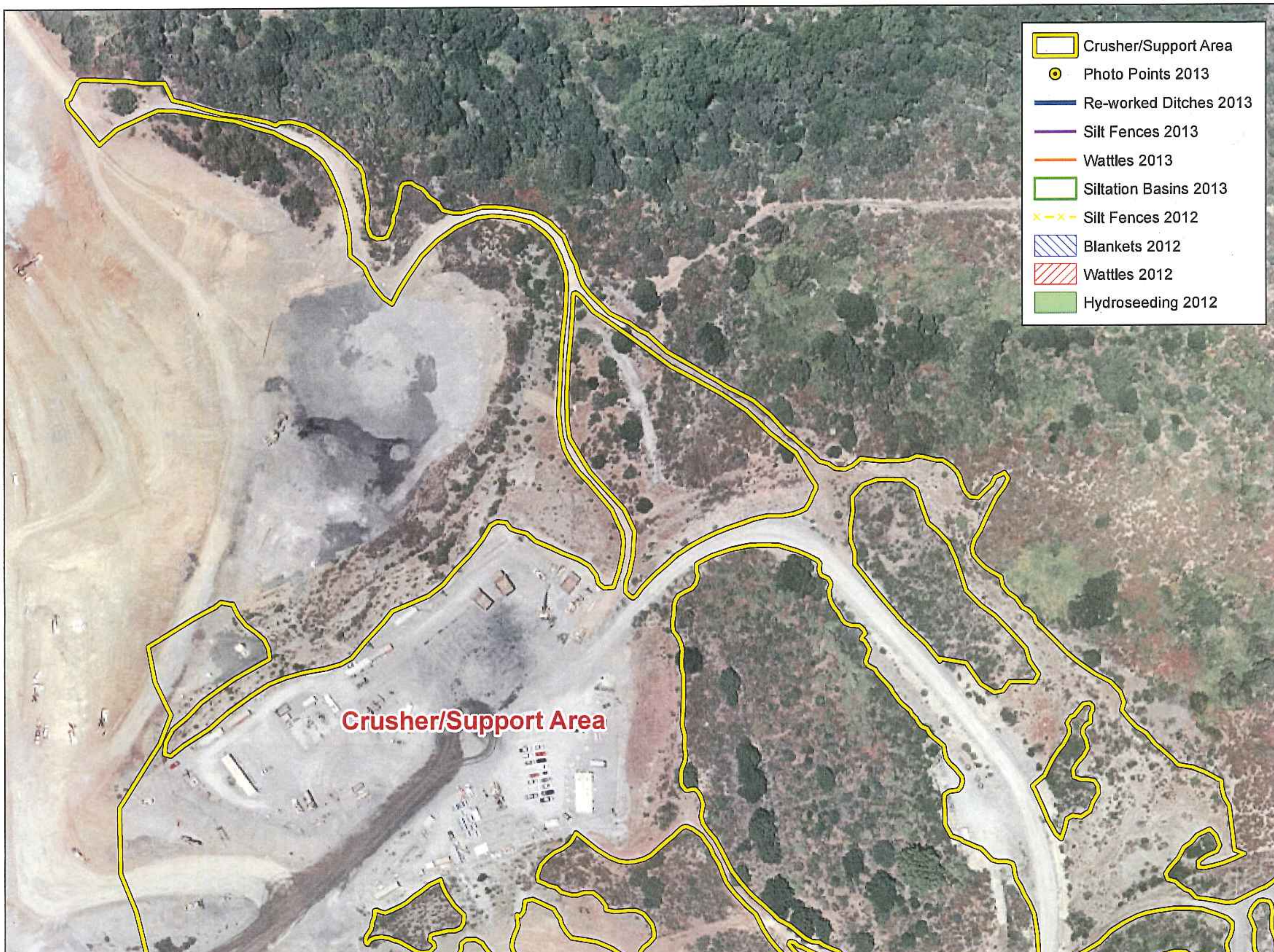
Figure 2b.

PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle



Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 2c.mxd

wra ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

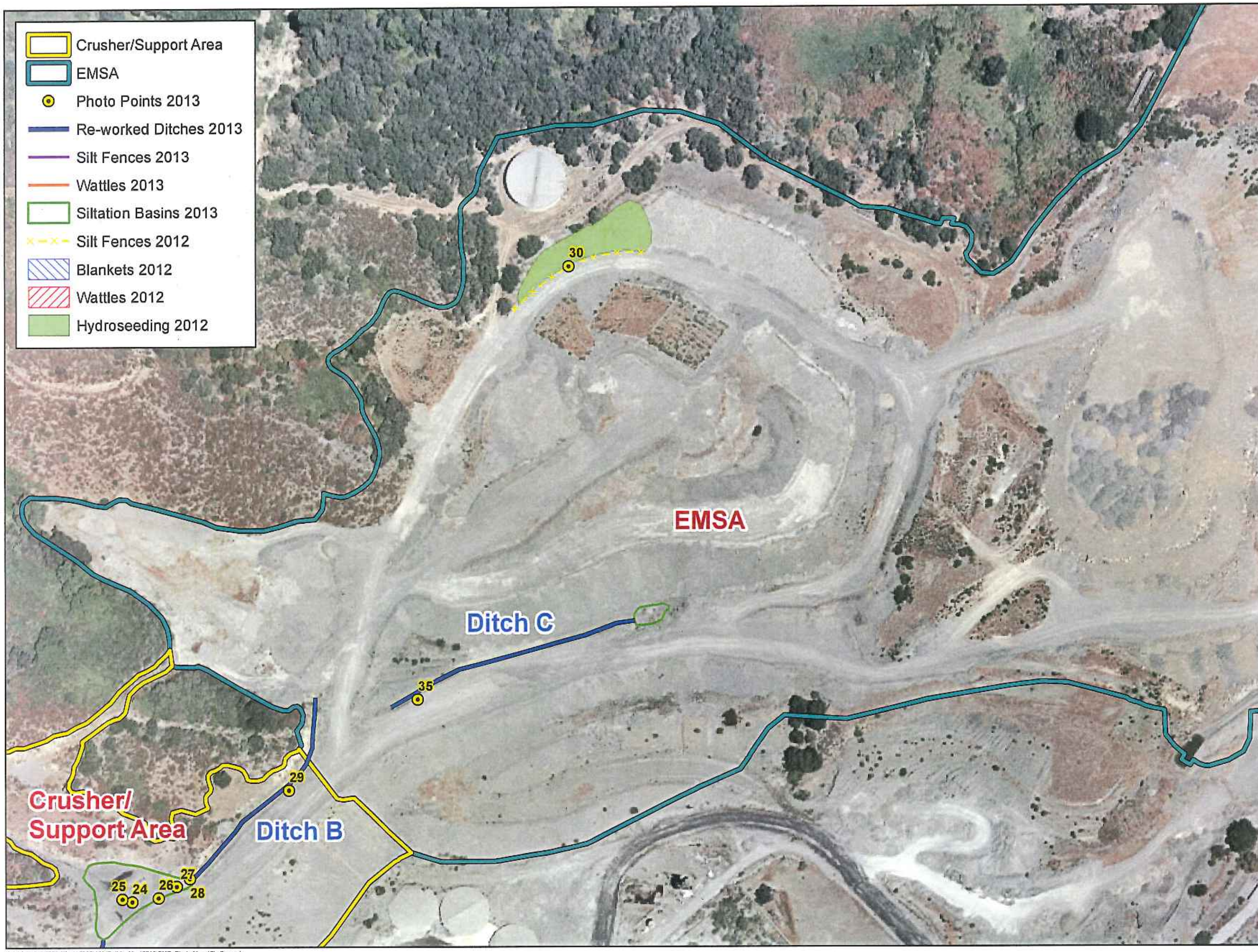
Figure 2c.

PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200 Feet

Date: August 2013
Map By: Michael Rochelle



WRA ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 3a.

PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 3a.mxd

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 3b.

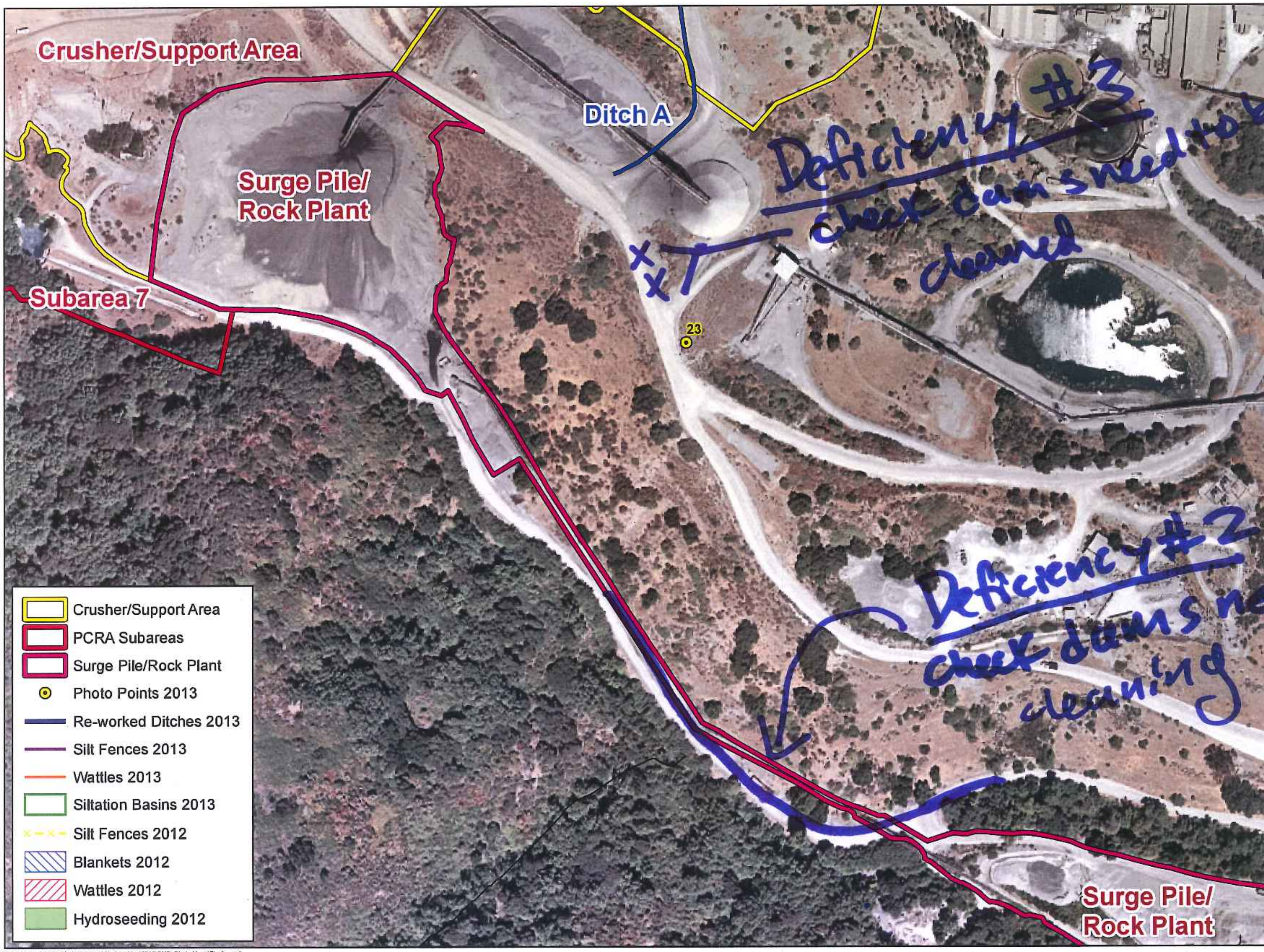
PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 3b.mxd



wra ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 4a.

PCRA Erosion Control Installation Areas and Picture Points

N W E S

0 50 100 200 Feet

Date: August 2013
Map By: Michael Rochelle

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 4b.

PCRA
Erosion Control
Installation Areas
and Picture Points

N W E S

0 50 100 200 Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 4b.mxd

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Memorandum

To: Greg Knapp, Lehigh Hanson
Cc:

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: December 23, 2013

Subject: Permanente Quarry – Erosion Control Inspection

Per COA 78 of the Final Conditions of Approval, the Mine Operator shall:

> "…regularly inspect all stormwater and erosion controls, especially before and following qualifying rain events. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately." And
>
> "Ensure that all stormwater, erosion, and sediment control BMPs are installed, inspected, maintained, and repaired under the direction of either a California certified engineer, geologist, or landscape architect, a registered professional hydrologist, or a certified erosion control specialist."

WRA has been actively managing the inspections of stormwater, erosion, and sediment control BMPs in the RPA. WRA regularly reports on the inspections of the various BMP's to include:

- Check dams on the haul roads
- Erosion control blankets, straw wattles, and silt fence installations within the PCRA treatment areas.
- Berms where stockpiles are placed

On December 20, 2013, Scott Batiuk and Reuben Brandt, WRA biologists, inspected the Permanente Quarry for erosion control deficiencies. No "qualifying event" (0.50 inches of precipitation in 24 hours) occurred prior to the inspection. Instead, the inspection was conducted to ensure the integrity of the BMPs in anticipation of a predicted qualifying event. Deficiencies were recorded on the Erosion Controls Checklist (Appendix A) and Maps 1b, 1c, and 4a (Appendix B).

Most erosion controls are intact and do not need repair. Of the deficiencies that were noted in the November 2013 report, silt fencing in Subarea 4 was repaired and the check dams along the Rock Plant-Surge Pile road were cleaned out. However, the check dams along the haul road east of the Crusher/Support Area were not cleaned out.

Deficiencies in erosion control measures were limited to erosion-caused rivulets in the haul road in the WMSA and the need for check dam maintenance in the WMSA and on the haul road east of the Crusher/Support Area.

In the WMSA, erosion from water flowing down the haul road is causing rivulets to form. However, this water is eventually being captured by check dams and has no possibility of entering Permanente Creek. Unless the roads are significantly altered by manmade or natural events in the future, this deficiency does not need to be addressed.

In the WMSA, several of the check dams along the haul road are filling with sediment and should be cleaned out.

Along the haul road east of the Crusher/Support Area, check dams are filling with sediment and should be cleaned out.

Attention to all noted deficiencies should be given as soon as feasible. The following actions should be completed:

1) Remove sediment from rock check dams along the haul road east of the Crusher/Support Area
2) Remove sediment from rock check dams along the haul road in the WMSA

If you have any questions regarding this inspection or the actions that should be taken, please do not hesitate to contact me or other WRA staff at your convenience.

APPENDIX A

EROSION CONTROLS CHECKLIST

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Permanente Quarry Erosion Controls Checklist

Per COA 78, inspections of BMPs should be conducted before and following qualifying rain events to ensure their integrity. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately.

This checklist should be used to inspect the BMPs installed through the PCRA areas as listed in the RPA and will serve as documentation for reporting purposes. Photo documentation should accompany both sufficient and deficient BMPs.

For erosion control measures (BMP's) installed in the PCRA, a map is produced on an annual basis at the end the fall season and may be used to determine the locations of the various BMP installations. This map can be marked up in the field with identification numbers that reflect the deficiencies.

Inspection Information				
Date and Time of Inspection: 12/20/2013, 12:15 pm – 3:45 pm (approx..)		Date Report Written: 1/7/2014		
Area Inspected (PCRA Subarea, WMSA, EMSA, Rock Plant, etc.): WMSA, PCRA Subareas, EMSA, Surge Pile (Ponds 13A & 13B)				
Inspection Type: (Circle one)	Monthly	Pre-Storm	During Rain Event	Post-Storm

Inspector/Reviewer Information	
Inspector Name: Scott Batiuk	Inspector Title: Miner
Inspector Signature: [signature]	Date: 1/13/14
Reviewer Name: Megan Stromberg	Reviewer Title: QSD
Reviewer Signature: [signature]	Date: 1/13/14

Weather	
Estimate storm beginning: 12/6/2013 (date and time)	Estimate storm duration: 48 hours (hours)
Estimate time since last storm: 13 days (days or hours)	Rain gauge reading and location for last storm (in): 0.16 inches
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain in 24 hours)? (Y/N) If yes, summarize forecast:	

Silt Fencing

No Yes

☐ ☐ Are any sections of the silt fence split, torn, slumping or undercut?

Map ID/photo numbers: _______ _______ _______ _______ _______ _______ _______

☐ ☐ Do any sections of the silt fence have weathered fabric?

Map ID/photo numbers: _______ _______ _______ _______ _______ _______ _______

☐ ☐ Do any sections of the silt sediment have sediment accumulation which reaches one-third of the barrier height?

Map ID/photo numbers: _______ _______ _______ _______ _______ _______ _______

☐ ☐ Are areas upgradient of the silt fence permanently stabilized?

Map ID/photo numbers: _______ _______ _______ _______ _______ _______ _______

☐ ☐ Are there any other areas in need of silt fencing?

Map ID/photo numbers: _______ _______ _______ _______ _______ _______ _______

Geotextiles and Mats

☐ ☐ Is erosion or scouring evident around or under matting?

Map ID/photo numbers: _______ _______ _______ _______ _______ _______ _______

☐ ☐ Do any areas of the installed blankets have washouts or breakage or are otherwise damaged?

Map ID/photo numbers: _______ _______ _______ _______ _______ _______ _______

☐ ☐ Are blankets uniformly in contact with the soil areas?

Map ID/photo numbers: _______ _______ _______ _______ _______ _______ _______

☐ ☐ Are blanket lap joints secure where they exist?

Map ID/photo numbers: _______ _______ _______ _______ _______ _______ _______

☐ ☐ Are blanket staples or pins flush with the ground?

Map ID/photo numbers: _______ _______ _______ _______ _______ _______ _______

☐ ☐ Are there additional areas that need further installation of erosion control blankets?

Map ID/photo numbers: _______ _______ _______ _______ _______ _______ _______

Fiber Rolls

No Yes

☐ ☐ Are there any split, torn, unraveling, or slumping fiber rolls?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any washouts or breakages of fiber rolls?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any rills or gullies adjacent to, along, or under fiber rolls?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any portions of the fiber rolls where sediment has accumulated to one-third the designated sediment storage depth?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Hydromulch and Seeding

☐ ☐ Are hydroseeded areas scoured, disturbed, or otherwise have erosion?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Do hydroseeded areas have constant cover?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Do any other areas require further hydroseeeding?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Other Measures

☐ ☐ Are there any stockpiles that have uncontrolled run-on or run-off?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any breaks in the haul road berm allowing water to run into the PCRA or Permanente Creek Slopes?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any sediment catchment ponds overflowing?

Map ID/photo numbers: Deficiency #1: 4a/2732-3____ _1b-1c/2712, 14, 15, 28_____

☐ ☐ Are any ditches or water conveyances damaged?

Map ID/photo numbers: ______ ______ ______ ______ ______

BMP Deficiency Descriptions	
Deficiency ID Number	**Deficiency Description**
1.	Map 4a, photos 2732-3: check dams are not overflowing, but they are filling with sediment and should be cleaned out.
	Map 1b, photos 2712, 2728: a few check dams along haul road have overflowed and should be cleaned out/re-shaped.
	Maps 1b & 1c, photos 2714-5: erosion from water flowing down center of haul road is causing rivulets to form.

APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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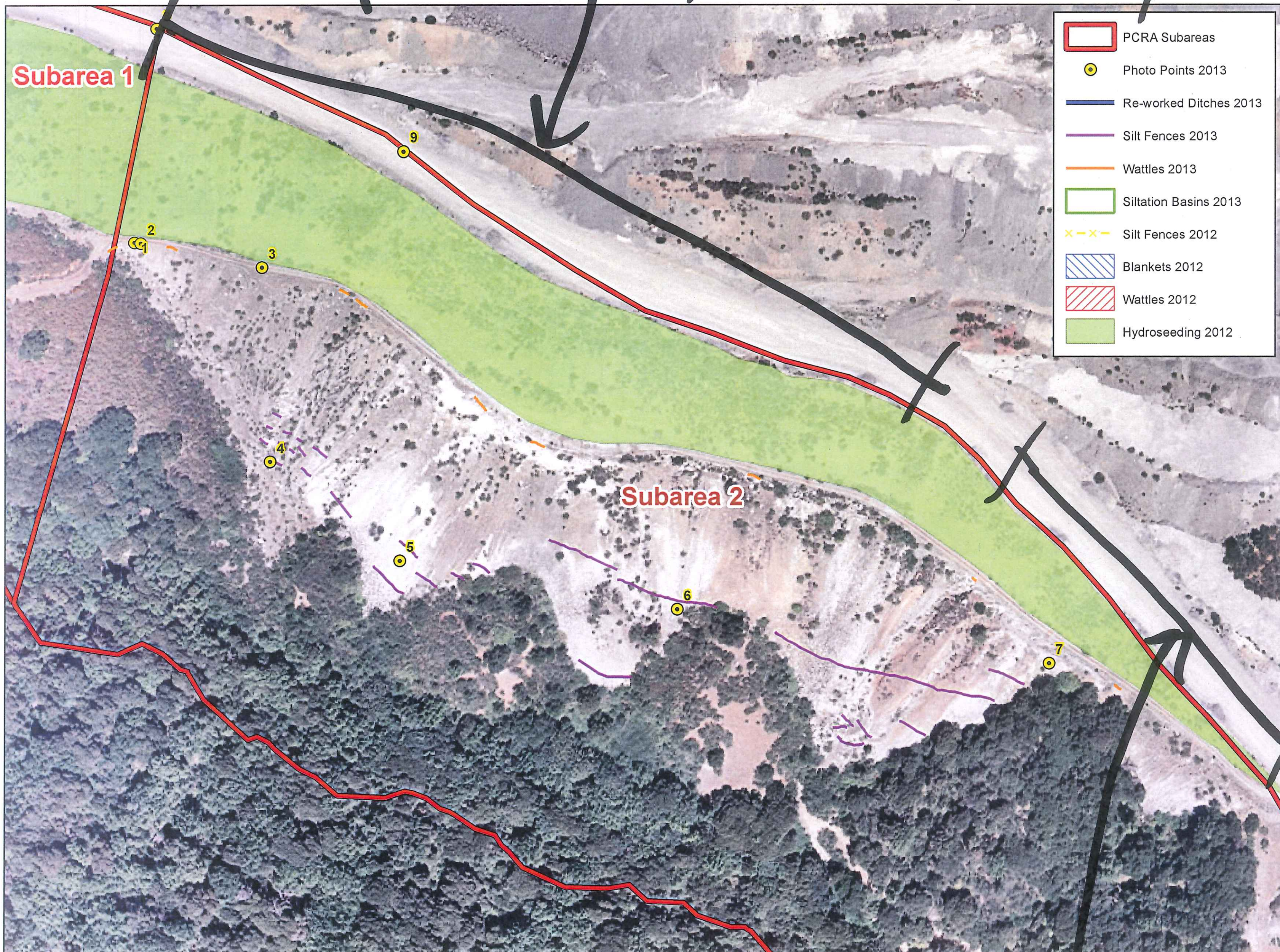
Photos 2712&2728 overflowing check dams along this portion of main haul road. Deficiency #1



WRA ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

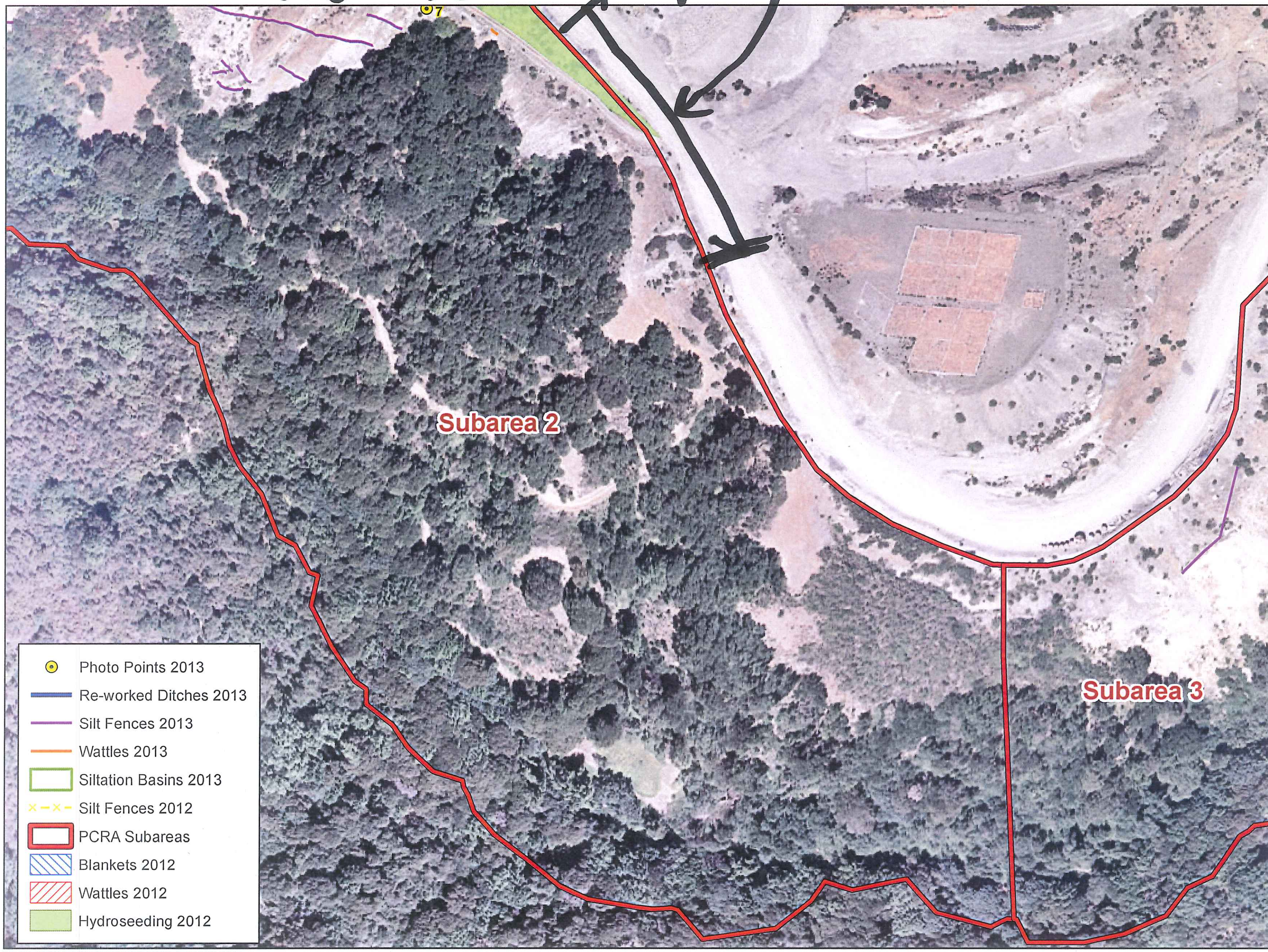
Figure 1b.

PCRA
Erosion Control
Installation Areas
and Picture Points

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Photos 2714-2715. waterflow has eroded rivulets down center of haul road. Deficiency #1.

Photos 2714-2715
water flow has eroded rivulets down center of
haul road Deficiency #1.



Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1c.mxd

WRA ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 1c.

PCRA
Erosion Control
Installation Areas
and Picture Points

N W E S

0 50 100 200 Feet

Date: August 2013
Map By: Michael Rochelle
Aerial: ESRI Streaming 2010

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 4a.mxd

wra ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 4a.

PCRA Erosion Control Installation Areas and Picture Points

Date: August 2013
Map By: Michael Rochelle

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Memorandum

To: Greg Knapp, Lehigh Hanson
Cc:

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: February 26, 2014
Subject: Permanente Quarry – Erosion Control Inspection

Per COA 78 of the Final Conditions of Approval, the Mine Operator shall:

> "…regularly inspect all stormwater and erosion controls, especially before and following qualifying rain events. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately." And

> "Ensure that all stormwater, erosion, and sediment control BMPs are installed, inspected, maintained, and repaired under the direction of either a California certified engineer, geologist, or landscape architect, a registered professional hydrologist, or a certified erosion control specialist."

WRA has been actively managing the inspections of stormwater, erosion, and sediment control BMPs in the RPA. WRA regularly reports on the inspections of the various BMP's to include:

- Check dams on the haul roads
- Erosion control blankets, straw wattles, and silt fence installations within the PCRA treatment areas.
- Berms where stockpiles are placed

On February 19, 2014, WRA scientist Sean Avent inspected the Permanente Quarry for erosion control deficiencies. This inspection was a follow-up to the February 11, 2014, inspection, during which the WMSA was inaccessible due to mining activity. The primary goal of the February 19, 2014, visit was to inspect the WMSA. The rest of the Permanente Quarry was also inspected at that time, but only new deficiencies were reported. No "qualifying event" (0.50 inches of precipitation in 24 hours) occurred between February 11 and February 19, 2014. Deficiencies were recorded on the Erosion Controls Checklist (Appendix A) and Maps 1-3 (Appendix B).

Most erosion controls are intact and do not need repair. Of the deficiencies that were noted in the February 11 report, the silt fence at the EMSA stockpile was repaired, and silt fencing was placed at the channel leading to Pond 30. The check dams along the haul road east of the Crusher/Support Area were not cleaned out. Deficiencies in erosion control measures on February 19 were limited to damage to silt fencing at the WMSA soil stockpiles; lack of erosion control measures at the eastern WMSA stockpile and the Pond 11 stockpile; a berm impeding water flow on the EMSA haul road; and the potential for erosion into the ditch at the north end of the detention basin below C-Station.

At the western WMSA soil stockpile, a section of silt fence was torn, but it was fixed that day. In addition, the silt fence at the base of the eastern WMSA stockpile was damaged, but it was also repaired that day.

The Pond 11 soil stockpile and the upper end of the eastern WMSA soil stockpile had no erosion control measures. That same day, silt fencing, hay bales, and straw wattles were placed below the Pond 11 stockpile and below the WMSA stockpile.

On the EMSA haul road, a small berm created by a grader is impeding the flow of water, causing a pool of water and sediment to form in the road. The berm should be removed.

At the north end of the detention basin below C-Station, there is potential for erosion into the ditch. Silt fencing was placed that day.

Attention to all noted deficiencies should be given as soon as feasible. The following actions should be completed:

1) Remove sediment from rock check dams along haul road east of the Crusher/Support Area
2) Remove the berm along the EMSA haul road

If you have any questions regarding this inspection or the actions that should be taken, please do not hesitate to contact me or other WRA staff at your convenience.

APPENDIX A

EROSION CONTROLS CHECKLIST

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Permanente Quarry Erosion Controls Checklist

Per COA 78, inspections of BMPs should be conducted before and following qualifying rain events to ensure their integrity. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately.

This checklist should be used to inspect the BMPs installed through the PCRA areas as listed in the RPA and will serve as documentation for reporting purposes. Photo documentation should accompany both sufficient and deficient BMPs.

For erosion control measures (BMP's) installed in the PCRA, a map is produced on an annual basis at the end the fall season and may be used to determine the locations of the various BMP installations. This map can be marked up in the field with identification numbers that reflect the deficiencies.

Inspection Information				
Date and Time of Inspection: 2/19/2014 0800-1200		Date Report Written: 2/20/2014		
Area Inspected (PCRA Subarea, WMSA, EMSA, Rock Plant, etc.): WMSA, PCRA Subareas 1-4, Crusher/Support Area, EMSA This inspection was intended as a supplement to the inspection on 2/11/2014. The WMSA was inaccessible that day, so this inspection was primarily intended to address that area. This report only addresses deficiencies not noted in the 2/11/2014 report.				
Inspection Type: (Circle one)	Monthly	Pre-Storm	During Rain Event	Post-Storm

Inspector/Reviewer Information	
Inspector Name: Sean Avent	Inspector Title: Biologist
Inspector Signature:	Date: 9-3-14
Reviewer Name: Megan Stromberg	Reviewer Title: QSD
Reviewer Signature:	Date: 9-3-14

Weather	
Estimate storm beginning: 2/5/14, nighttime (date and time)	Estimate storm duration: 120 (hours)
Estimate time since last storm: 13 days (days or hours)	Rain gauge reading and location for last storm (in): 0.7

Is a “Qualifying Event” predicted or did one occur (i.e., 0.5” rain in 24 hours)? (Y/N)

If yes, summarize forecast: light rain (<0.05 inches) on 2/5, 2/7-2/10; 0.53 inches on 2/7.

Silt Fencing

No Yes

☐ ☐ Are any sections of the silt fence split, torn, slumping or undercut?

Map ID/photo numbers: Map 1. Photos 1-2. Deficiency #1______ ______ ______

☐ ☐ Do any sections of the silt fence have weathered fabric?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Do any sections of the silt sediment have sediment accumulation which reaches one-third of the barrier height?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are areas upgradient of the silt fence permanently stabilized?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any other areas in need of silt fencing?

Map ID/photo numbers: Map 2. Photo 5. Deficiency #4

Geotextiles and Mats

☐ ☐ Is erosion or scouring evident around or under matting?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Do any areas of the installed blankets have washouts or breakage or are otherwise damaged?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are blankets uniformly in contact with the soil areas?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are blanket lap joints secure where they exist?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are blanket staples or pins flush with the ground?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there additional areas that need further installation of erosion control blankets?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Fiber Rolls

No Yes

☐ ☐ Are there any split, torn, unraveling, or slumping fiber rolls?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any washouts or breakages of fiber rolls?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any rills or gullies adjacent to, along, or under fiber rolls?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any portions of the fiber rolls where sediment has accumulated to one-third the designated sediment storage depth?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Hydromulch and Seeding

☐ ☐ Are hydroseeded areas scoured, disturbed, or otherwise have erosion?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Do hydroseeded areas have constant cover?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Do any other areas require further hydroseeeding?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Other Measures

☐ ☐ Are there any stockpiles that have uncontrolled run-on or run-off?

Map ID/photo numbers: Map 1. Photos 3; Map 3. Photo 4. Deficiency #2______

☐ ☐ Are there any breaks in the haul road berm allowing water to run into the PCRA or Permanente Creek Slopes?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any sediment catchment ponds overflowing?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any ditches or water conveyances damaged?

Map ID/photo numbers: Map 2. No photo available. Deficiency #3.

BMP Deficiency Descriptions	
Deficiency ID Number	**Deficiency Description**
1.	Deficiency occurs at WMSA soil stockpiles. Silt fence is torn in one location and slumping in another. Potential for erosion at top of eastern soil stockpile. Map 1. Photos 1-2.
2.	Deficiency occurs in two locations (1) adjacent to haul road at the Pond 11 stockpile and (2) the eastern WMSA stockpile. The Pond 11 stockpile does not have erosion protection and is eroding into the haul road. At the top of the eastern WMSA soil stockpile, there is potential for erosion of the stockpile into the road. Map 1. Photo 3; Map 3. Photo 4.
3.	Deficiency occurs in EMSA along the road east of Ditch C. A grader created a small berm that is impeding water flow, causing a large puddle to form in the road. Map 2. No photo available.
4.	Deficiency occurs at the detention basin below C-Station. There is potential for erosion into the ditch at the north end of the basin. The basin is otherwise functioning well. Map 2. Photo 5.
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	

APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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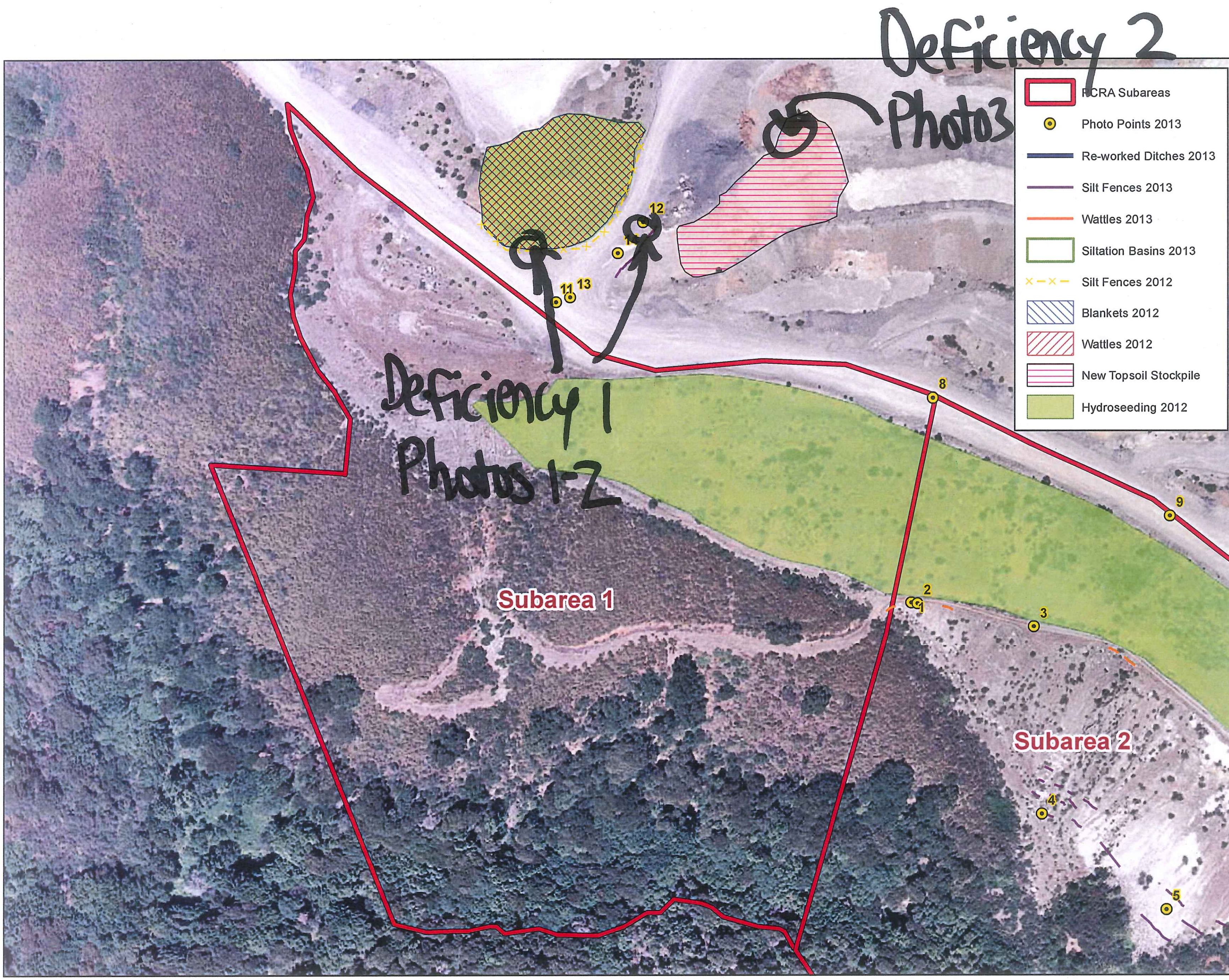


ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 1a.

PCRA
Erosion Control
Installation Areas
and Picture Points

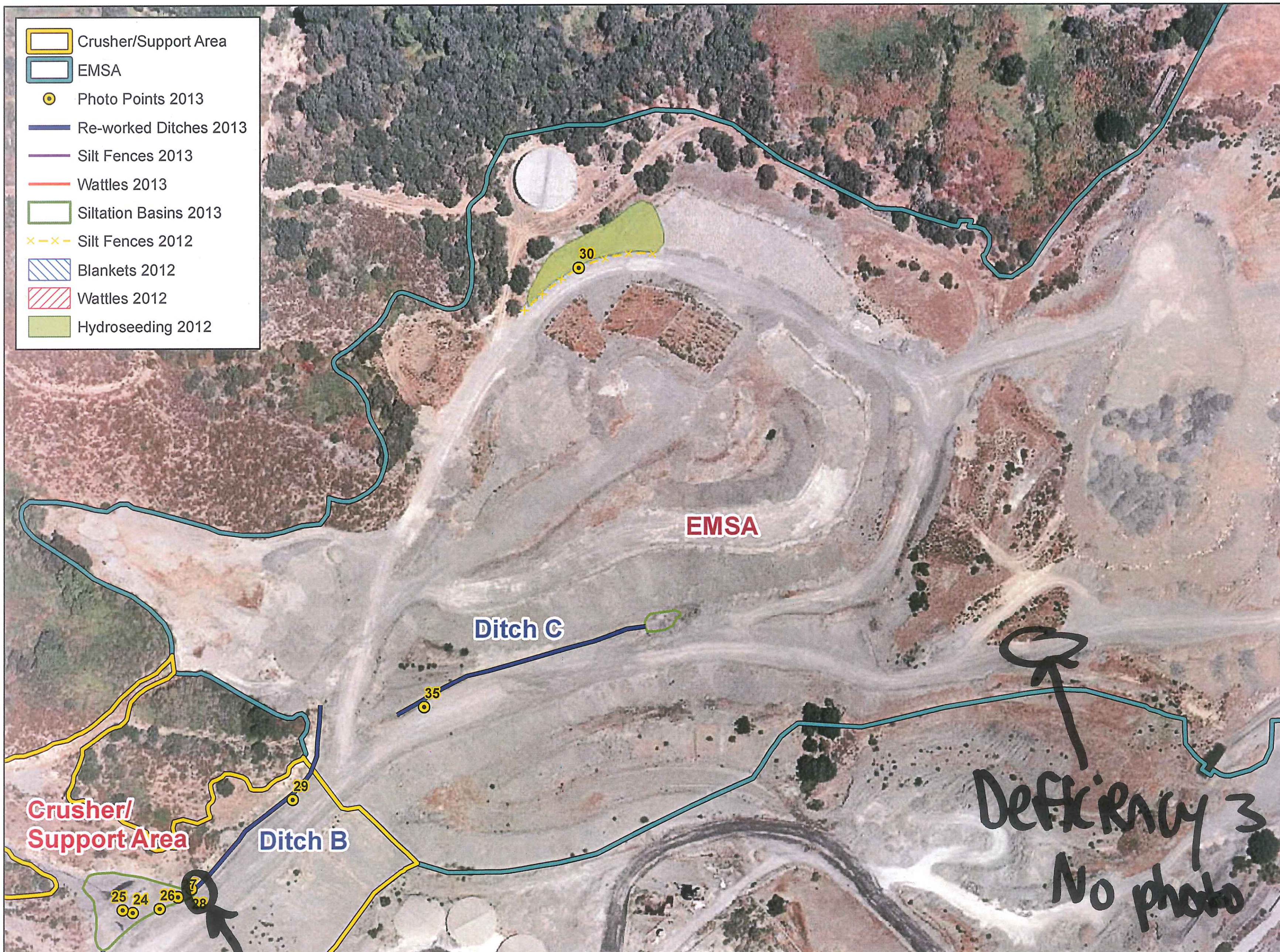
Map 1

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1a.mxd



wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 3a.

PCRA
Erosion Control
Installation Areas
and Picture Points

Map 2

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 3a.mxd

Deficiency 4
Photo 5

Deficiency 2
Photo 4

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 4b.

PCRA
Erosion Control
Installation Areas
and Picture Points

Map3

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 4b.mxd

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Memorandum

To: Greg Knapp, Lehigh Hanson

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: March 4, 2014

Subject: Permanente Quarry – Erosion Control Inspection

Per COA 78 of the Final Conditions of Approval, the Mine Operator shall:

> "…regularly inspect all stormwater and erosion controls, especially before and following qualifying rain events. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately." And
>
> "Ensure that all stormwater, erosion, and sediment control BMPs are installed, inspected, maintained, and repaired under the direction of either a California certified engineer, geologist, or landscape architect, a registered professional hydrologist, or a certified erosion control specialist."

WRA has been actively managing the inspections of stormwater, erosion, and sediment control BMPs in the RPA. WRA regularly reports on the inspections of the various BMP's to include:

- Check dams on the haul roads
- Erosion control blankets, straw wattles, and silt fence installations within the PCRA treatment areas.
- Berms where stockpiles are placed

On March 3, 2014 Reuben Brandt inspected the Permanente Quarry for erosion control deficiencies. A "qualifying rain event" occurred with approximately 2.15 inches of rain falling between February 27, and March 3, 2014. The inspection was conducted to ensure the integrity of the BMPs after the qualifying event. Deficiencies were recorded on the Erosion Controls Checklist (Appendix A) and Maps (Appendix B).

Most erosion controls are intact and are not in need of repair; however several deficiencies in erosion control measures were observed. Of the repairs observed, ECI will be responsible for the following BMP repairs.

An erosion control wattle below the new crusher has been undercut and slumped. This wattle must be put back into place and secured. Additionally, silt fencing below the damaged wattle appears to have collapsed and broken in several places and should be replaced or repaired.

Existing BMPs along main quarry road below the stockpile are insufficient to control the volume of debris flowing from the pile and should be bolstered to ensure all erosion is controlled.

Silt fencing in subarea 4 and above subarea 7 has been damaged and should be repaired or replaced to ensure the integrity of the BMPs throughout the WMSA.

Additionally, significant erosion has been observed immediately below the quarry office and above the main haul road. While no actions are required at this time WRA would like ECI to determine the feasibility of installing an erosion control measure to ameliorate the observed erosion feature.

Additional inadequacies were observed during the investigation; however, due to the nature or location of the deficiencies Lehigh Permanente Quarry will be responsible for the repairs. Those deficiencies are described in detail below.

In addition to the repairs conducted by ECI, WRA suggests further repairs be conducted by the Lehigh Permanente Quarry and/or Rock Plant. Specifically, check dams installed along the edge of the road leading from the Surge Pile/ Rock Plant to Pond 13 have filled in and should be cleared before additional rain events.

Check-dams along the main haul road in the WMSA have filled with sediment and should be cleared to ensure all sediment flowing through the WMSA is controlled.

Several non-limestone lined ditches have been filled and coated in limestone rich sediment and should be cleared and relined with non-limestone rock.

Pond 31 B has overflowed and should be cleared prior to additional rains.

All deficiencies which could be repaired by ECI (as noted above) have been completed as of March 10, 2014. If you have any questions regarding this inspection or the actions that should be taken, please do not hesitate to contact WRA at your convenience.

APPENDIX A

EROSION CONTROLS CHECKLIST

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Permanente Quarry Erosion Controls Checklist

Per COA 78, inspections of BMPs should be conducted before and following qualifying rain events to ensure their integrity. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately.

This checklist should be used to inspect the BMPs installed through the PCRA areas as listed in the RPA and will serve as documentation for reporting purposes. Photo documentation should accompany both sufficient and deficient BMPs.

For erosion control measures (BMP's) installed in the PCRA, a map is produced on an annual basis at the end the fall season and may be used to determine the locations of the various BMP installations. This map can be marked up in the field with identification numbers that reflect the deficiencies.

Inspection Information				
Date and Time of Inspection: 3/3/14		Date Report Written: 3/4/14		
Area Inspected (PCRA Subarea, WMSA, EMSA, Rock Plant, etc.): PCRA, EMSA, Rock Plnt				
Inspection Type: (Circle one)	Monthly	Pre-Storm	During Rain Event	Post-Storm

Inspector/Reviewer Information	
Inspector Name: Reuben Brandt	Inspector Title: ECOLOGIST
Inspector Signature: Reuben Brandt	Date: 3/3/14
Reviewer Name: Megan Stromberg	Reviewer Title: QSD
Reviewer Signature:	Date: 9-3-14

Weather	
Estimate storm beginning: (date and time) 2/27/14	Estimate storm duration: (hours) 72
Estimate time since last storm: (days or hours) 12 hours	Rain gauge reading and location for last storm (in):
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain in 24 hours)? (Y/N) If yes, summarize forecast: 2.1 inches	

Silt Fencing

No Yes

☐ ☑ Are any sections of the silt fence split, torn, slumping or undercut?

Map ID/photo numbers: 1, 3; ______ ______ ______ ______ ______

☑ ☐ Do any sections of the silt fence have weathered fabric?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☑ Do any sections of the silt sediment have sediment accumulation which reaches one-third of the barrier height?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☑ Are areas upgradient of the silt fence permanently stabilized?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☑ ☐ Are there any other areas in need of silt fencing?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Geotextiles and Mats

☑ ☐ Is erosion or scouring evident around or under matting?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☑ ☐ Do any areas of the installed blankets have washouts or breakage or are otherwise damaged?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☑ Are blankets uniformly in contact with the soil areas?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☑ Are blanket lap joints secure where they exist?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☐ ☑ Are blanket staples or pins flush with the ground?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

☑ ☐ Are there additional areas that need further installation of erosion control blankets?

Map ID/photo numbers: ______ ______ ______ ______ ______ ______ ______

Fiber Rolls

No	Yes	
☑	☐	Are there any split, torn, unraveling, or slumping fiber rolls?
		Map ID/photo numbers:
☐	☑	Are there any washouts or breakages of fiber rolls?
		Map ID/photo numbers: 1
☐	☑	Are there any rills or gullies adjacent to, along, or under fiber rolls?
		Map ID/photo numbers: 1
☑	☐	Are any portions of the fiber rolls where sediment has accumulated to one-third the designated sediment storage depth?
		Map ID/photo numbers:

Hydromulch and Seeding

☐	☑	Are hydroseeded areas scoured, disturbed, or otherwise have erosion?
		Map ID/photo numbers: 4
☑	☐	Do hydroseeded areas have constant cover?
		Map ID/photo numbers: 4
☑	☐	Do any other areas require further hydroseeeding?
		Map ID/photo numbers:

Other Measures

☑	☐	Are there any stockpiles that have uncontrolled run-on or run-off?
		Map ID/photo numbers:
☑	☐	Are there any breaks in the haul road berm allowing water to run into the PCRA or Permanente Creek Slopes?
		Map ID/photo numbers:
☐	☑	Are any sediment catchment ponds overflowing?
		Map ID/photo numbers: 9
☐	☑	Are any ditches or water conveyances damaged?
		Map ID/photo numbers: 7

BMP Deficiency Descriptions	
Deficiency ID Number	**Deficiency Description**
1.	Erosion control wattle slumped and fallen. Silt fence ripped where straw wattle collapsed. (Photo 1)
2.	Insufficient BMPs along Quarry road.
3.	Silt fencing in PCRA Subarea 4 broken.
4.	Erosion below Quarry office.
5, 6.	Check dams on road from the rock plant to Pond 13 full (Photos 5 & 6)
7, 8.	Non-limestone lined ditches full of limestone-containing sediment.
9.	Pond 31b has overflowed and should be cleared.

APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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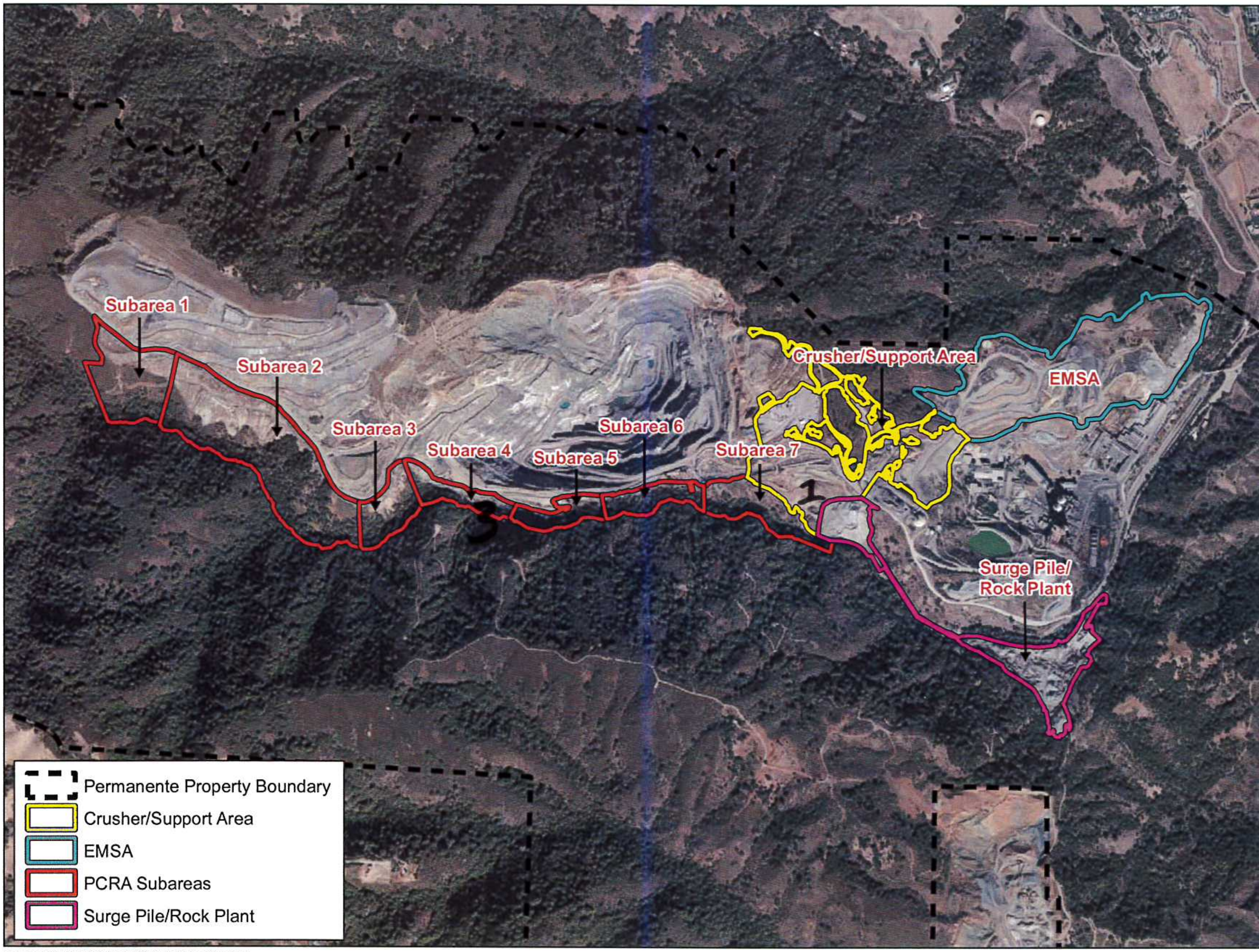


ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

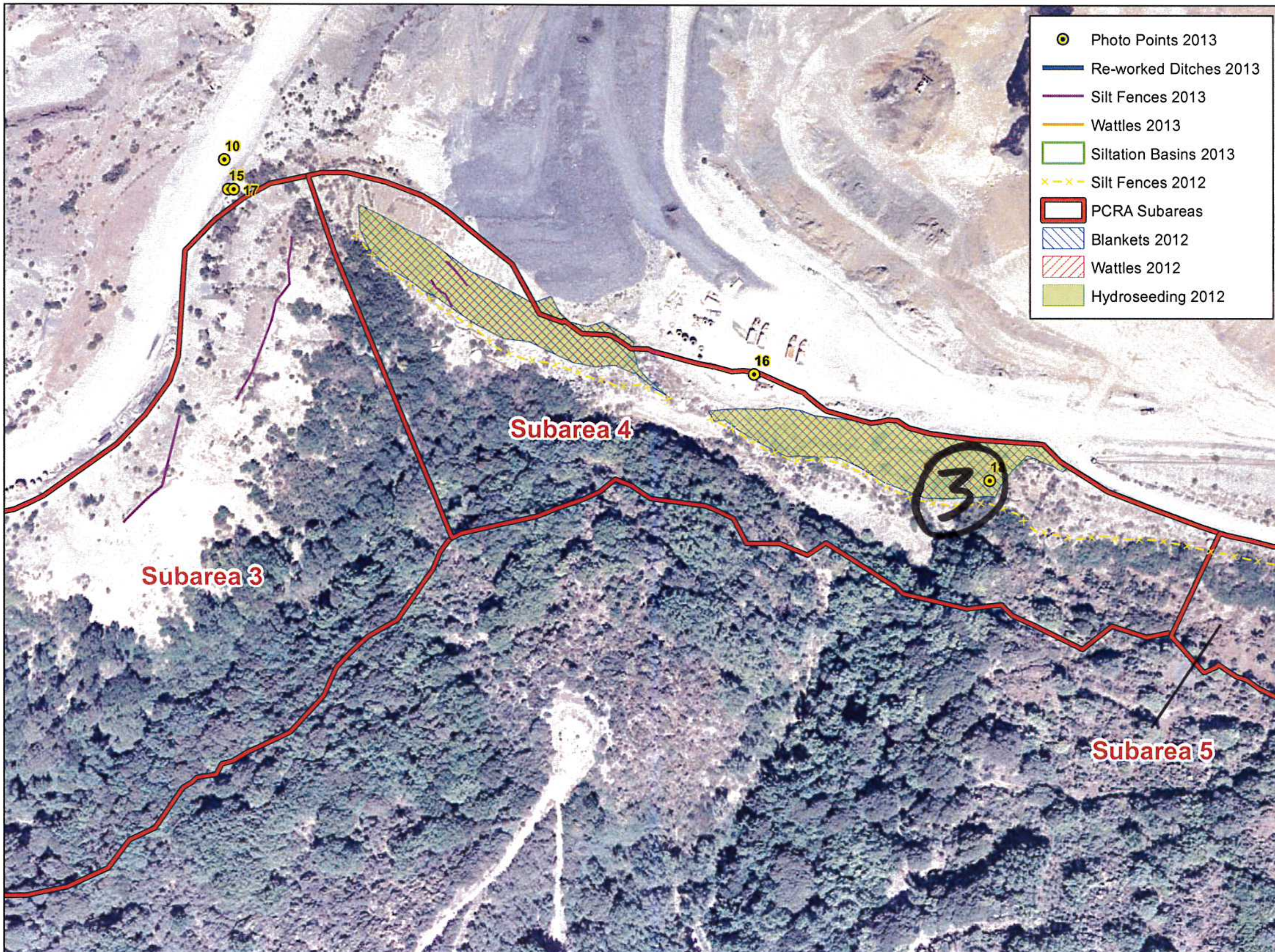
Overview

N
W E
S

0 500 1,000 2,000
Feet

Date: August 2013
Map By: Chirs Zumwalt
Aerial: ESRI Streaming 2010

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Overview.mxd



wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 1d.

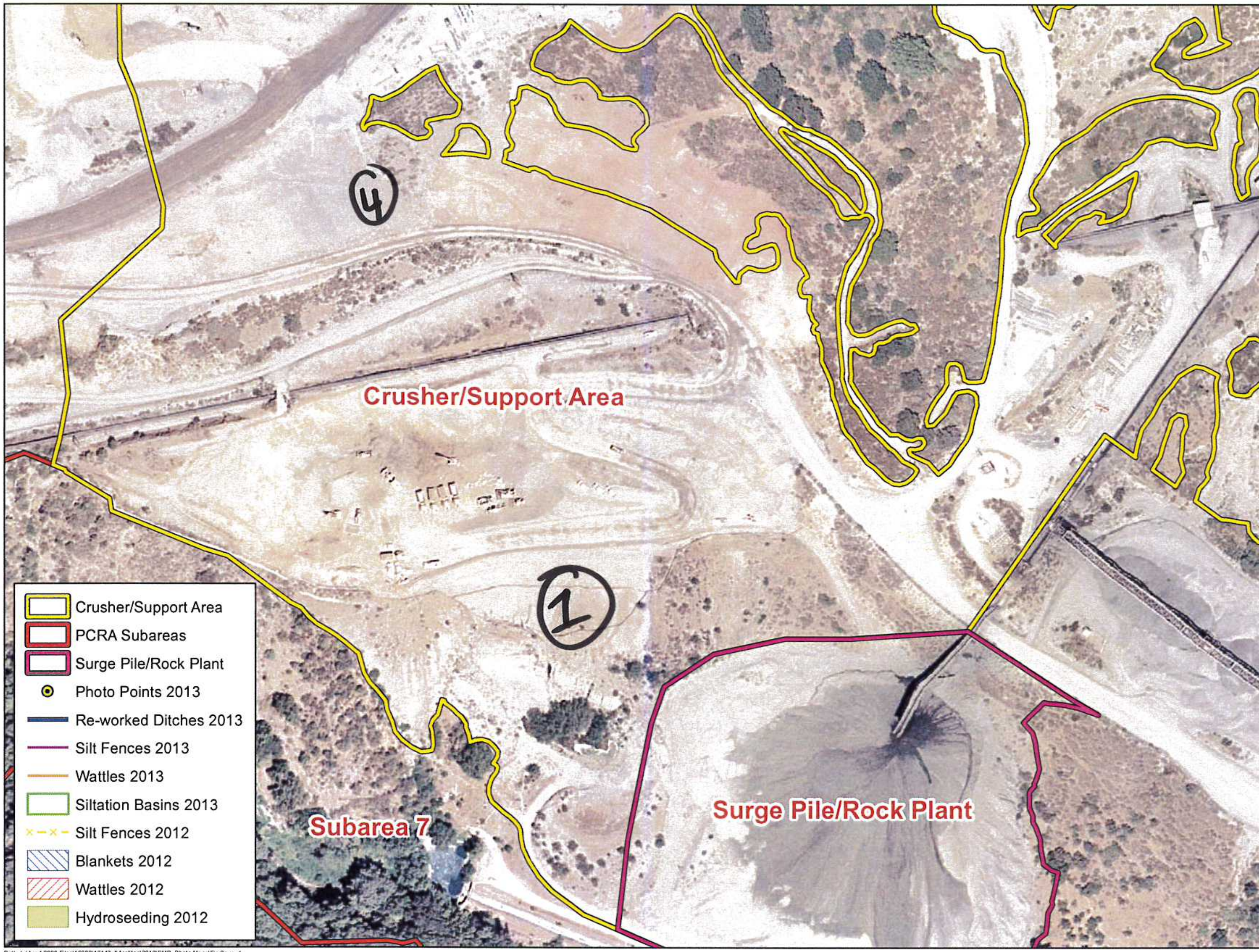
PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1d.mxd



wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 2a.

PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 2a.mxd

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 3b.

PCRA
Erosion Control Installation Areas and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 3b.mxd

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 4a.

PCRA
Erosion Control
Installation Areas
and Picture Points

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 4a.mxd

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Memorandum

To: Greg Knapp, Lehigh Hanson

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: April 8, 2014

Subject: Permanente Quarry – Erosion Control Inspection

Per COA 78 of the Final Conditions of Approval, the Mine Operator shall:

> "…regularly inspect all stormwater and erosion controls, especially before and following qualifying rain events. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately." And
>
> "Ensure that all stormwater, erosion, and sediment control BMPs are installed, inspected, maintained, and repaired under the direction of either a California certified engineer, geologist, or landscape architect, a registered professional hydrologist, or a certified erosion control specialist."

WRA has been actively managing the inspections of stormwater, erosion, and sediment control BMPs in the RPA. WRA regularly reports on the inspections of the various BMP's to include:

- Check dams on the haul roads
- Erosion control blankets, straw wattles, and silt fence installations within the PCRA treatment areas.
- Berms where stockpiles are placed

On April 8, 2014, Scott Batiuk inspected the Permanente Quarry for erosion control deficiencies. A "qualifying rain event" occurred when approximately 1.19 inches of rain fell between March 29, 2014 and April 1, 2014. The inspection was conducted to ensure the integrity of the BMPs after the qualifying event. Deficiencies were recorded on the Erosion Controls Checklist (Appendix A) and Maps (Appendix B).

Most erosion controls are intact and are not in need of repair; however several deficiencies in erosion control measures were observed.

An erosional rivulet has been observed immediately below the quarry office and above the main haul road. In addition, the hydroseed has slid off of the surface of the slope in several places. This area is part of an experiment testing the effectiveness of different hydroseed treatments. The loss of hydroseed will be incorporated into experimental data, but it is not presently causing significant erosion. While no actions are required at this time, WRA would like ECI to determine the feasibility of installing an erosion control measure to ameliorate the observed erosion feature.

Outside of the RPA boundary, south of the aluminum building where the road crosses the railroad tracks, water is flowing around BMPs and into the railroad tracks. In addition, the sediment catchment at that intersection needs to be cleaned out. This area needs to be redesigned so that runoff will be more effectively captured by the appropriate nearby catchment areas.

The berm above the Pond 4 outlet pipe has been breached and is causing erosion on the adjacent slope. This berm needs to be repaired.

An erosion control wattle below the new crusher has been undercut and slumped. This wattle must be put back into place and secured.

Water is ponding on the access road north of Pond 13, possibly because of a seep. This is not causing erosion, but the standing water could act as a breeding ground for mosquitos. This area should be redesigned to prevent the ponding of water.

Several non-limestone lined ditches have been filled and coated in limestone rich sediment and should be cleared and relined with non-limestone rock.

There is scouring below the Pond 30 outfall. This area should be re-lined with material that is more erosion-resistant.

If you have any questions regarding this inspection or the actions that should be taken, please do not hesitate to contact WRA at your convenience.

APPENDIX A

EROSION CONTROLS CHECKLIST

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Permanente Quarry Erosion Controls Checklist

Per COA 78, inspections of BMPs should be conducted before and following qualifying rain events to ensure their integrity. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately.

This checklist should be used to inspect the BMPs installed through the PCRA areas as listed in the RPA and will serve as documentation for reporting purposes. Photo documentation should accompany both sufficient and deficient BMPs.

For erosion control measures (BMP's) installed in the PCRA, a map is produced on an annual basis at the end the fall season and may be used to determine the locations of the various BMP installations. This map can be marked up in the field with identification numbers that reflect the deficiencies.

Inspection Information				
Date and Time of Inspection: 4/7/2014; 9:00 AM – 5:00 pm		Date Report Written: 4/8/2014		
Area Inspected (PCRA Subarea, WMSA, EMSA, Rock Plant, etc.): PCRA Subareas 5-7, EMSA, Crusher/Support Area, Surge Pile, Rock Plant. The WMSA was inaccessible to the vehicle available that day, and it will be assessed in the near future.				
Inspection Type: (Circle one)	Monthly	Pre-Storm	During Rain Event	Post-Storm

Inspector/Reviewer Information	
Inspector Name: Scott Batiuk	Inspector Title: Biologist
Inspector Signature:	Date: 4/8/2014
Reviewer Name: Megan Stromberg	Reviewer Title: QSD
Reviewer Signature:	Date: 9-3-14

Weather	
Estimate storm beginning: 3/29/14; morning (date and time)	Estimate storm duration: 96 (hours)
Estimate time since last storm: 5 days (days or hours)	Rain gauge reading and location for last storm (in): 1.19 inches, Cupertino, California

Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain in 24 hours)? (Y/N) If yes, summarize forecast: 1.19 inches of rain fell from 3/29/14-4/1/14. The daily maximum during that time was 0.52 inches on 3/31. No rain is predicted for the near future.

Silt Fencing

No Yes

☐ ☐ Are any sections of the silt fence split, torn, slumping or undercut?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Do any sections of the silt fence have weathered fabric?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Do any sections of the silt fence have sediment accumulation which reaches one-third of the barrier height?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are areas upgradient of the silt fence permanently stabilized?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any other areas in need of silt fencing?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Geotextiles and Mats

☐ ☐ Is erosion or scouring evident around or under matting?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Do any areas of the installed blankets have washouts or breakage or are otherwise damaged?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are blankets uniformly in contact with the soil areas?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are blanket lap joints secure where they exist?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are blanket staples or pins flush with the ground?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Are there additional areas that need further installation of erosion control blankets?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Fiber Rolls

No Yes

Are there any split, torn, unraveling, or slumping fiber rolls?

Deficiency number(s): ___5___ ______ ______ ______ ______ ______ ______

Are there any washouts or breakages of fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Are there any rills or gullies adjacent to, along, or under fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Are any portions of the fiber rolls where sediment has accumulated to one-third the designated sediment storage depth?

Deficiency number(s): __1____ ______ ______ ______ ______ ______ ______

Hydromulch and Seeding

Are hydroseeded areas scoured, disturbed, or otherwise eroding?

Deficiency number(s): __2____ ______ ______ ______ ______ ______ ______

Do hydroseeded areas have constant cover?

Deficiency number(s): __2____ ______ ______ ______ ______ ______ ______

Do any other areas require further hydroseeeding?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Other Measures

Are there any stockpiles that have uncontrolled run-on or run-off?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Are there any breaks in the haul road berm allowing water to run into the PCRA or Permanente Creek Slopes?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any sediment catchment ponds overflowing?

Deficiency number(s): __3____ ______ ______ ______ ______ ______ ______

☐ ☐ Are any ditches or water conveyances damaged?

Deficiency number(s): __1___ ___3___ ___4___ ______ ______ ______ ______

BMP Deficiency Descriptions	
Deficiency ID Number	**Deficiency Description**
1.	This is a note and not a deficiency. Past runoff and erosion from the slopes and roads north of Pond 30 has caused limestone-containing sediment to enter the channel leading to Pond 30 and has caused erosion of the channel edges. Silt fence and fiber rolls have been placed and are preventing runoff sediment from entering the channel. In addition, the EMSA is actively being regraded, and the final topography will be such that the current erosion and runoff issues will be eliminated.
2.	The hydroseed on the slopes above the new crusher has slid off the slope in many places. However, aside from a small rivulet forming immediately below the Quarry Office, no significant erosion is occurring. This area is being used for an experiment to test the effectiveness of different hydroseed treatments, and the loss of hydroseed cover will be used as data for the experiment. However, the slopes will continue to be monitored for erosion. Map 2a; photo 1.
3.	South of the aluminum building, where the road crosses the railroad tracks, water is flowing around BMPs and into the railroad tracks. In addition, the sediment catchment at that intersection needs to be cleaned out. Map 5; photo 2.
4.	The berm above the Pond 4 outlet pipe has been breached and is eroding down the slope. Map 1e; photo 3.
5.	On the slope below the new crusher, a fiber roll has slumped. Map 2a; photo 4.
6.	Water is ponding on the access road north of Pond 13. This is not causing erosion issues, but it may be mosquito breeding habitat. Map 2a; photo 5.
7.	Limestone sediment has entered the non-limestone-lined channels in several places. These channels should be cleaned out. Map 3a, 3b; photos 6-7.
8.	There is scouring below the Pond 30 outfall. This area should be re-lined with materials that are more erosion-resistant. Map 3b; photo 8.
9.	
10.	
11.	

APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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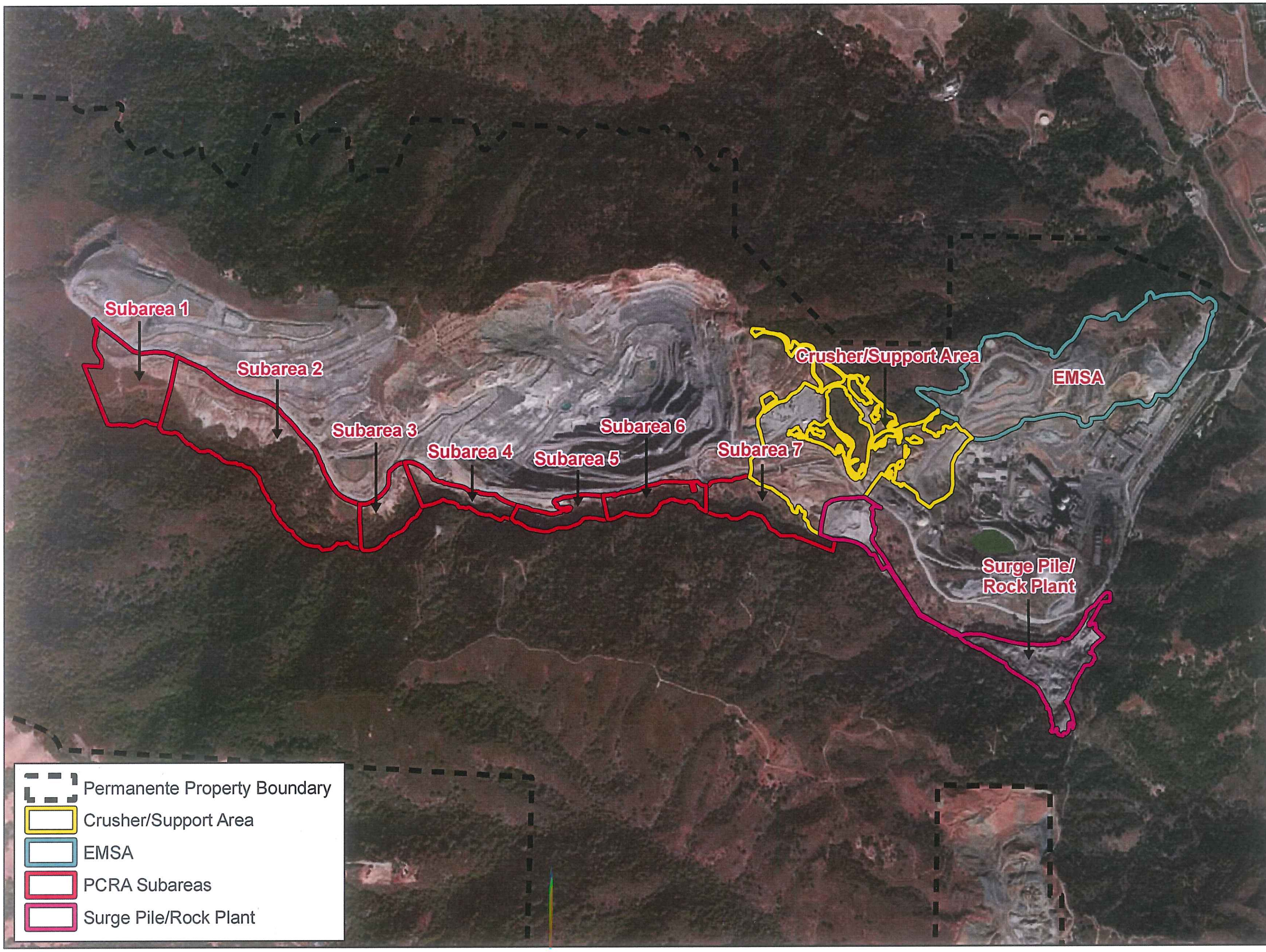


wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

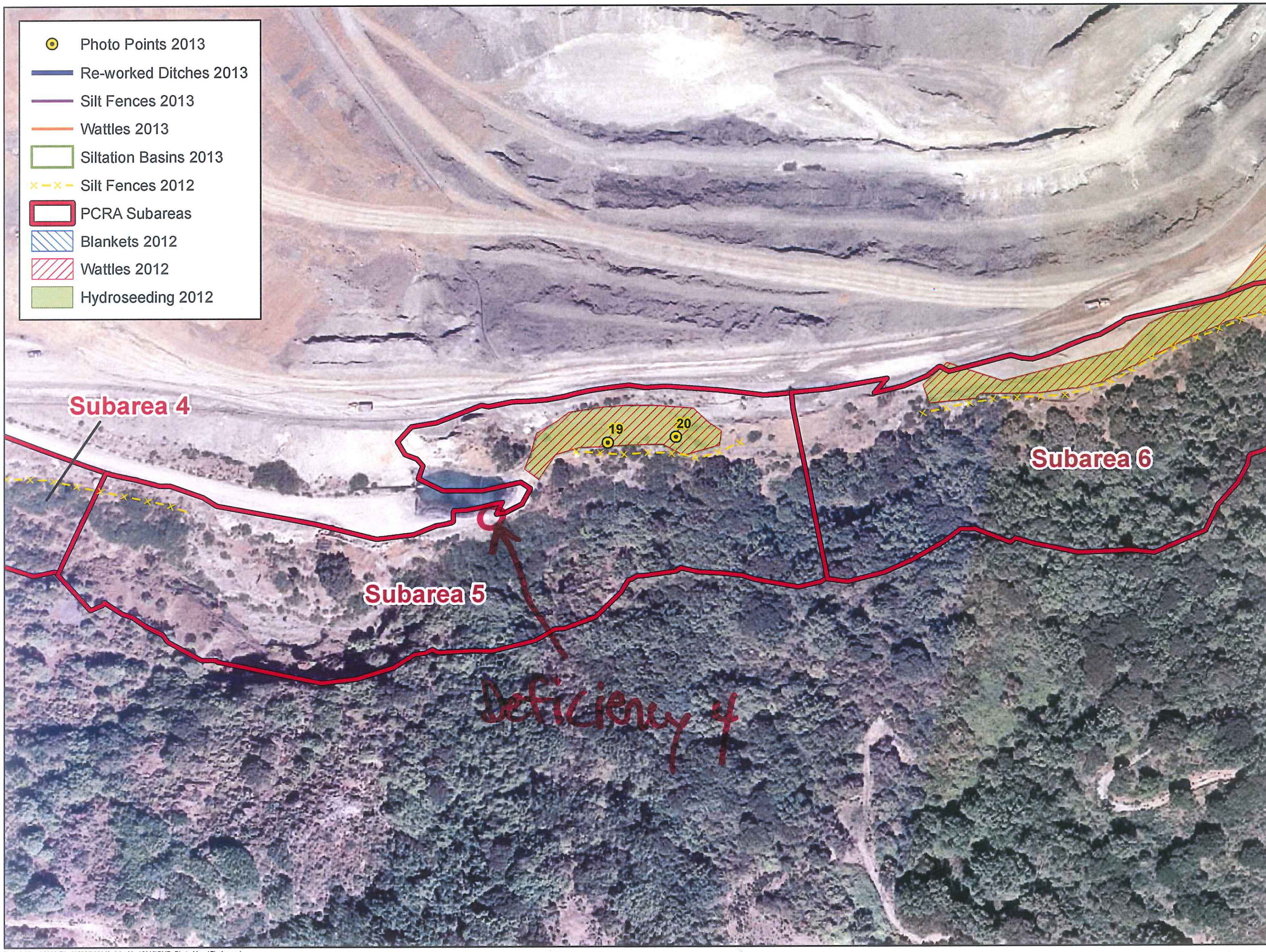
Overview

N
W E
S

0 500 1,000 2,000
Feet

Date: August 2013
Map By: Chirs Zumwalt
Aerial: ESRI Streaming 2010

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Overview.mxd



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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 1e.

PCRA
Erosion Control
Installation Areas
and Picture Points

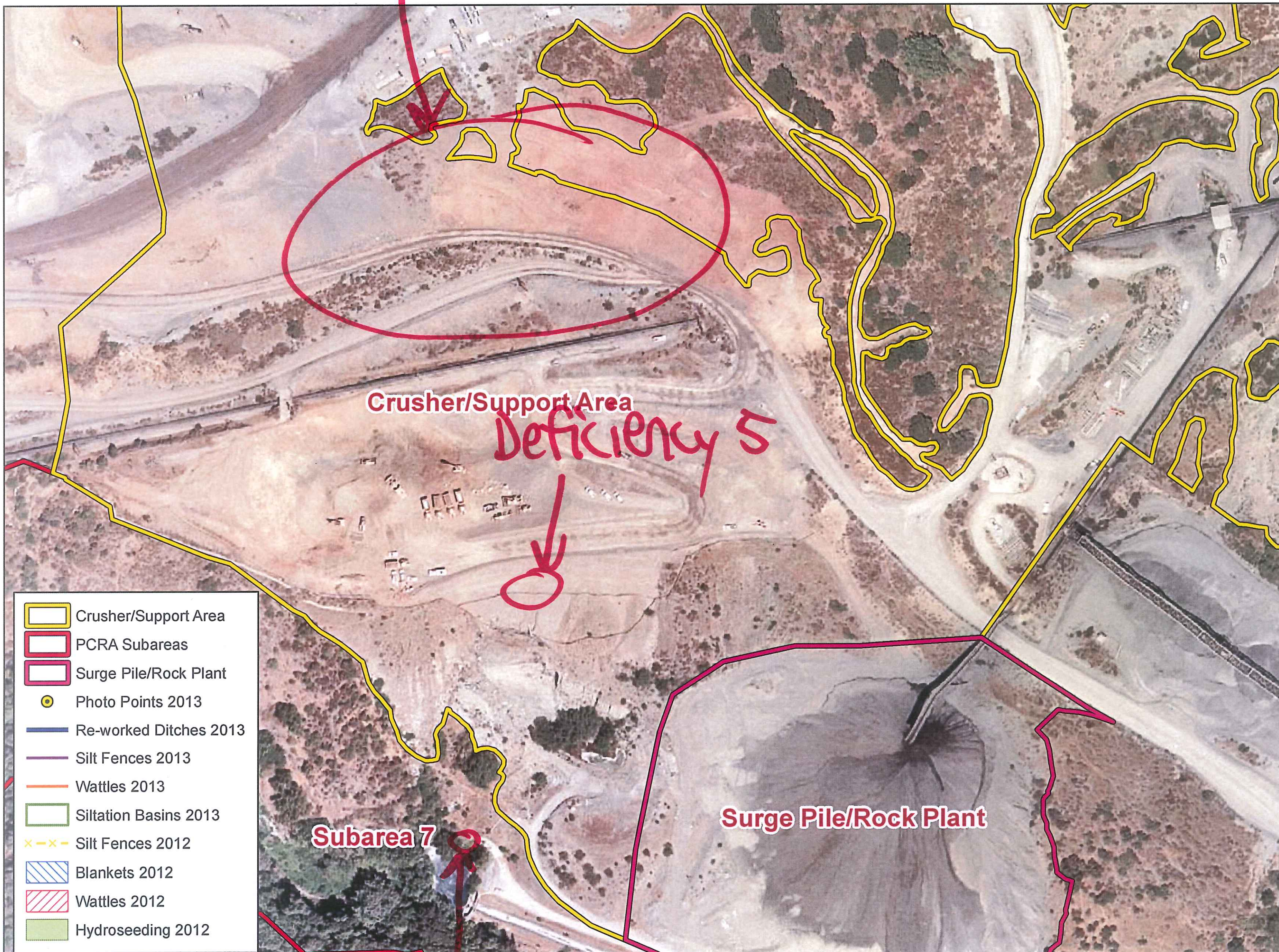
N W E S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1e.mxd

Deficiency 2



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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 2a.

PCRA
Erosion Control Installation Areas and Picture Points

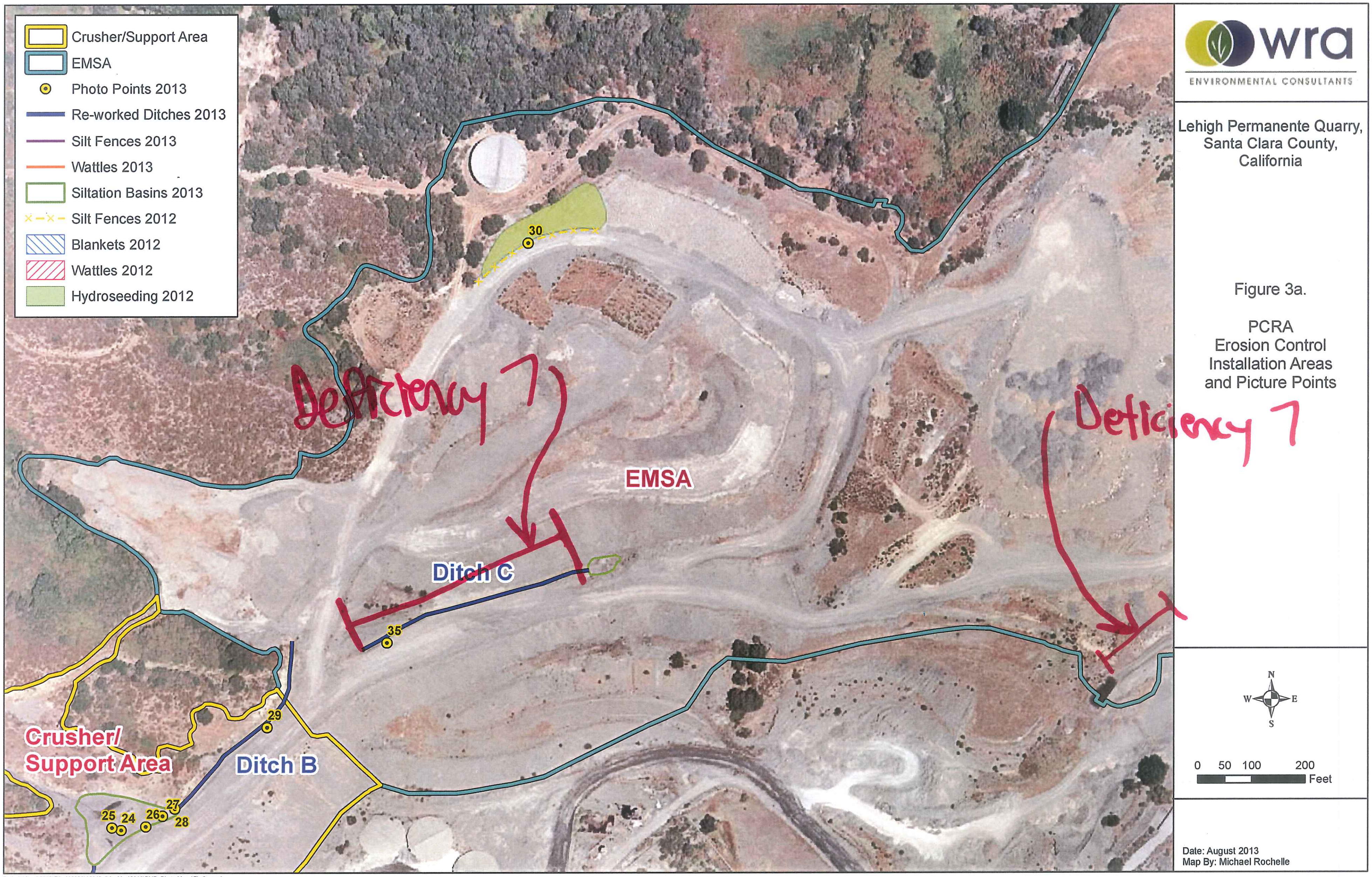
N W E S

0 50 100 200 Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 2a.mxd

Deficiency 6



Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 3a.mxd

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 3b.mxd

Figure 5

Permanente Rd
Deficiency 3
© 2014 Google
Google earth
1948
Imagery Date: 4/15/2013
37°19'04.15" N 122°05'16.68" W elev 535 ft
eye alt 1007 ft

Memorandum

To: Greg Knapp, Lehigh Hanson
Cc:

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: August 28, 2014
Subject: Permanente Quarry – June 2014 Erosion Control Inspection

Per COA 78 of the Final Conditions of Approval, the Mine Operator shall:

> "…regularly inspect all stormwater and erosion controls, especially before and following qualifying rain events. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately."

> "Ensure that all stormwater, erosion, and sediment control BMPs are installed, inspected, maintained, and repaired under the direction of either a California certified engineer, geologist, or landscape architect, a registered professional hydrologist, or a certified erosion control specialist."

WRA has been actively managing the inspections of stormwater, erosion, and sediment control BMPs in the RPA. WRA regularly reports on the inspections of the various BMP's to include:

- Check dams on the haul roads
- Erosion control blankets, straw wattles, and silt fence installations within the PCRA treatment areas.
- Berms where stockpiles are placed

On June 24, 2014, Scott Yarger, WRA biologist, inspected the site for erosion control deficiencies. Deficiencies were recorded on the Erosion Controls Checklist (Appendix A) and Maps 1-4 (Appendix B).

This inspection occurred during the dry season, and there were no qualifying rain events prior to the inspection. Areas inspected include the PCRA Subareas, WMSA and the lower EMSA. A significant portion of the EMSA was inaccessible on the day of inspection due to heavy machinery traffic. WRA will return to assess the area as soon as possible.

Most erosion controls were intact and did not need repair at the time of inspection. The deficiencies noted during the June 24, 2014 inspection are described below.

In the WMSA, the silt fencing around the western topsoil stockpile was not buried in places and portions of the fence fabric were slumping. At Pond 4a, the silt fence at the perimeter of the selenium treatment plant construction activity was knocked over in places and in need of repair. Outside of the RPA, checkdams along the canyon road, were filled with sediment and needed cleaning.

All deficiencies noted during the inspection have been addressed and fixed by WRA contractor, Ecological Concerns Inc., or Quarry staff.

If you have any questions regarding this inspection or the actions that should be taken, please do not hesitate to contact me or other WRA staff at your convenience.

APPENDIX A

EROSION CONTROLS CHECKLIST

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Permanente Quarry Erosion Controls Checklist

Per COA 78, inspections of BMPs should be conducted before and following qualifying rain events to ensure their integrity. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately.

This checklist should be used to inspect the BMPs installed through the PCRA areas as listed in the RPA and will serve as documentation for reporting purposes. Photo documentation should accompany both sufficient and deficient BMPs.

For erosion control measures (BMP's) installed in the PCRA, a map is produced on an annual basis at the end the fall season and may be used to determine the locations of the various BMP installations. This map can be marked up in the field with identification numbers that reflect the deficiencies.

Inspection Information				
Date and Time of Inspection: 6/24/14 8:00 AM			Date Report Written: 6/25/14	
Area Inspected (PCRA Subarea, WMSA, EMSA, Rock Plant, etc.): PCRA subareas, WMSA, lower EMSA				
Inspection Type: (Circle one)	Monthly	Pre-Storm	During Rain Event	Post-Storm

Inspector/Reviewer Information	
Inspector Name: Scott Yarger	Inspector Title: Biologist
Inspector Signature: [signature]	Date: 6/25/14
Reviewer Name: Megan Stromberg	Reviewer Title: QSD
Reviewer Signature: [signature]	Date: 8/29/14

Weather	
Estimate storm beginning: (date and time) N/A	Estimate storm duration: (hours) N/A
Estimate time since last storm: (days or hours) N/A	Rain gauge reading and location for last storm (in): N/A
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain in 24 hours)? (Y/N) If yes, summarize forecast:	

Silt Fencing

No Yes

☐ ☑ Are any sections of the silt fence split, torn, slumping or undercut?

Deficiency number(s): 1 ______ ______ ______ ______ ______ ______

☐ ☑ Do any sections of the silt fence have weathered fabric?

Deficiency number(s): 1 ______ ______ ______ ______ ______ ______

☐ ☑ Do any sections of the silt fence have sediment accumulation which reaches one-third of the barrier height?

Deficiency number(s): 2 3 ______ ______ ______ ______ ______

☐ ☐ Are areas upgradient of the silt fence permanently stabilized?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any other areas in need of silt fencing?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Geotextiles and Mats

☐ ☑ Is erosion or scouring evident around or under matting?

Deficiency number(s): 1 ______ ______ ______ ______ ______ ______

☐ ☑ Do any areas of the installed blankets have washouts or breakage or are otherwise damaged?

Deficiency number(s): 1 ______ ______ ______ ______ ______ ______

☐ ☐ Are blankets uniformly in contact with the soil areas?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are blanket lap joints secure where they exist?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are blanket staples or pins flush with the ground?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there additional areas that need further installation of erosion control blankets?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Fiber Rolls

No Yes

☐ ☐ Are there any split, torn, unraveling, or slumping fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any washouts or breakages of fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any rills or gullies adjacent to, along, or under fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any portions of the fiber rolls where sediment has accumulated to one-third the designated sediment storage depth?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Hydromulch and Seeding

☐ ☑ Are hydroseeded areas scoured, disturbed, or otherwise eroding?

Deficiency number(s): __1__ ______ ______ ______ ______ ______ ______

☐ ☐ Do hydroseeded areas have constant cover?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Do any other areas require further hydroseeeding?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Other Measures

☐ ☐ Are there any stockpiles that have uncontrolled run-on or run-off?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any breaks in the haul road berm allowing water to run into the PCRA or Permanente Creek Slopes?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any sediment catchment ponds overflowing?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any ditches or water conveyances damaged?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

BMP Deficiency Descriptions	
Deficiency ID Number	Deficiency Description
1.	Silt fencing is torn and not buried in areas around top soil stockpile. Blankets are torn and erosion occuring. Area could possibly benefit from re-hydroseed.
2.	Silt fence between pond 4A & creek buried more than 1/3 and knocked over in places due to recent berm building.
3.	BMPs & checkdams filled with sediment need to be dugout & cleaned up. Silt fence buried. Sean emailed Reza re: this 6/23/14
4.	
5.	
6.	
7.	
8.	
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14.	
15.	
16.	

APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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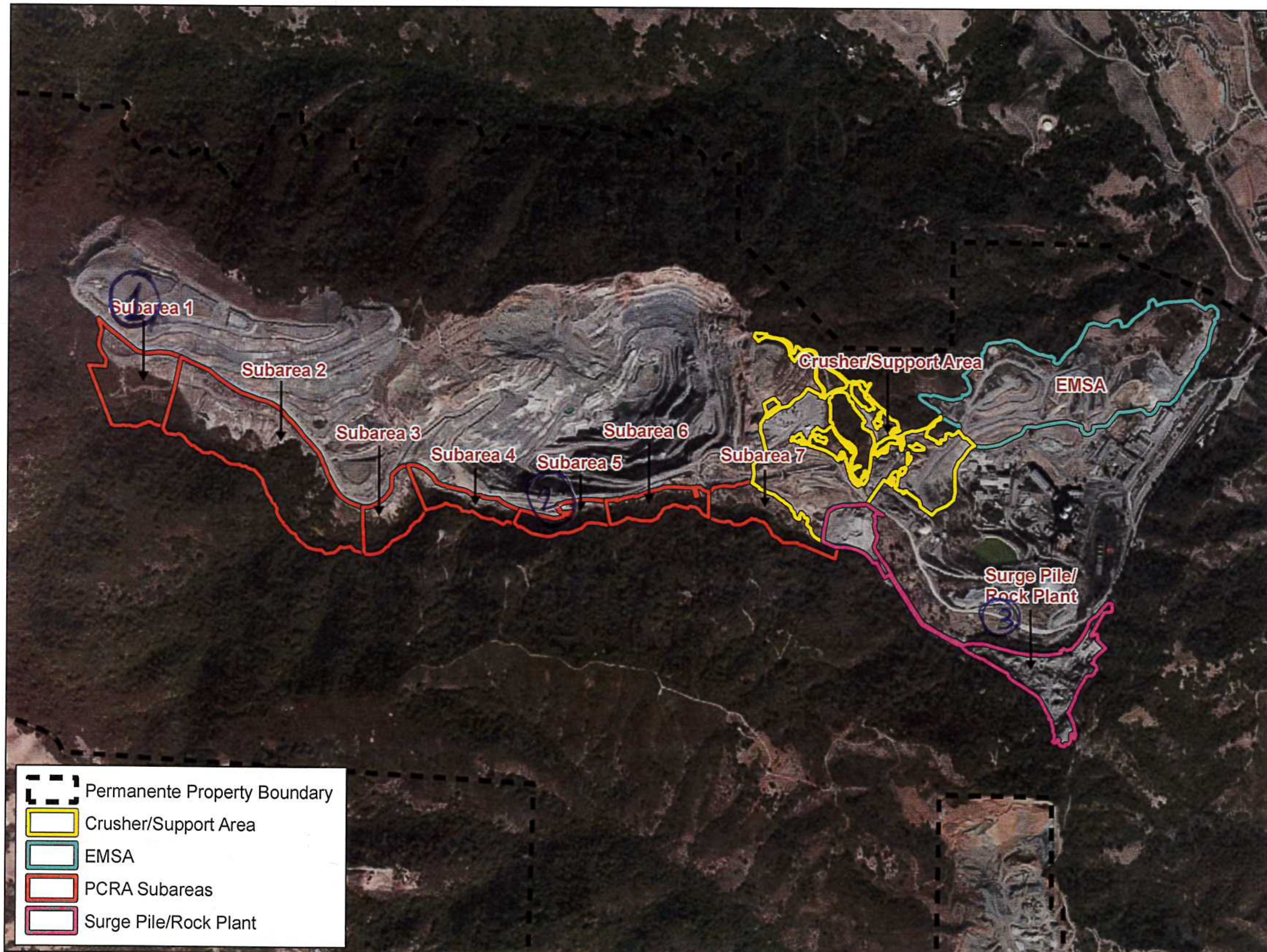
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Overview

Fig. 1



N
W E
S

0 500 1,000 2,000 Feet

Date: August 2013
Map By: Chirs Zumwalt
Aerial: ESRI Streaming 2010

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Overview.mxd

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

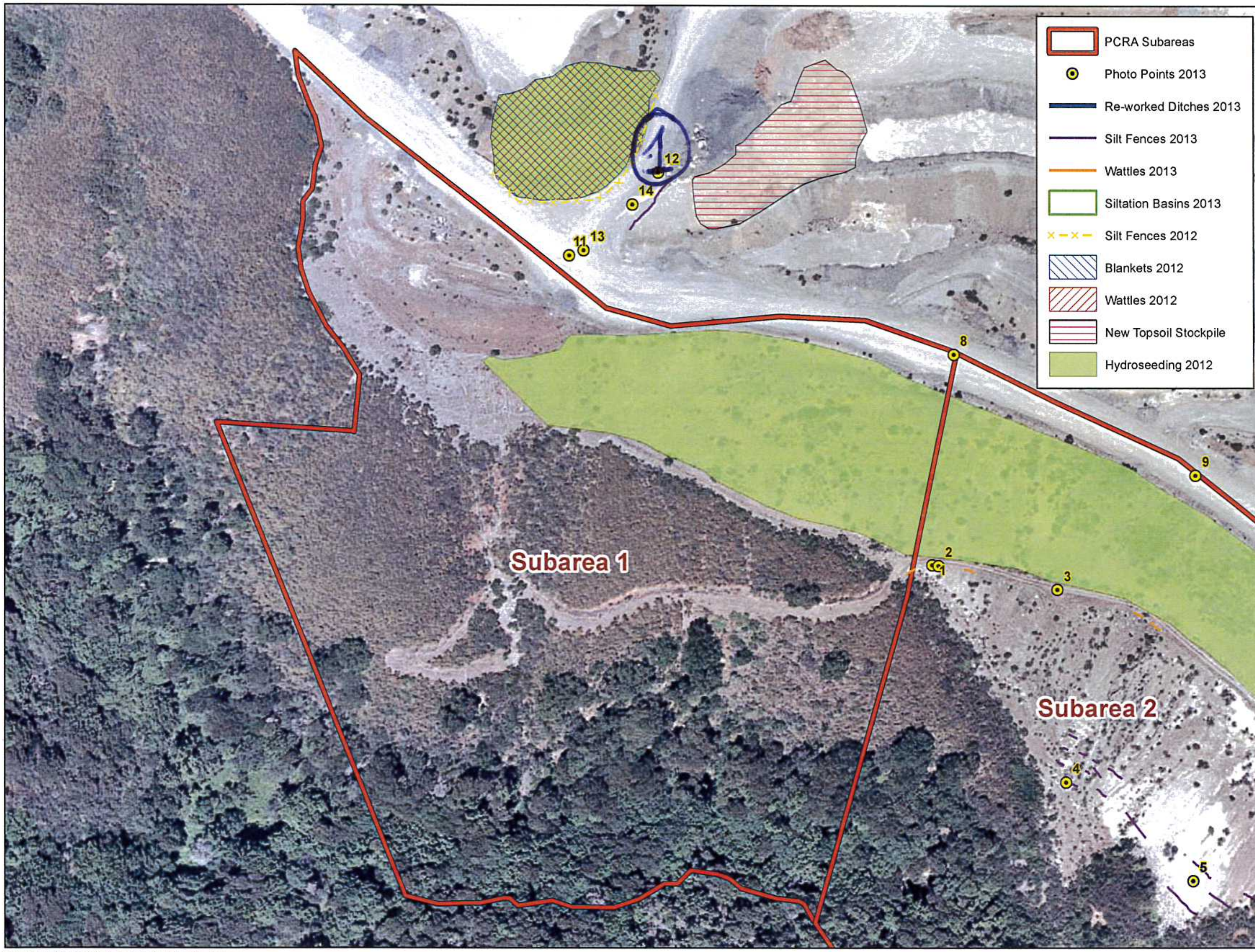


Figure ~~1a.~~ 2.

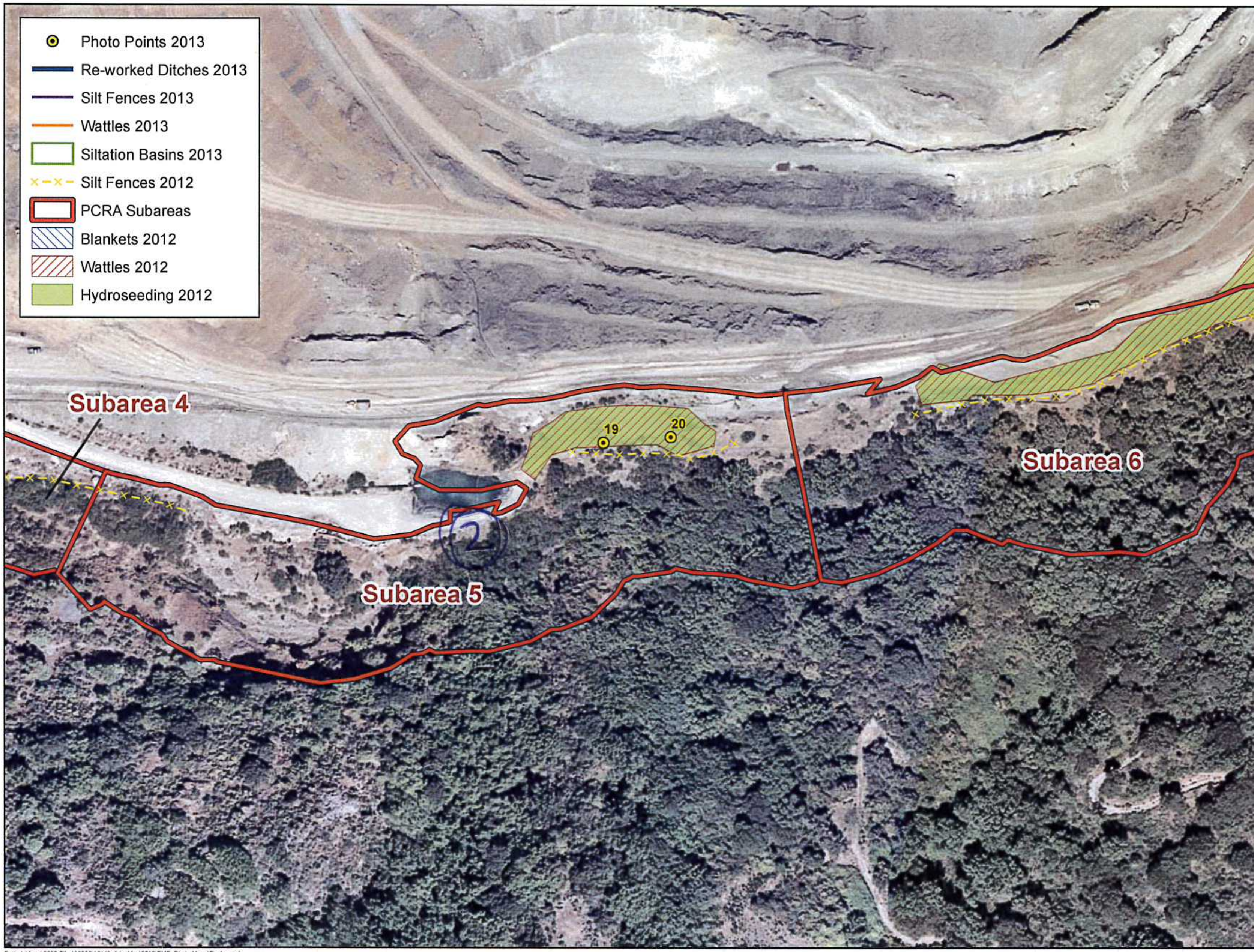
PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1a.mxd



WRA
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure ~~1e~~ 3.

PCRA Erosion Control Installation Areas and Picture Points

N
W E
S

0 50 100 200 Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1e.mxd

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 4b

PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 4b.mxd

Memorandum

To: Greg Knapp, Lehigh Hanson
Cc:

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: August 29, 2014
Subject: Permanente Quarry – July 2014 Erosion Control Inspection

Per COA 78 of the Final Conditions of Approval, the Mine Operator shall:

> "…regularly inspect all stormwater and erosion controls, especially before and following qualifying rain events. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately."
>
> "Ensure that all stormwater, erosion, and sediment control BMPs are installed, inspected, maintained, and repaired under the direction of either a California certified engineer, geologist, or landscape architect, a registered professional hydrologist, or a certified erosion control specialist."

WRA has been actively managing the inspections of stormwater, erosion, and sediment control BMPs in the RPA. WRA regularly reports on the inspections of the various BMP's to include:

- Check dams on the haul roads
- Erosion control blankets, straw wattles, and silt fence installations within the PCRA treatment areas.
- Berms where stockpiles are placed

On July 31, 2014, Scott Yarger, WRA biologist, inspected the site for erosion control deficiencies. Deficiencies were recorded on the Erosion Controls Checklist (Appendix A) and Maps 1-4 (Appendix B).

This inspection occurred during the dry season, and there were no qualifying rain events prior to the inspection. Areas inspected include the PCRA Subareas up to Pond 13, EMSA areas of the Cement Plant, outside of the RPA. The Quarry Pit, WMSA, and PCRA areas upstream of Pond 13 were inaccessible on the day of inspection due to blasting in the Quarry Pit. WRA will return to assess those areas as soon as possible. In addition to the RPA area, BMPs in the Cement Plant area, outside of the RPA area, were inspected.

Most erosion controls were intact and did not need repair at the time of inspection. The deficiencies noted during the July 31 inspection are described below.

A new topsoil stockpile of non-limestone Santa Clara formation, to be used in reclamation activities, was formed in the EMSA. The stockpile was unprotected for approximately one week

as it was being formed. Quarry staff notified WRA to the existence of the new stockpile immediately. The stockpile was assessed by WRA on the date of inspection, and was determined to need straw wattles at the base of the pile on the upgradient side to prevent run-on and silt fencing at the downgradient perimeter to prevent run-off.

In the lower EMSA, the Pond 30 outfall area had been eroded during the rainy season. The outfall pipe was determined to need non-limestone boulders surrounding the pipe outfall to prevent erosion.

Outside of the RPA area, the Dinky Shed sedimentation basin and the Canyon Rd. checkdams were full of sediment and in need of cleaning out.

All deficiencies noted during the inspection have been addressed and fixed by WRA contractor, Ecological Concerns Inc., or Quarry staff.

If you have any questions regarding this inspection or the actions that should be taken, please do not hesitate to contact me or other WRA staff at your convenience.

APPENDIX A

EROSION CONTROLS CHECKLIST

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Permanente Quarry Erosion Controls Checklist

Per COA 78, inspections of BMPs should be conducted before and following qualifying rain events to ensure their integrity. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately.

This checklist should be used to inspect the BMPs installed through the PCRA areas as listed in the RPA and will serve as documentation for reporting purposes. Photo documentation should accompany both sufficient and deficient BMPs.

For erosion control measures (BMP's) installed in the PCRA, a map is produced on an annual basis at the end the fall season and may be used to determine the locations of the various BMP installations. This map can be marked up in the field with identification numbers that reflect the deficiencies.

Inspection Information				
Date and Time of Inspection: 7/31/14 08:00			Date Report Written: 8/29/14	
Area Inspected (PCRA Subarea, WMSA, EMSA, Rock Plant, etc.): PCRA Subareas up to Pond 13, EMSA, Rock Plant, Non-RPA area				
Inspection Type: (Circle one)	Monthly	Pre-Storm	During Rain Event	Post-Storm

Inspector/Reviewer Information	
Inspector Name: Scott Yarger	Inspector Title: Biologist
Inspector Signature: [signature]	Date: 8/29/14
Reviewer Name: Megan Stromberg	Reviewer Title: QSD
Reviewer Signature: [signature]	Date: 8/29/14

Weather	
Estimate storm beginning: (date and time) N/A	Estimate storm duration: (hours) N/A
Estimate time since last storm: (days or hours) N/A	Rain gauge reading and location for last storm (in): N/A
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain in 24 hours)? (Y/N) N/A If yes, summarize forecast:	

Silt Fencing

No	Yes	
☑	☐	Are any sections of the silt fence split, torn, slumping or undercut?
		Deficiency number(s): ______ ______ ______ ______ ______ ______ ______
☑	☐	Do any sections of the silt fence have weathered fabric?
		Deficiency number(s): ______ ______ ______ ______ ______ ______ ______
☑	☐	Do any sections of the silt fence have sediment accumulation which reaches one-third of the barrier height?
		Deficiency number(s): ______ ______ ______ ______ ______ ______ ______
☑	☐	Are areas upgradient of the silt fence permanently stabilized?
		Deficiency number(s): ______ ______ ______ ______ ______ ______ ______
☐	☑	Are there any other areas in need of silt fencing?
		Deficiency number(s): 4 ______ ______ ______ ______ ______ ______

Geotextiles and Mats

☑	☐	Is erosion or scouring evident around or under matting?
		Deficiency number(s): ______ ______ ______ ______ ______ ______ ______
☑	☐	Do any areas of the installed blankets have washouts or breakage or are otherwise damaged?
		Deficiency number(s): ______ ______ ______ ______ ______ ______ ______
☐	☑	Are blankets uniformly in contact with the soil areas?
		Deficiency number(s): ______ ______ ______ ______ ______ ______ ______
☐	☑	Are blanket lap joints secure where they exist?
		Deficiency number(s): ______ ______ ______ ______ ______ ______ ______
☐	☑	Are blanket staples or pins flush with the ground?
		Deficiency number(s): ______ ______ ______ ______ ______ ______ ______
☑	☐	Are there additional areas that need further installation of erosion control blankets?
		Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Fiber Rolls

No Yes

☒ ☐ Are there any split, torn, unraveling, or slumping fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any washouts or breakages of fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any rills or gullies adjacent to, along, or under fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are any portions of the fiber rolls where sediment has accumulated to one-third the designated sediment storage depth?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Hydromulch and Seeding

☒ ☐ Are hydroseeded areas scoured, disturbed, or otherwise eroding?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Do hydroseeded areas have constant cover?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any other areas require further hydroseeeding?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Other Measures

☒ ☐ Are there any stockpiles that have uncontrolled run-on or run-off?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any breaks in the haul road berm allowing water to run into the PCRA or Permanente Creek Slopes?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are any sediment catchment ponds overflowing?

Deficiency number(s): 1 2 -canyon Rd. checkdams ______ ______ ______ ______

☒ ☐ Are any ditches or water conveyances damaged?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

3 - Pond 30 outfall scoured from rainy season.

BMP Deficiency Descriptions	
Deficiency ID Number	Deficiency Description
1. 1	Dinky shed basin (Not in RPA), nearly full of sediment,
2. 2	Three checkdams on Canyon Rd. (Not in RPA), nearly full of sediment.
3. 3	Pond 30 outfall needs non-limestone boulders to prevent washout, before rainy season,
4. 4	Santa Clara formation (topsoil) stockpile unprotected in EMSA. Needs silt fence downslope
5.	
6.	
7.	
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16.	

APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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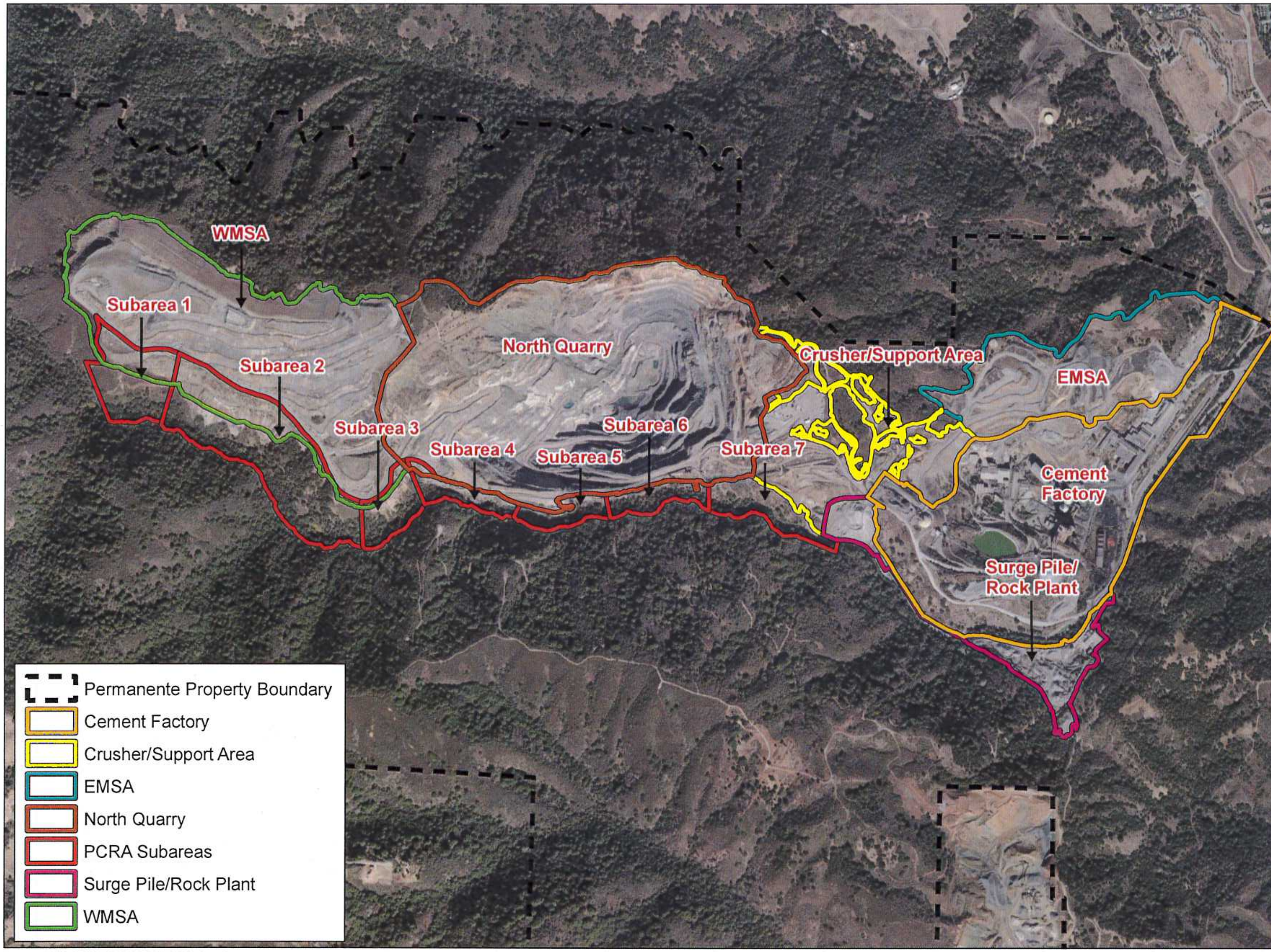

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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Overview

N
W E
S

0 500 1,000 2,000 Feet

Date: August 2013
Map By: Chirs Zumwalt
Aerial: ESRI Streaming 2010

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Overview.mxd

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure ~~4b~~. 1

Surge Pile/Rock Plant

Field Reference Map

PCRA Subareas

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure ~~#~~ 2

Surge Pile/Rock Plant

Field Reference Map

PCRA Subareas

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure ~~2b~~ 3

EMSA

Field Reference Map

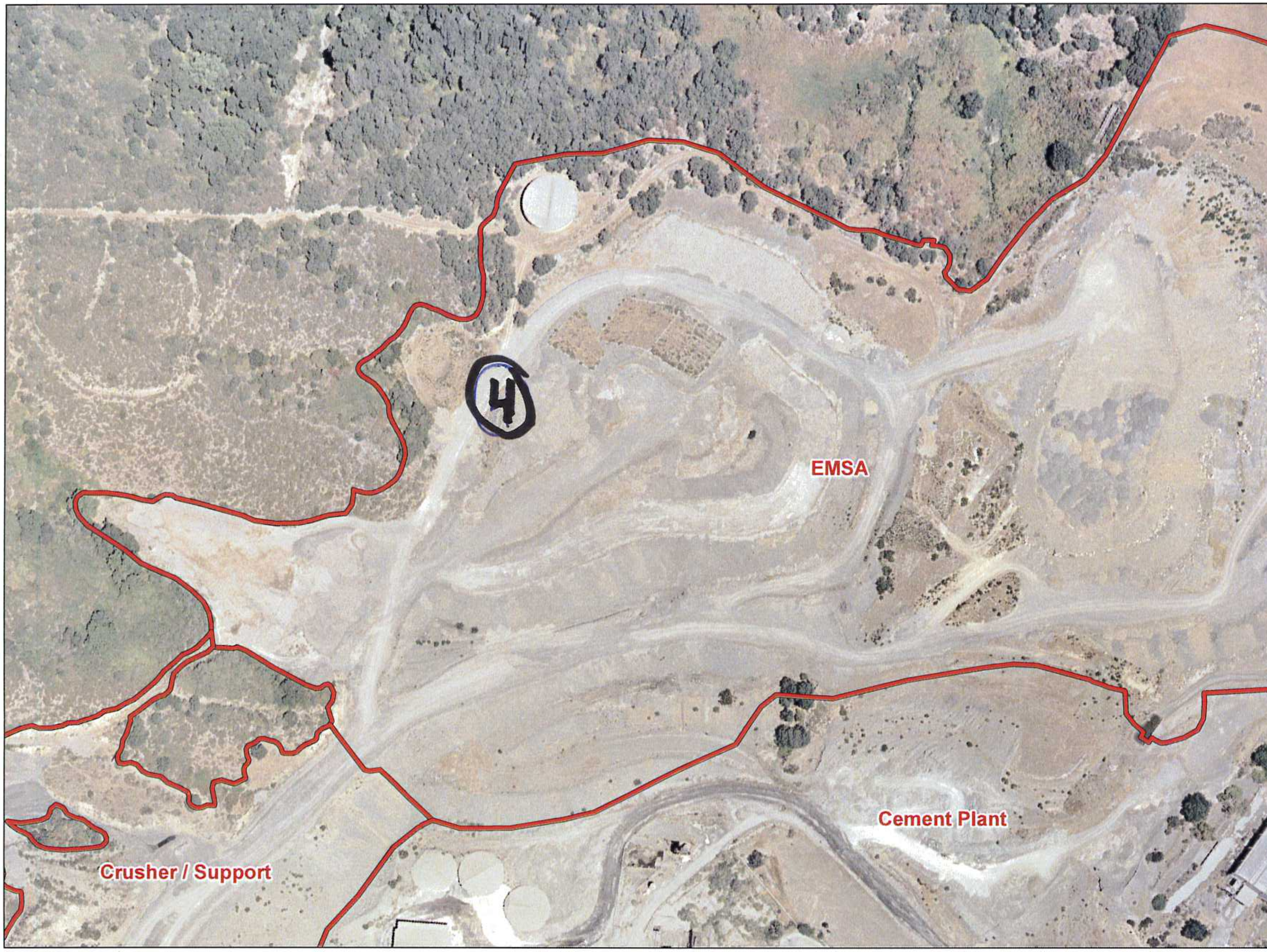
PCRA Subareas

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd



wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 4

EMSA

Field Reference Map

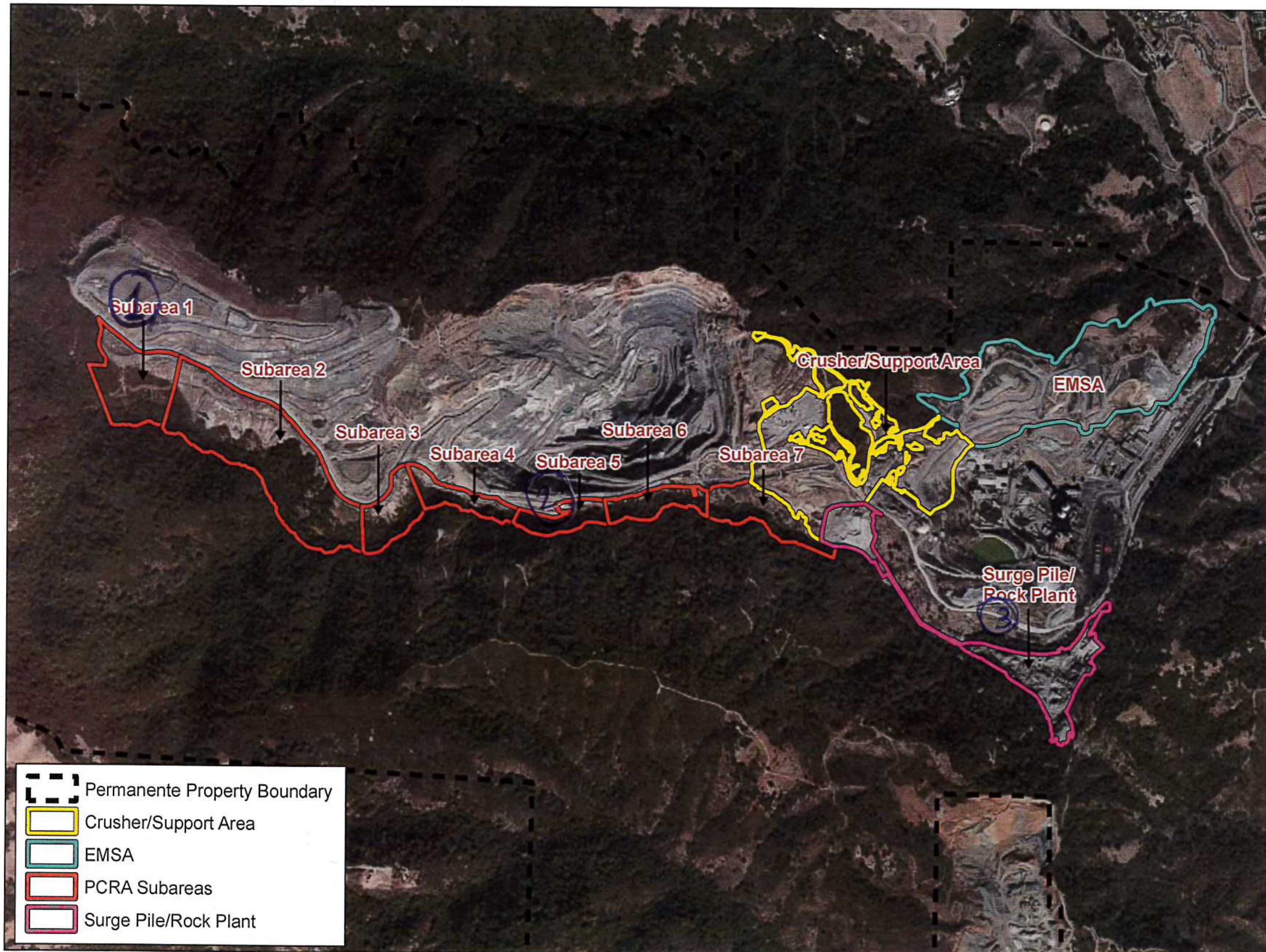
Subareas

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd



Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Overview.mxd

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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

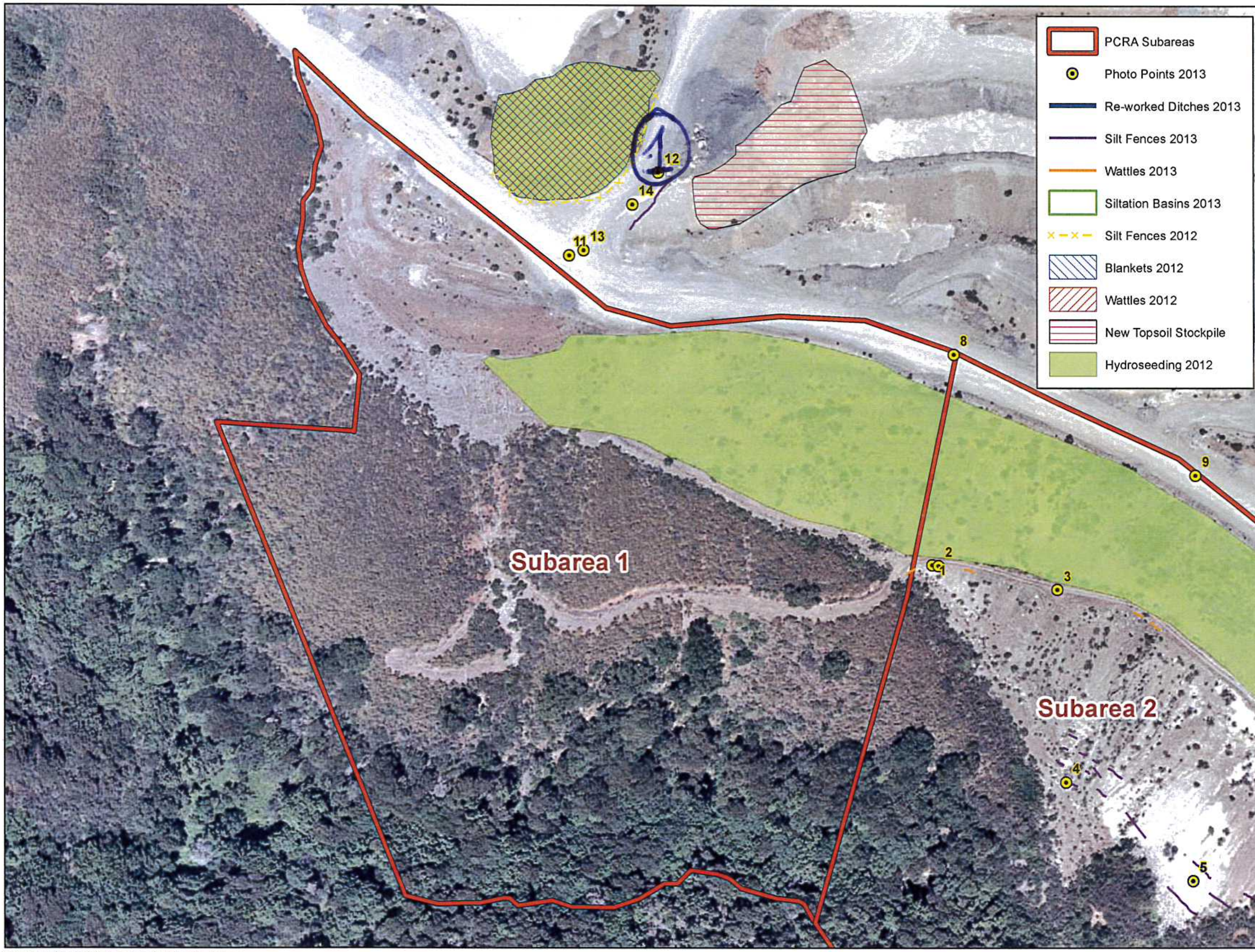
Overview

Fig. 1

N
W E
S

0 500 1,000 2,000
Feet

Date: August 2013
Map By: Chirs Zumwalt
Aerial: ESRI Streaming 2010



ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure ~~1a~~. 2.

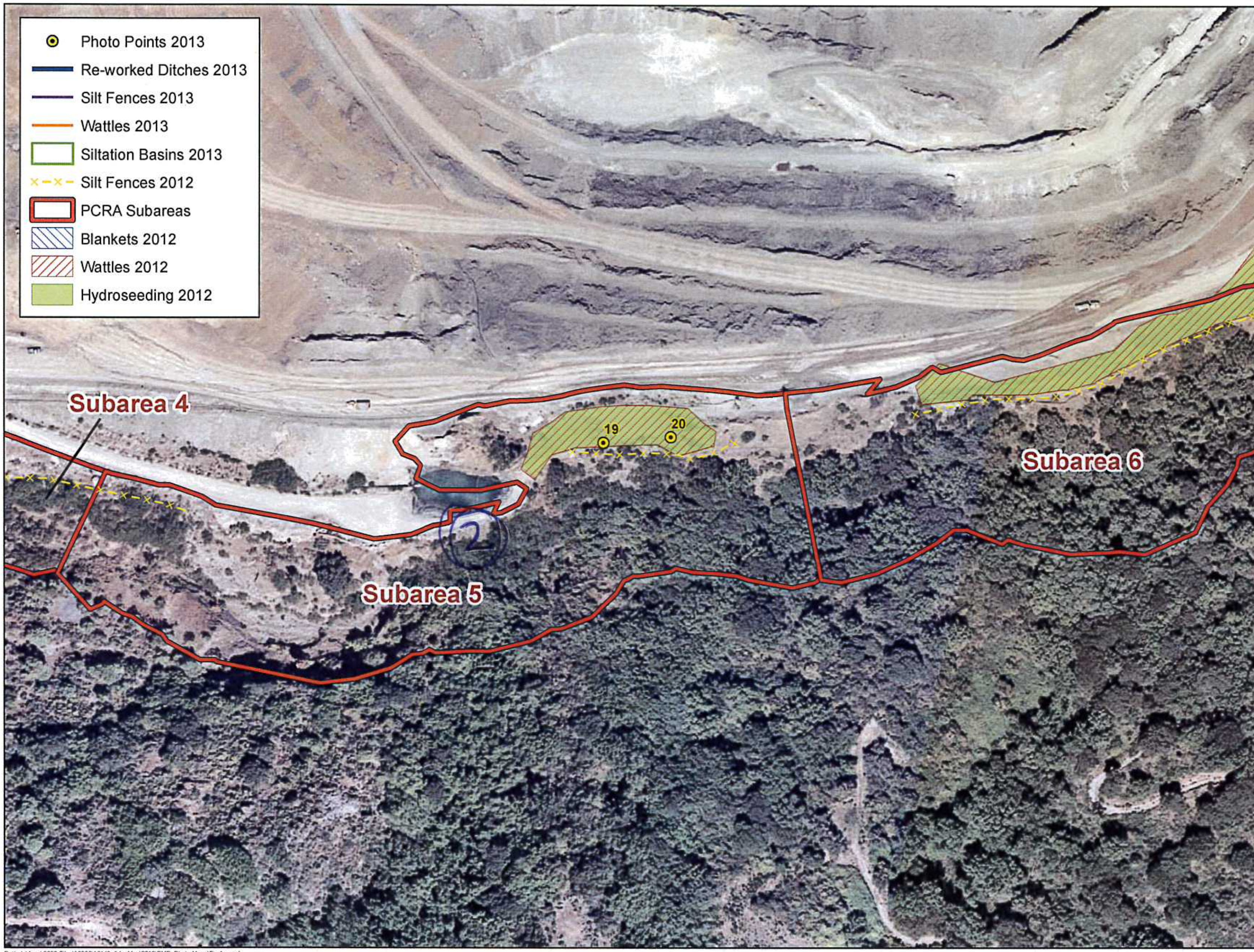
PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1a.mxd



ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure ~~1e~~ 3.

PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1e.mxd

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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 4b

PCRA
Erosion Control
Installation Areas
and Picture Points

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 4b.mxd

Memorandum

To: Greg Knapp, Lehigh Hanson
Cc:

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: August 29, 2014
Subject: Permanente Quarry – July 2014 Erosion Control Inspection

Per COA 78 of the Final Conditions of Approval, the Mine Operator shall:

> "…regularly inspect all stormwater and erosion controls, especially before and following qualifying rain events. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately."
>
> "Ensure that all stormwater, erosion, and sediment control BMPs are installed, inspected, maintained, and repaired under the direction of either a California certified engineer, geologist, or landscape architect, a registered professional hydrologist, or a certified erosion control specialist."

WRA has been actively managing the inspections of stormwater, erosion, and sediment control BMPs in the RPA. WRA regularly reports on the inspections of the various BMP's to include:

- Check dams on the haul roads
- Erosion control blankets, straw wattles, and silt fence installations within the PCRA treatment areas.
- Berms where stockpiles are placed

On July 31, 2014, Scott Yarger, WRA biologist, inspected the site for erosion control deficiencies. Deficiencies were recorded on the Erosion Controls Checklist (Appendix A) and Maps 1-4 (Appendix B).

This inspection occurred during the dry season, and there were no qualifying rain events prior to the inspection. Areas inspected include the PCRA Subareas up to Pond 13, EMSA areas of the Cement Plant, outside of the RPA. The Quarry Pit, WMSA, and PCRA areas upstream of Pond 13 were inaccessible on the day of inspection due to blasting in the Quarry Pit. WRA will return to assess those areas as soon as possible. In addition to the RPA area, BMPs in the Cement Plant area, outside of the RPA area, were inspected.

Most erosion controls were intact and did not need repair at the time of inspection. The deficiencies noted during the July 31 inspection are described below.

A new topsoil stockpile of non-limestone Santa Clara formation, to be used in reclamation activities, was formed in the EMSA. The stockpile was unprotected for approximately one week

as it was being formed. Quarry staff notified WRA to the existence of the new stockpile immediately. The stockpile was assessed by WRA on the date of inspection, and was determined to need straw wattles at the base of the pile on the upgradient side to prevent run-on and silt fencing at the downgradient perimeter to prevent run-off.

In the lower EMSA, the Pond 30 outfall area had been eroded during the rainy season. The outfall pipe was determined to need non-limestone boulders surrounding the pipe outfall to prevent erosion.

Outside of the RPA area, the Dinky Shed sedimentation basin and the Canyon Rd. checkdams were full of sediment and in need of cleaning out.

All deficiencies noted during the inspection have been addressed and fixed by WRA contractor, Ecological Concerns Inc., or Quarry staff.

If you have any questions regarding this inspection or the actions that should be taken, please do not hesitate to contact me or other WRA staff at your convenience.

APPENDIX A

EROSION CONTROLS CHECKLIST

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Permanente Quarry Erosion Controls Checklist

Per COA 78, inspections of BMPs should be conducted before and following qualifying rain events to ensure their integrity. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately.

This checklist should be used to inspect the BMPs installed through the PCRA areas as listed in the RPA and will serve as documentation for reporting purposes. Photo documentation should accompany both sufficient and deficient BMPs.

For erosion control measures (BMP's) installed in the PCRA, a map is produced on an annual basis at the end the fall season and may be used to determine the locations of the various BMP installations. This map can be marked up in the field with identification numbers that reflect the deficiencies.

Inspection Information				
Date and Time of Inspection: 7/31/14 08:00			Date Report Written: 8/29/14	
Area Inspected (PCRA Subarea, WMSA, EMSA, Rock Plant, etc.): PCRA Subareas up to Pond 13, EMSA, Rock Plant, Non-RPA area				
Inspection Type: (Circle one)	Monthly	Pre-Storm	During Rain Event	Post-Storm

Inspector/Reviewer Information	
Inspector Name: Scott Yarger	Inspector Title: Biologist
Inspector Signature: [signature]	Date: 8/29/14
Reviewer Name: Megan Stromberg	Reviewer Title: QSD
Reviewer Signature: [signature]	Date: 8/29/14

Weather	
Estimate storm beginning: (date and time) N/A	Estimate storm duration: (hours) N/A
Estimate time since last storm: (days or hours) N/A	Rain gauge reading and location for last storm (in): N/A
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain in 24 hours)? (Y/N) N/A If yes, summarize forecast:	

Silt Fencing

No Yes

☒ ☐ Are any sections of the silt fence split, torn, slumping or undercut?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any sections of the silt fence have weathered fabric?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any sections of the silt fence have sediment accumulation which reaches one-third of the barrier height?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are areas upgradient of the silt fence permanently stabilized?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are there any other areas in need of silt fencing?

Deficiency number(s): 4 ______ ______ ______ ______ ______ ______

Geotextiles and Mats

☒ ☐ Is erosion or scouring evident around or under matting?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any areas of the installed blankets have washouts or breakage or are otherwise damaged?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are blankets uniformly in contact with the soil areas?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are blanket lap joints secure where they exist?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are blanket staples or pins flush with the ground?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there additional areas that need further installation of erosion control blankets?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Fiber Rolls

No Yes

☒ ☐ Are there any split, torn, unraveling, or slumping fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any washouts or breakages of fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any rills or gullies adjacent to, along, or under fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are any portions of the fiber rolls where sediment has accumulated to one-third the designated sediment storage depth?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Hydromulch and Seeding

☒ ☐ Are hydroseeded areas scoured, disturbed, or otherwise eroding?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Do hydroseeded areas have constant cover?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any other areas require further hydroseeeding?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Other Measures

☒ ☐ Are there any stockpiles that have uncontrolled run-on or run-off?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any breaks in the haul road berm allowing water to run into the PCRA or Permanente Creek Slopes?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are any sediment catchment ponds overflowing?

Deficiency number(s): 1 2 -canyon Rd. checkdams

☒ ☐ Are any ditches or water conveyances damaged?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

3 - Pond 30 outfall scoured from rainy season.

BMP Deficiency Descriptions	
Deficiency ID Number	Deficiency Description
1. 1	Dinky shed basin (Not in RPA), nearly full of sediment.
2. 2	Three checkdams on Canyon Rd. (Not in RPA), nearly full of sediment.
3. 3	Pond 30 outfall needs non-limestone boulders to prevent washout, before rainy season.
4. 4	Santa Clara formation (topsoil) stockpile unprotected in EMSA. Needs silt fence downslope
5.	
6.	
7.	
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15.	
16.	

APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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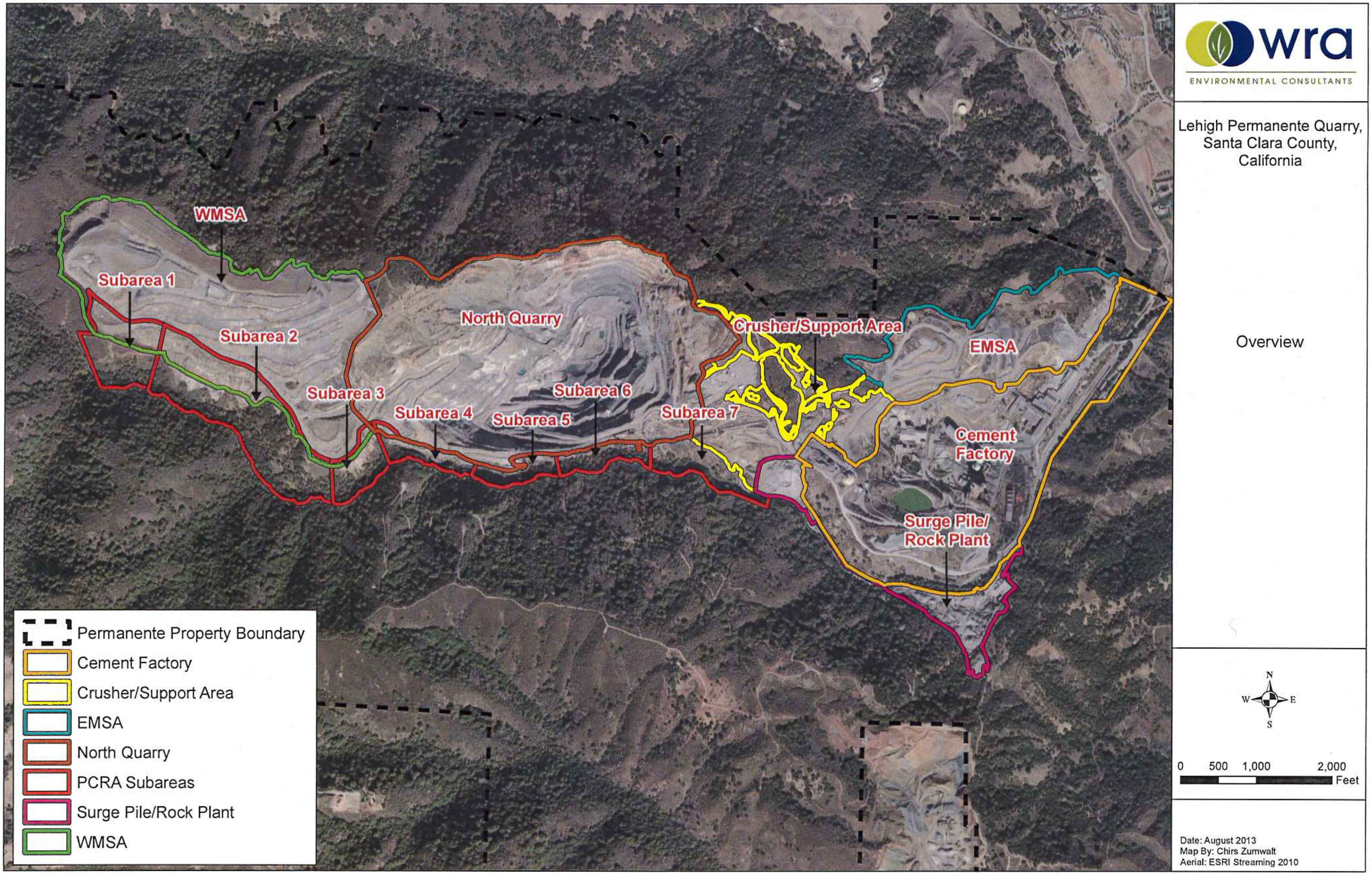

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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure ~~4b~~. 1

Surge Pile/Rock Plant

Field Reference Map

PCRA Subareas

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd

ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 2

Surge Pile/Rock Plant

Field Reference Map

PCRA Subareas

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd

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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure ~~2b~~ 3

EMSA

Field Reference Map

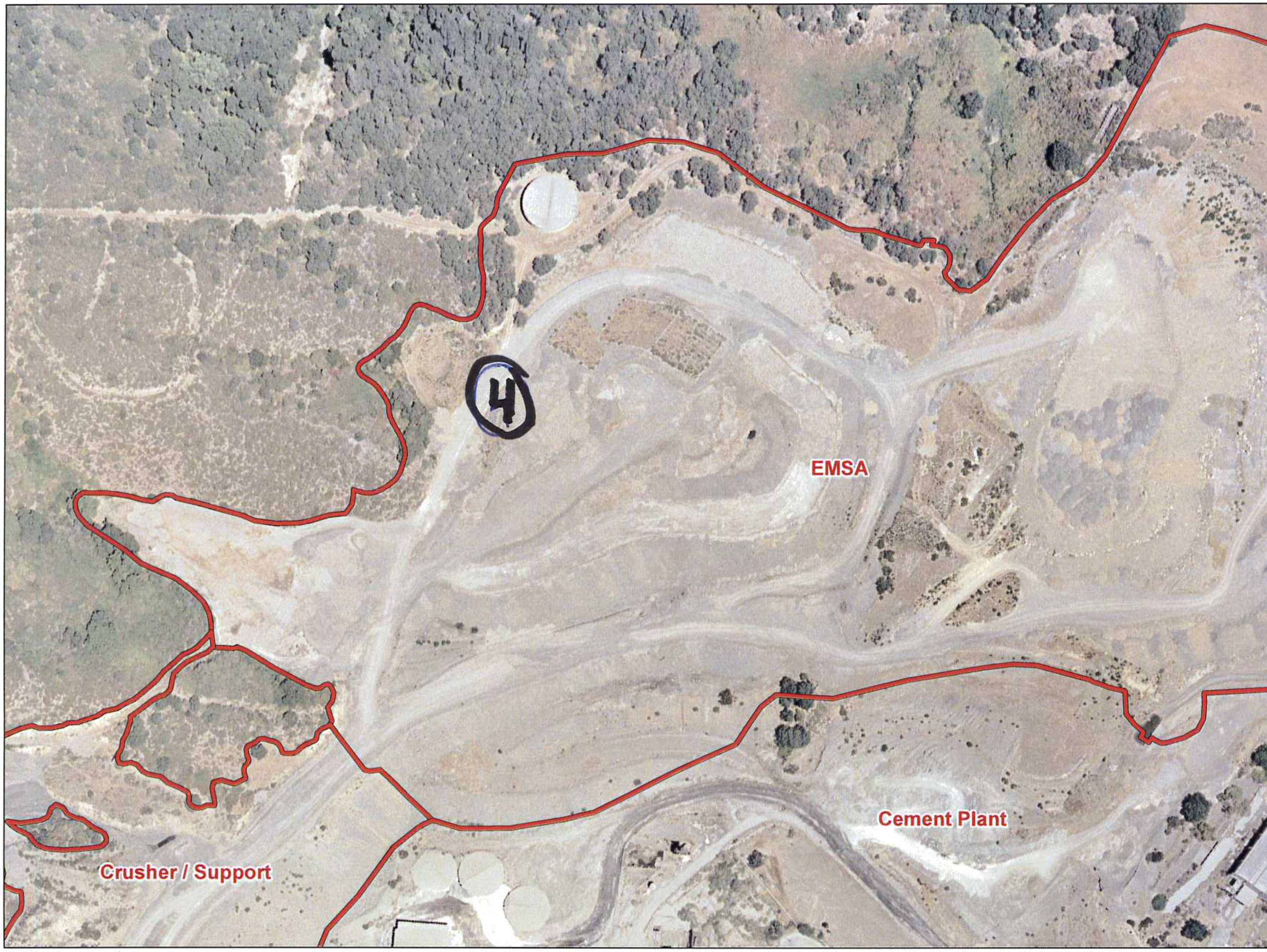
PCRA Subareas

N
W
E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd



ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 4

EMSA

Field Reference Map

Subareas

N
W E
S

0 50 100 200 Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd

APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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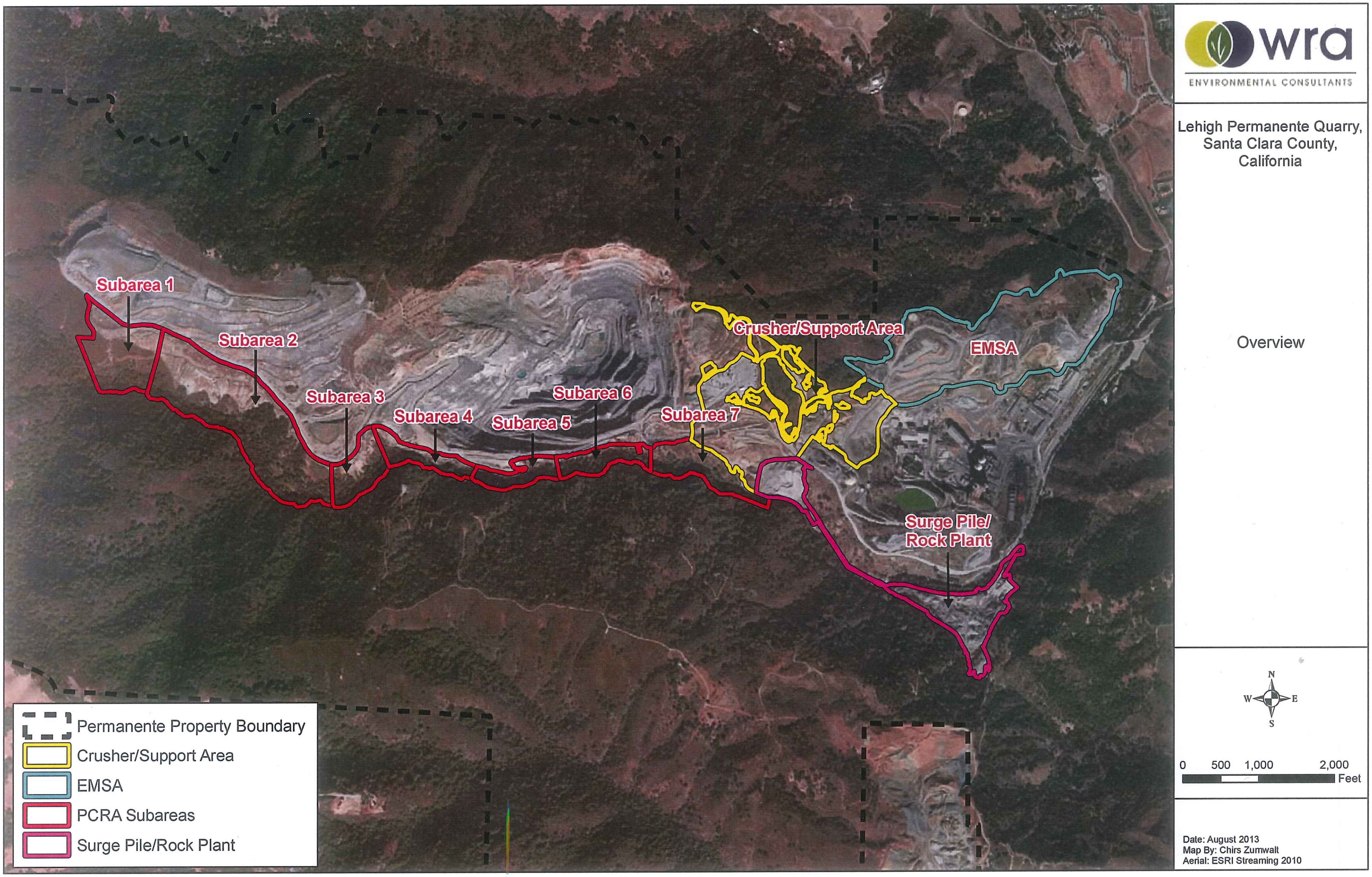

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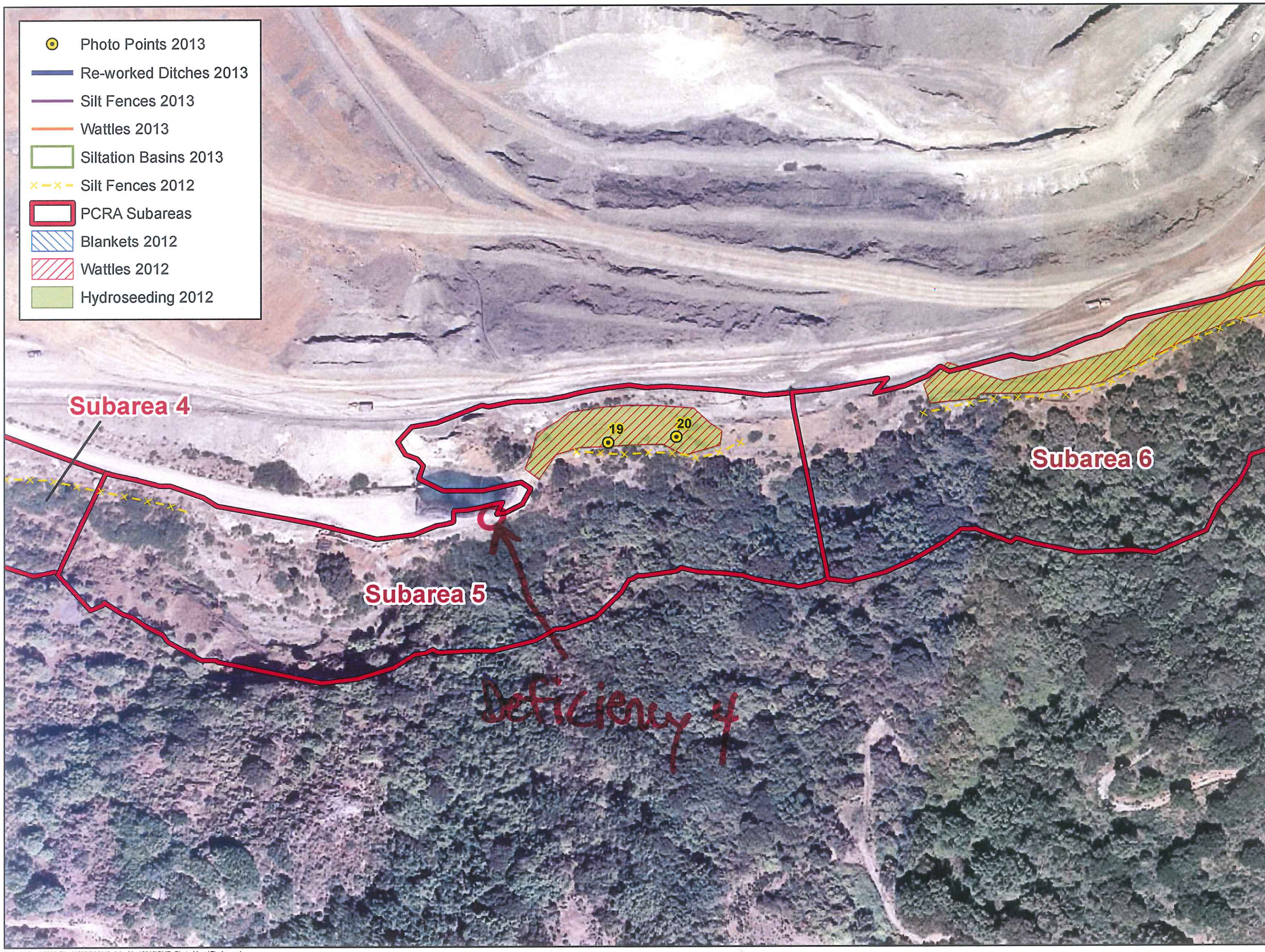


Lehigh Permanente Quarry, Santa Clara County, California

Figure 1e.

PCRA
Erosion Control
Installation Areas
and Picture Points

N
W
E
S

0 50 100 200
Feet

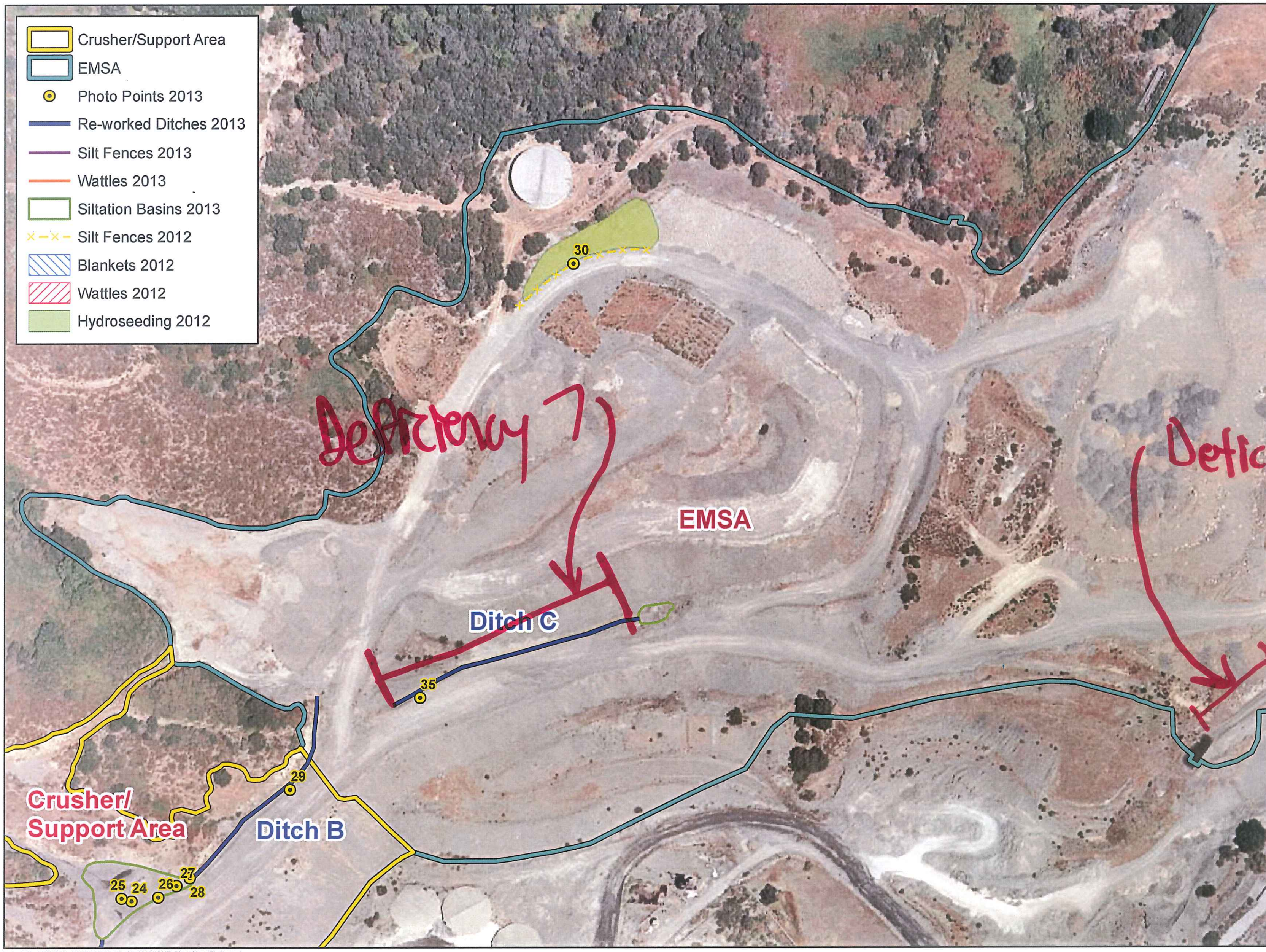
Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1e.mxd

Deficiency 2

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 2a.mxd

Deficiency 6



ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 3a.

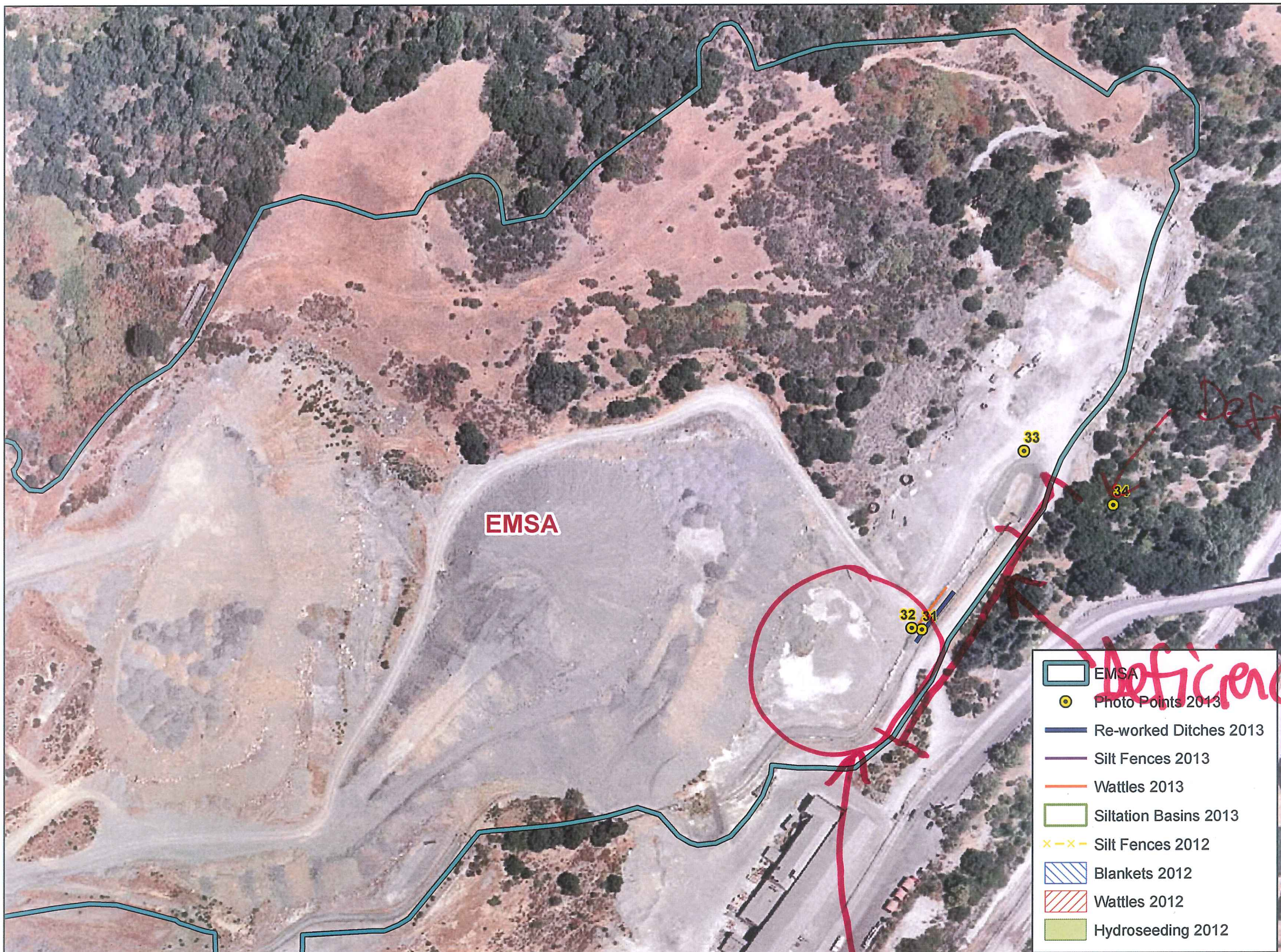
PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 3a.mxd



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Lehigh Permanente Quarry, Santa Clara County, California

Figure 3b.

PCRA Erosion Control Installation Areas and Picture Points

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 3b.mxd

Figure 5

Permanente Rd
Deficiency 3
© 2014 Google
Google earth
1948
Imagery Date: 4/15/2013 37°19'04.15" N 122°05'16.68" W elev 535 ft eye alt 1007 ft

APPENDIX C

PHOTOGRAPHIC EVIDENCE

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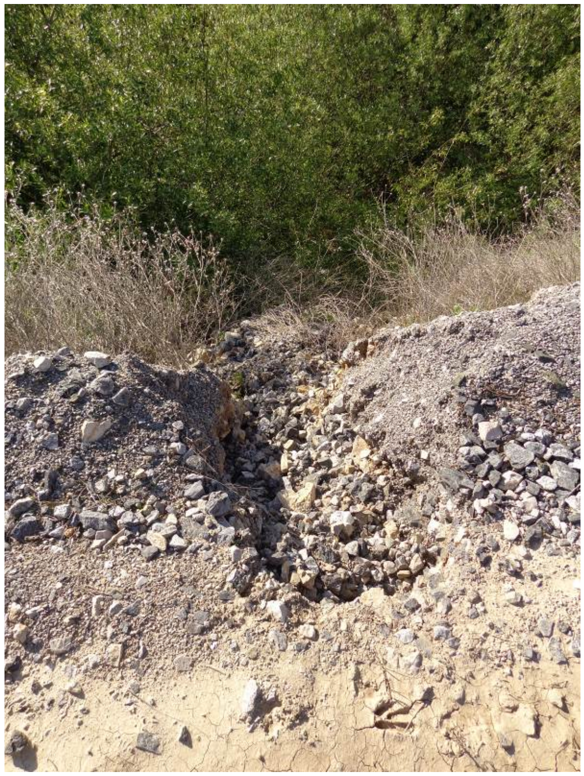
Above: Photo 1; deficiency 2. Erosional rivulet on slope immediately below Quarry Office. Map 2a.

Below: Photo 2; deficiency 3. Channel filling with sediment and sediment entering railroad tracks. Map 5.

Photographs taken April 7, 2014.

wra

ENVIRONMENTAL CONSULTANTS



Above: Photo 3; deficiency 4. Breached berm above Pond 4 outfall. Map 1e.

Below: Photo 4; deficiency 5. Slumped fiber roll on slope below new crusher. Map 2a.

Photographs taken April 7, 2014.

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ENVIRONMENTAL CONSULTANTS

Above: Photo 5; deficiency 6. Water ponding on access road north of Pond 13. Map 2a.

Below: Photo 6; deficiency 7. Limestone-containing sediment has entered non-limestone-lined channel. Map 3a.

Photographs taken April 7, 2014.

wra ENVIRONMENTAL CONSULTANTS

Above: Photo 7; deficiency 7. Limestone-containing sediment has entered non-limestone-lined channel. Map 3a.

Below: Photo 8; deficiency 8. Scouring below Pond 30 outfall. Map 3b.

Photographs taken April 7, 2014.

Memorandum

To: Greg Knapp, Lehigh Hanson
Cc:

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: August 28, 2014
Subject: Permanente Quarry – June 2014 Erosion Control Inspection

Per COA 78 of the Final Conditions of Approval, the Mine Operator shall:

> "…regularly inspect all stormwater and erosion controls, especially before and following qualifying rain events. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately."
>
> "Ensure that all stormwater, erosion, and sediment control BMPs are installed, inspected, maintained, and repaired under the direction of either a California certified engineer, geologist, or landscape architect, a registered professional hydrologist, or a certified erosion control specialist."

WRA has been actively managing the inspections of stormwater, erosion, and sediment control BMPs in the RPA. WRA regularly reports on the inspections of the various BMP's to include:

- Check dams on the haul roads
- Erosion control blankets, straw wattles, and silt fence installations within the PCRA treatment areas.
- Berms where stockpiles are placed

On June 24, 2014, Scott Yarger, WRA biologist, inspected the site for erosion control deficiencies. Deficiencies were recorded on the Erosion Controls Checklist (Appendix A) and Maps 1-4 (Appendix B).

This inspection occurred during the dry season, and there were no qualifying rain events prior to the inspection. Areas inspected include the PCRA Subareas, WMSA and the lower EMSA. A significant portion of the EMSA was inaccessible on the day of inspection due to heavy machinery traffic. WRA will return to assess the area as soon as possible.

Most erosion controls were intact and did not need repair at the time of inspection. The deficiencies noted during the June 24, 2014 inspection are described below.

In the WMSA, the silt fencing around the western topsoil stockpile was not buried in places and portions of the fence fabric were slumping. At Pond 4a, the silt fence at the perimeter of the selenium treatment plant construction activity was knocked over in places and in need of repair. Outside of the RPA, checkdams along the canyon road, were filled with sediment and needed cleaning.

All deficiencies noted during the inspection have been addressed and fixed by WRA contractor, Ecological Concerns Inc., or Quarry staff.

If you have any questions regarding this inspection or the actions that should be taken, please do not hesitate to contact me or other WRA staff at your convenience.

APPENDIX A

EROSION CONTROLS CHECKLIST

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Permanente Quarry Erosion Controls Checklist

Per COA 78, inspections of BMPs should be conducted before and following qualifying rain events to ensure their integrity. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately.

This checklist should be used to inspect the BMPs installed through the PCRA areas as listed in the RPA and will serve as documentation for reporting purposes. Photo documentation should accompany both sufficient and deficient BMPs.

For erosion control measures (BMP's) installed in the PCRA, a map is produced on an annual basis at the end the fall season and may be used to determine the locations of the various BMP installations. This map can be marked up in the field with identification numbers that reflect the deficiencies.

Inspection Information				
Date and Time of Inspection: 6/24/14 8:00 AM		Date Report Written: 6/25/14		
Area Inspected (PCRA Subarea, WMSA, EMSA, Rock Plant, etc.): PCRA subareas, WMSA, lower EMSA				
Inspection Type: (Circle one)	Monthly	Pre-Storm	During Rain Event	Post-Storm

Inspector/Reviewer Information	
Inspector Name: Scott Yarger	Inspector Title: Biologist
Inspector Signature:	Date: 6/25/14
Reviewer Name: Megan Stromberg	Reviewer Title: QSD
Reviewer Signature:	Date: 8/29/14

Weather	
Estimate storm beginning: (date and time) N/A	Estimate storm duration: (hours) N/A
Estimate time since last storm: (days or hours) N/A	Rain gauge reading and location for last storm (in): N/A
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain in 24 hours)? (Y/N) If yes, summarize forecast:	

Silt Fencing

No Yes

☐ ☑ Are any sections of the silt fence split, torn, slumping or undercut?

Deficiency number(s): 1 ______ ______ ______ ______ ______ ______

☐ ☑ Do any sections of the silt fence have weathered fabric?

Deficiency number(s): 1 ______ ______ ______ ______ ______ ______

☐ ☑ Do any sections of the silt fence have sediment accumulation which reaches one-third of the barrier height?

Deficiency number(s): 2 3 ______ ______ ______ ______ ______

☐ ☐ Are areas upgradient of the silt fence permanently stabilized?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any other areas in need of silt fencing?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Geotextiles and Mats

☐ ☑ Is erosion or scouring evident around or under matting?

Deficiency number(s): 1 ______ ______ ______ ______ ______ ______

☐ ☑ Do any areas of the installed blankets have washouts or breakage or are otherwise damaged?

Deficiency number(s): 1 ______ ______ ______ ______ ______ ______

☐ ☐ Are blankets uniformly in contact with the soil areas?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are blanket lap joints secure where they exist?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are blanket staples or pins flush with the ground?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there additional areas that need further installation of erosion control blankets?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Fiber Rolls

No Yes

☐ ☐ Are there any split, torn, unraveling, or slumping fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any washouts or breakages of fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any rills or gullies adjacent to, along, or under fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any portions of the fiber rolls where sediment has accumulated to one-third the designated sediment storage depth?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Hydromulch and Seeding

☐ ☑ Are hydroseeded areas scoured, disturbed, or otherwise eroding?

Deficiency number(s): __1__ ______ ______ ______ ______ ______ ______

☐ ☐ Do hydroseeded areas have constant cover?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Do any other areas require further hydroseeeding?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Other Measures

☐ ☐ Are there any stockpiles that have uncontrolled run-on or run-off?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are there any breaks in the haul road berm allowing water to run into the PCRA or Permanente Creek Slopes?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any sediment catchment ponds overflowing?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☐ Are any ditches or water conveyances damaged?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

BMP Deficiency Descriptions	
Deficiency ID Number	Deficiency Description
1.	Silt fencing is torn and not buried in areas around top soil stockpile. Blankets are torn and erosion occuring. Area could possibly benefit from re-hydroseed.
2.	Silt fence between pond 4A & creek buried more than 1/3 and knocked over in places due to recent berm building.
3.	BMPs & checkdams filled with sediment. need to be dugout & cleaned up. Silt fence buried. Sean emailed Reza re: this 6/23/14
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APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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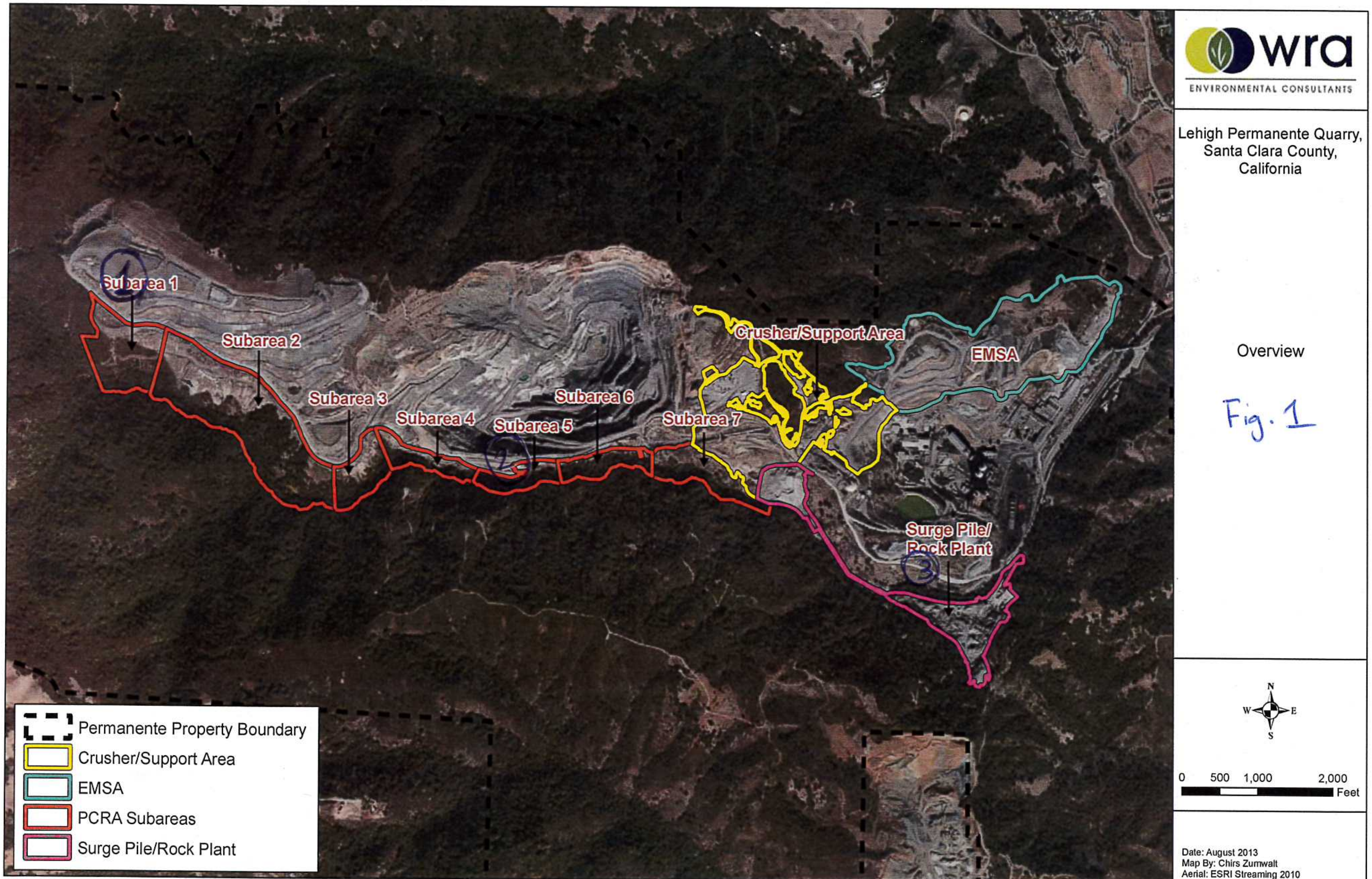

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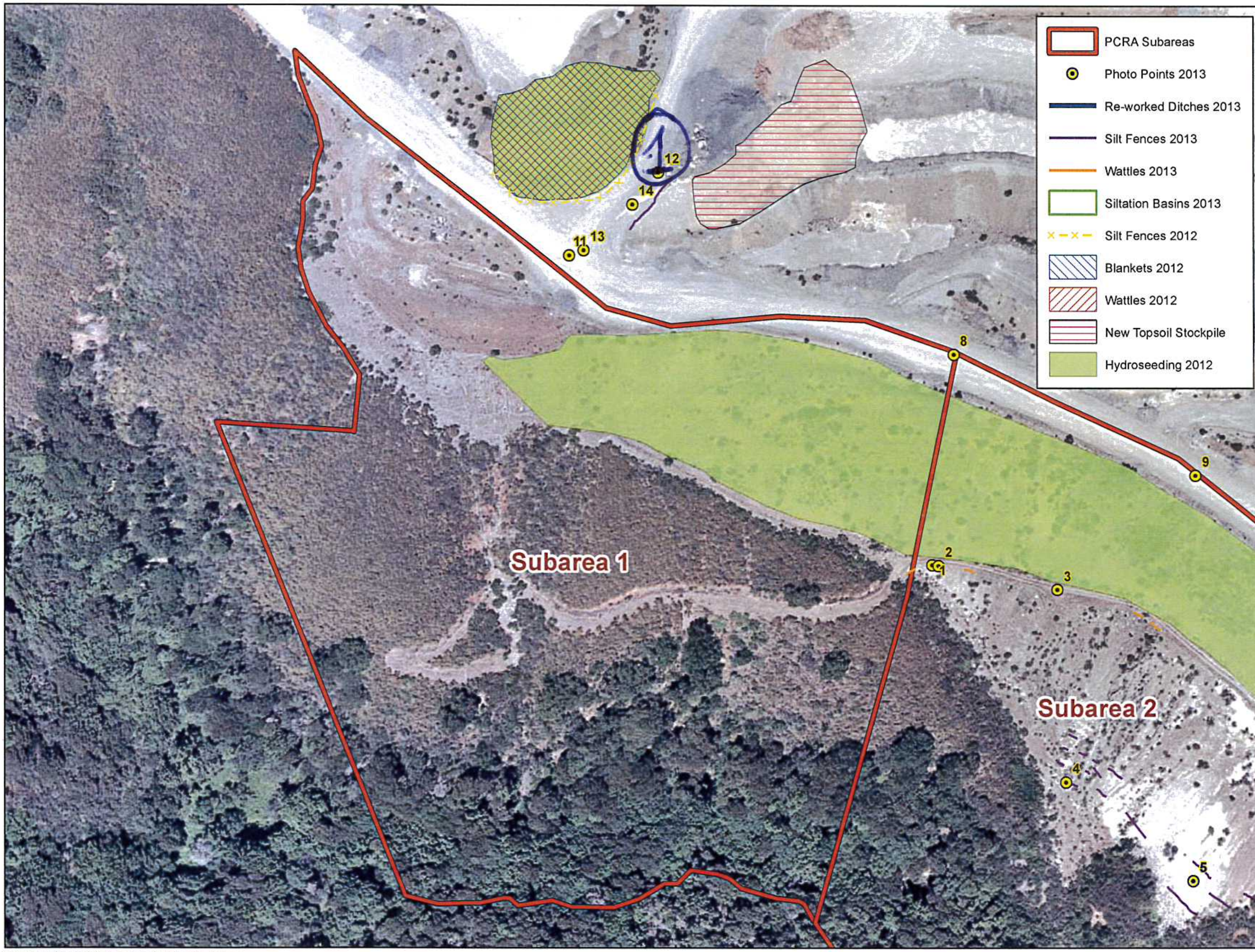

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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry,
Santa Clara County,
California

Figure ~~1a~~. 2.

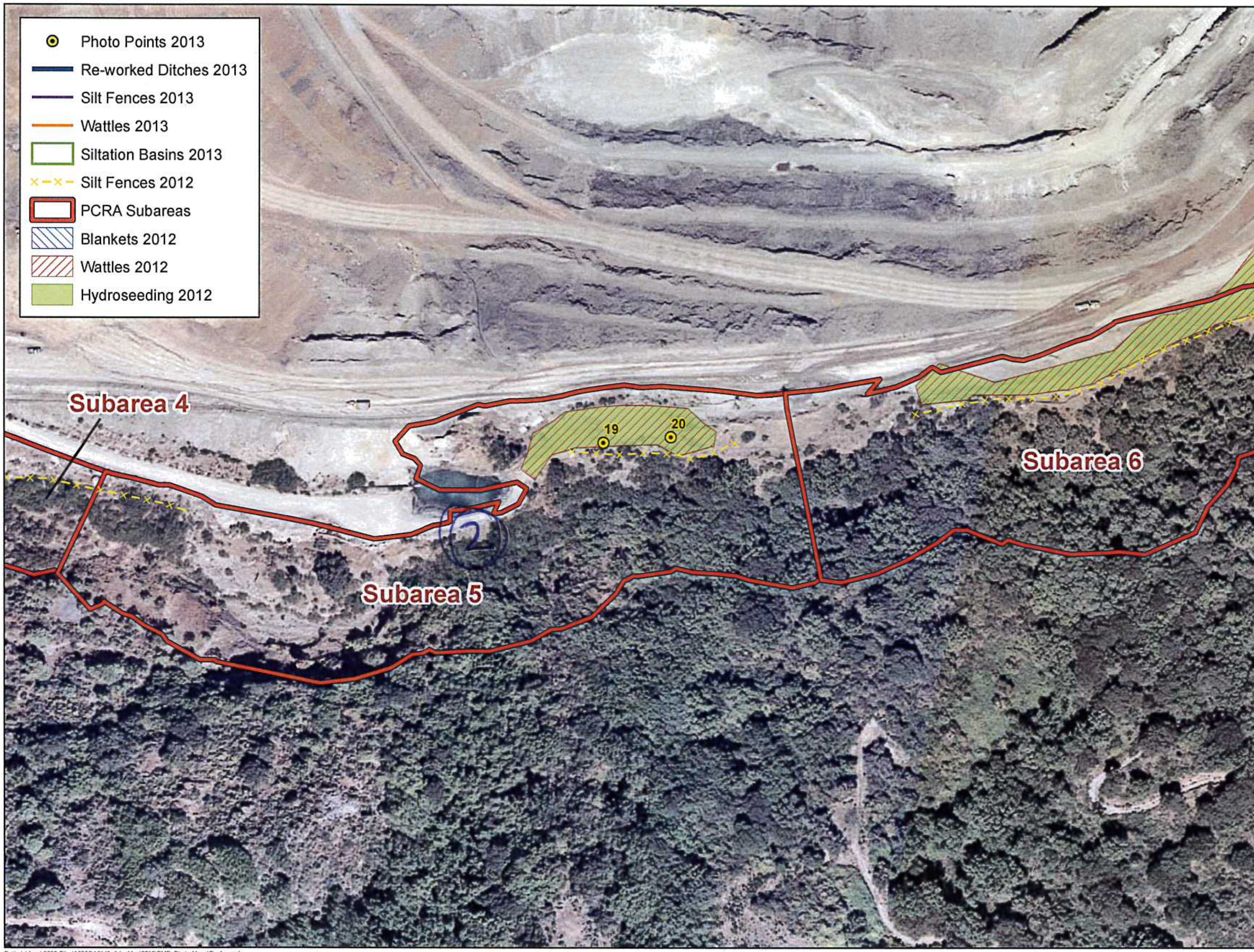
PCRA
Erosion Control
Installation Areas
and Picture Points

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1a.mxd



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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure ~~1e~~. 3.

PCRA
Erosion Control
Installation Areas
and Picture Points

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 1e.mxd

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Lehigh Permanente Quarry, Santa Clara County, California

Figure 4b

PCRA
Erosion Control
Installation Areas
and Picture Points

Date: August 2013
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2013\BMP_Photo Maps\Fig 4b.mxd

Memorandum

To: Greg Knapp, Lehigh Hanson
Cc:

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: August 29, 2014
Subject: Permanente Quarry – July 2014 Erosion Control Inspection

Per COA 78 of the Final Conditions of Approval, the Mine Operator shall:

> "…regularly inspect all stormwater and erosion controls, especially before and following qualifying rain events. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately."
>
> "Ensure that all stormwater, erosion, and sediment control BMPs are installed, inspected, maintained, and repaired under the direction of either a California certified engineer, geologist, or landscape architect, a registered professional hydrologist, or a certified erosion control specialist."

WRA has been actively managing the inspections of stormwater, erosion, and sediment control BMPs in the RPA. WRA regularly reports on the inspections of the various BMP's to include:

- Check dams on the haul roads
- Erosion control blankets, straw wattles, and silt fence installations within the PCRA treatment areas.
- Berms where stockpiles are placed

On July 31, 2014, Scott Yarger, WRA biologist, inspected the site for erosion control deficiencies. Deficiencies were recorded on the Erosion Controls Checklist (Appendix A) and Maps 1-4 (Appendix B).

This inspection occurred during the dry season, and there were no qualifying rain events prior to the inspection. Areas inspected include the PCRA Subareas up to Pond 13, EMSA areas of the Cement Plant, outside of the RPA. The Quarry Pit, WMSA, and PCRA areas upstream of Pond 13 were inaccessible on the day of inspection due to blasting in the Quarry Pit. WRA will return to assess those areas as soon as possible. In addition to the RPA area, BMPs in the Cement Plant area, outside of the RPA area, were inspected.

Most erosion controls were intact and did not need repair at the time of inspection. The deficiencies noted during the July 31 inspection are described below.

A new topsoil stockpile of non-limestone Santa Clara formation, to be used in reclamation activities, was formed in the EMSA. The stockpile was unprotected for approximately one week

as it was being formed. Quarry staff notified WRA to the existence of the new stockpile immediately. The stockpile was assessed by WRA on the date of inspection, and was determined to need straw wattles at the base of the pile on the upgradient side to prevent run-on and silt fencing at the downgradient perimeter to prevent run-off.

In the lower EMSA, the Pond 30 outfall area had been eroded during the rainy season. The outfall pipe was determined to need non-limestone boulders surrounding the pipe outfall to prevent erosion.

Outside of the RPA area, the Dinky Shed sedimentation basin and the Canyon Rd. checkdams were full of sediment and in need of cleaning out.

All deficiencies noted during the inspection have been addressed and fixed by WRA contractor, Ecological Concerns Inc., or Quarry staff.

If you have any questions regarding this inspection or the actions that should be taken, please do not hesitate to contact me or other WRA staff at your convenience.

APPENDIX A

EROSION CONTROLS CHECKLIST

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Permanente Quarry Erosion Controls Checklist

Per COA 78, inspections of BMPs should be conducted before and following qualifying rain events to ensure their integrity. Inspections shall be documented and periodically reported. Any violations shall be corrected immediately.

This checklist should be used to inspect the BMPs installed through the PCRA areas as listed in the RPA and will serve as documentation for reporting purposes. Photo documentation should accompany both sufficient and deficient BMPs.

For erosion control measures (BMP's) installed in the PCRA, a map is produced on an annual basis at the end the fall season and may be used to determine the locations of the various BMP installations. This map can be marked up in the field with identification numbers that reflect the deficiencies.

Inspection Information				
Date and Time of Inspection: 7/31/14 08:00		Date Report Written: 8/29/14		
Area Inspected (PCRA Subarea, WMSA, EMSA, Rock Plant, etc.): PCRA Subareas up to Pond 13, EMSA, Rock Plant, Non-RPA area				
Inspection Type: (Circle one)	Monthly	Pre-Storm	During Rain Event	Post-Storm

Inspector/Reviewer Information	
Inspector Name: Scott Yarger	Inspector Title: Biologist
Inspector Signature: [signature]	Date: 8/29/14
Reviewer Name: Megan Stromberg	Reviewer Title: QSD
Reviewer Signature: [signature]	Date: 8/29/14

Weather	
Estimate storm beginning: (date and time) N/A	Estimate storm duration: (hours) N/A
Estimate time since last storm: (days or hours) N/A	Rain gauge reading and location for last storm (in): N/A
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain in 24 hours)? (Y/N) N	
If yes, summarize forecast:	

Silt Fencing

No Yes

☒ ☐ Are any sections of the silt fence split, torn, slumping or undercut?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any sections of the silt fence have weathered fabric?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any sections of the silt fence have sediment accumulation which reaches one-third of the barrier height?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are areas upgradient of the silt fence permanently stabilized?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are there any other areas in need of silt fencing?

Deficiency number(s): 4 ______ ______ ______ ______ ______ ______

Geotextiles and Mats

☒ ☐ Is erosion or scouring evident around or under matting?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any areas of the installed blankets have washouts or breakage or are otherwise damaged?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are blankets uniformly in contact with the soil areas?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are blanket lap joints secure where they exist?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are blanket staples or pins flush with the ground?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there additional areas that need further installation of erosion control blankets?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Fiber Rolls

No Yes

☒ ☐ Are there any split, torn, unraveling, or slumping fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any washouts or breakages of fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any rills or gullies adjacent to, along, or under fiber rolls?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are any portions of the fiber rolls where sediment has accumulated to one-third the designated sediment storage depth?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Hydromulch and Seeding

☒ ☐ Are hydroseeded areas scoured, disturbed, or otherwise eroding?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Do hydroseeded areas have constant cover?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Do any other areas require further hydroseeeding?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

Other Measures

☒ ☐ Are there any stockpiles that have uncontrolled run-on or run-off?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☒ ☐ Are there any breaks in the haul road berm allowing water to run into the PCRA or Permanente Creek Slopes?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

☐ ☒ Are any sediment catchment ponds overflowing?

Deficiency number(s): 1 2 - canyon Rd. checkdams

☒ ☐ Are any ditches or water conveyances damaged?

Deficiency number(s): ______ ______ ______ ______ ______ ______ ______

3 - Pond 30 outfall scoured from rainy season.

BMP Deficiency Descriptions	
Deficiency ID Number	Deficiency Description
1. 1	Dinky shed basin (Not in RPA), nearly full of sediment;
2. 2	Three checkdams on canyon Rd. (Not in RPA), nearly full of sediment.
3. 3	Pond 30 outfall needs non-limestone boulders to prevent washout, before rainy season.
4. 4	Santa Clara formation (topsoil) stockpile unprotected in EMSA. Needs silt fence downslope
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APPENDIX B

EROSION CONTROL CHECKLIST MAPS

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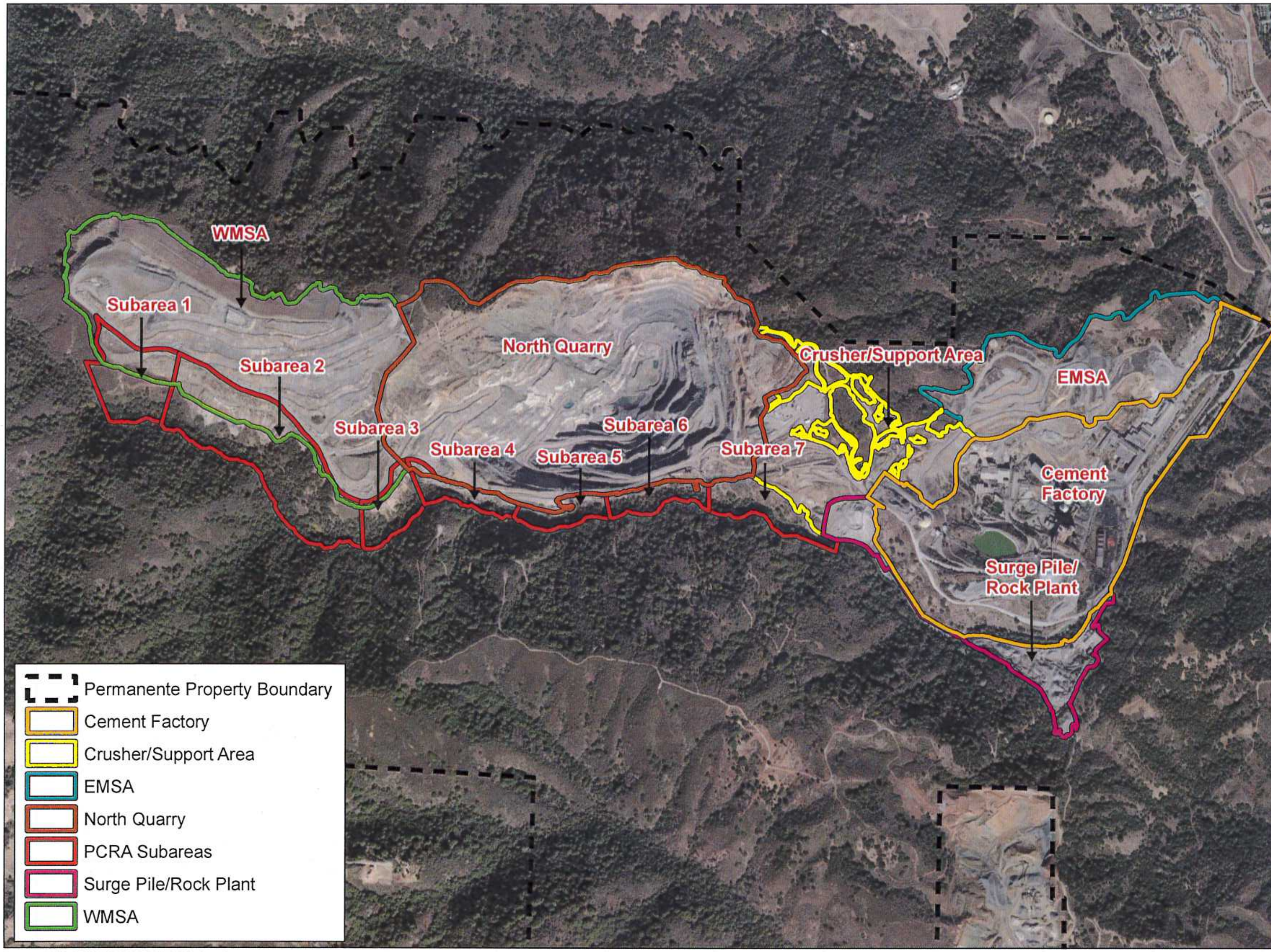

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Lehigh Permanente Quarry, Santa Clara County, California

Overview

N
W E
S

0 500 1,000 2,000 Feet

Date: August 2013
Map By: Chirs Zumwalt
Aerial: ESRI Streaming 2010

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Overview.mxd

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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure ~~4b~~: 1

Surge Pile/Rock Plant

Field Reference Map

PCRA Subareas

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd

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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure # 2

Surge Pile/Rock Plant

Field Reference Map

PCRA Subareas

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd

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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure ~~2a~~ 3

EMSA

Field Reference Map

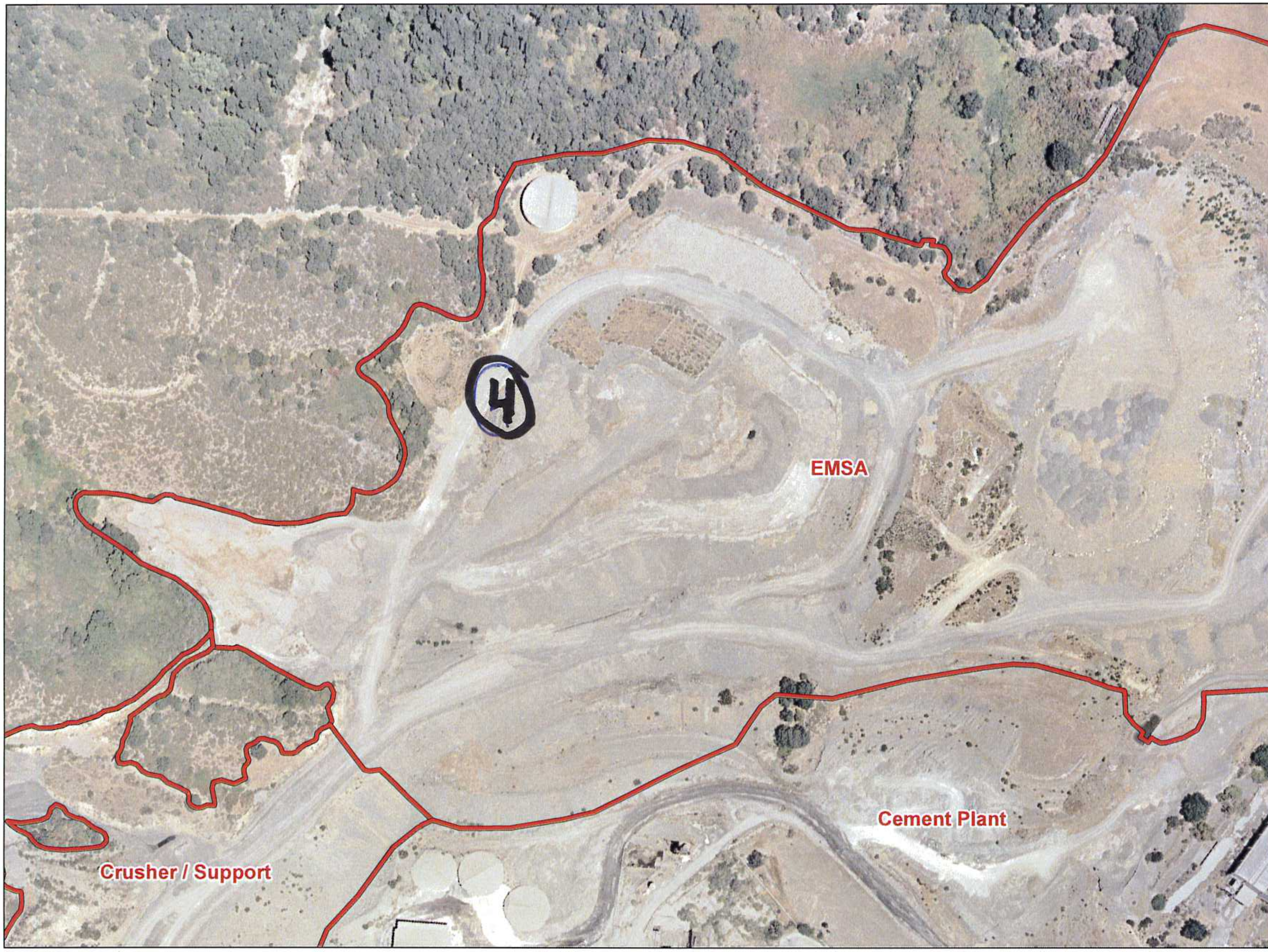
PCRA Subareas

N
W E
S

0 50 100 200
Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd



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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry, Santa Clara County, California

Figure 4

EMSA

Field Reference Map

Subareas

N
W E
S

0 50 100 200 Feet

Date: August 213
Map By: Michael Rochelle
Aerial: USGS 2008

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Mine Mapbook\Book.mxd

APPENDIX C:

RECLAMATION PLAN AMMENDMENT AND FINAL CONDITIONS OF APPROVAL ANNUAL WORKER TRAINING

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Santa Clara County: Reclamation Plan Amendment (RPA)

RECLAMATION PLAN AMENDMENT AND FINAL CONDITIONS OF APPROVAL TRAINING TOPICS

Per the Final Conditions of Approval number 11 (COA 11), Lehigh shall annually train all mining staff, including outside vendors, contractors, or consultants who are responsible for implementation of any part of the mine operations or reclamation at Permanente Quarry, on the requirements and provisions of the RPA, the conditions of approval, and the MMRP.

Reclamation Plan Amendment (RPA) and Provisions

Approval of the project would amend the existing reclamation plan for the Quarry and would result in the reclamation of an approximately 1,238-acre project area within the Applicant's overall 3,510-acre ownership. The Project is designed to make the reclaimed lands suitable for future open space uses. It includes site-specific activities to satisfy the reclamation requirements of the Surface Mining and Reclamation Act of 1975 and the County's surface mining ordinance and surface mining and land reclamation standards. The Project would be implemented in three phases over an approximately 20-year period, expected to begin in 2012 and conclude with final reclamation by approximately 2030.

As part of the RPA approval process, mitigation measures and provisions were agreed upon for the project. The Project Draft Environmental Impact Report (EIR) and Final EIR describe the various conditions and activities that the quarry must adhere to through the project. Quarry staff shall be aware of the conditions of approval that correspond to their job descriptions and responsibilities. These are listed and described throughout the Reclamation Plan Amendment, which is available for all quarry staff to view as needed.

Final Conditions of Approval

The County issued a Final Conditions of Approval which contains 89 different Conditions of Approval which shall be met by the Quarry. Quarry staff shall be aware of the COA's and be knowledgeable in those COA's which correspond to their job descriptions and responsibilities. A copy of the Final COAs is available for all quarry staff to view as needed.

Santa Clara County: Reclamation Plan Amendment (RPA)

PREVENTION OF TRIGGERING DEBRIS SLIDES

As a condition of approval for the Reclamation Plan Amendment, the County has mandated that mine operators shall be trained in the prevention of triggering debris slides. This is targeted at keeping sediment, especially limestone-based materials, from entering Permanente Creek and PCRA areas.

Please discuss the following topics with all employees:

1. General awareness of the causes and impacts of debris slides.

   Debris slides can occur on steep hillsides where consolidation of the substrate cannot support the loads above. Slides usually happen where fill slopes are steep and composed of loose materials. Any loosening or disturbance of supporting materials can cause a debris slide.

2. Maintaining thorough and adequate erosion control measures.

   Controls to prevent materials from sloughing off include debris/silt fencing placed on outer edge of grading and excavation operations, back-sloping excavations to prevent grade slope towards the creek, operations buffer areas, and berms along the outer extent of operations closest to the creek.

   At the Permanente Quarry, the main control is the haul road berms to prevent materials from entering the PCRA. Secondary controls are installed on the slopes below the haul road berm in various subareas on the creek slopes including erosion control matting, straw wattles, and wire-backed silt fencing.

3. Prevention of actions that may cause or exacerbate debris slide conditions

   Avoid unnecessarily removing vegetation, boulders and other substrates. Restrict vehicle operations to maintained roads. Stockpile fill and other debris in appropriate areas as designated with the haul road berms.

4. Regularly inspect areas with a high potential for slides and report any suspected conditions that might cause a debris slide into Permanente Creek and PCRA areas.

Lehigh Permanente Quarry

EROSION CONTROL TRAINING TOPICS

Erosion control is the practice of preventing or controlling wind or water erosion in agriculture, land development and construction. Effective erosion controls are important techniques in preventing water pollution and soil loss. Erosion controls are used in natural areas, agricultural settings or urban environments. Erosion controls often involve the creation of a physical barrier, such as vegetation or rock, to absorb some of the energy of the wind or water that is causing the erosion. On construction sites they are often implemented in conjunction with sediment controls such as sediment basins and silt fences.

On the Permanente Quarry Site, the main erosion controls include:

- Haul road berms to keep water out of the creek and directed toward siltation basins or ponds
- Siltation basins or ponds to settle out sediment and control waters leaving the site
- Silt fences, straw wattles, and erosion control blankets on the creek side of the haul road berms in select locations
- Silt fences, straw wattles, and erosion control blankets on the topsoil stockpiles

6 *Goals Of Erosion Control*

1. *No Sediment Leaves the Site*
2. *Lines of Defense Everywhere & Always*
3. *Cover Quickly*
4. *Protect the Swale, Ditch ,and Channel*
5. *Keep Clean Water Clean*
6. *Inspect, Clean & Fix*

Inlet Barriers (i.e.: sand bags, gutter buddies, straw wattles)

- Is the structure deteriorating
- Is sediment >1/2 the height of structure?
- Evidence of water/sediment getting around or under barrier?
- Are there other structures that require inlet barriers?

Sediment Barriers (i.e.: haul road check dams, ditch checks)

- Are they trenched in or falling down?
- Evidence of sediment/water getting around or under barrier?
- Is sediment more than 1/2 height of structure?
- Are there areas where more sediment barriers are required or need extended?

Perimeter Control (i.e.: Haul road berms, silt fence, straw wattles)

- Is all the off-site water being diverted where applicable?
- Evidence of water/sediment getting around or under barrier?
- Are there areas that need extended or additions to other locations?
- Are the barriers in good condition or in need of repair?
- Straw Blankets-are they deteriorating and need replaced?
- Are the haul road berms preventing water from entering the creek?

Stabilized Construction Entrance

- Evidence of sediment being tracked off site onto public streets?

Soil and Fines Stockpiles

- An earth berm must be constructed upstream around the area to prevent runoff from contacting stockpile and a downstream ditch to prevent waters from leaving the stockpile site

Sediment Basins

- Note the basin depth. Is the basin more than half full of sediment from original design?
- Condition of basin side slopes
- Evidence of water overtopping embankments
- Condition of outfall

General Site Conditions

- Trash barrels-any evidence of trash lying around site
- Location of porta potties
- Leaking vehicles
- Concrete Washouts Designated

Santa Clara County: Reclamation Plan Amendment (RPA)

STORM WATER POLLUTION PREVENTION PLAN: BMPs

Best Management Practices (BMPs) are practices used to reduce the amount of pollution entering surface waters. Based on the potential pollutant areas identified at the facility, existing and recommended BMPs for the facility are discussed below.

Please discuss the following areas with all employees:

1) **Truck Loading Areas**
   a. Continue to immediately cleanup any spilled cement or aggregate.

2) **Raw Material Storage**
   a. Any total suspended solids (TSS) generated by stormwater contact with the aggregate storage areas is directed to detention ponds or basins which are designed to remove TSS prior to discharge. BMP in these areas would be to insure that stormwater runoff from aggregate storage or cement loading areas does not leave the property, but indeed goes to ponds or basins.
   b. Maintain bag houses to prevent dust from cement. Immediately cleanup any spill material to limit exposure to stormwater.

3) **Secondary Containment Storage**
   a. Secondary containment walls should be maintained, inspected and repaired when necessary to prevent leaks. Secondary containment is defined as spill containment for the contents of the single largest tank plus sufficient freeboard to allow for a 25 year, 24 hour storm event.
   b. Maintain the equipment and hoses within the containment area used to transfer the materials. Clean inside walls when necessary.

4) **Diesel Tanks**
   a. Fuel overflows during storage tank filling can be a major source of spills. Watch the transfer constantly to prevent overfilling and spilling.
   b. Clean up any spills or drips immediately.
   c. Verify that drain plug is installed.
   d. Discourage topping off of fuel tanks.
   e. Properly protect portable fuel tanks, pumps and hoses from contact with trucks and other mobile equipment.
   f. Install secondary containment around tank pump and piping if not already done, this would prevent a leak or spill from entering ponds, basins or from leaving the property.

5) **Oil Storage Areas**
   a. Place all drums and lubricants on drip containment pallets.
   b. Clean up any spills or drips with sorbent materials immediately.
   c. Maintain valves to prevent leaks.
   d. Clean out within containment when necessary. Inspect for residue prior to rainwater release.
   e. Remove old & unused barrels

6) **Ponds and Basins**
   a. Inspect basins regularly for damage, erosion, waste, and sediment buildup.
   b. Clean out basins when necessary to prevent a stormwater overflow.
   c. Reduce amount of sediment and processed water to keep basins level low.
   d. Inspect outfall regularly for dry weather discharge.

7) **Sediment Drying Areas**
   a. Inspect area regularly for damage, erosion, waste, and sediment buildup.
   b. Clean out area when necessary to prevent a stormwater overflow.
   c. Reduce amount of sediment to keep sediment levels low.

8) **Equipment Wash Areas**
   a. Continue to wash mobile equipment to the basins and direct all wash water to prevent it from leaving the containment area
   b. Keep area swept and free of aggregates, fines and trash that could enter the ponds, basins or leave property.
   c. Inspect area regularly for damage and erosion.

REMEMBER:
Keep tanks inside secondary containment.

- **Prevent a leak or spill from entering the ponds, basins or leaving the property.**

Santa Clara County: Reclamation Plan Amendment (RPA)

CULTURAL RESOURCES IDENTIFICATION AND PRESERVATION

Because cultural artifacts have been encountered on the Quarry site, mine operators shall be trained in the identification of archaeological artifacts and preservation of those resources. Please discuss the following topics with all employees:

1. General awareness of COA 65.
   If cultural resources are encountered the Mine Operator shall notify the Planning Manager and all activity within 100 feet of the find shall stop until the cultural resource is evaluated by a qualified archaeologist and a Native American representative. Ground disturbance shall not resume within 100 feet of the find until an agreement has been reached as to the appropriate treatment of the find

2. Identification of Cultural Resources:
   a. Prehistoric Archaeological Materials might include:
      i. obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris;
      ii. culturally darkened soil ("midden") containing heat-affected rocks, artifacts, or shellfish remains;
      iii. stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered stone tools, such as hammerstones and pitted stones.
   b. Historic-period materials might include:
      i. stone, concrete, or adobe footings and walls;
      ii. filled wells or privies;
      iii. deposits of metal, glass, and/or ceramic refuse.

Figure 1. A grinding stone or 'metate' found on Permanente Quarry property.

Lehigh Southwest Cement Company
Permanente Quarry

2014 Reclamation Plan Amendment Staff Training

8/21/2014

Training Topics

1) Reclamation Plan Amendment (RPA)
2) Environmental Impact Report (EIR) Mitigation Monitoring and Reporting Plan (MMRP)
3) Conditions of Approval (COA's)
4) Storm Water Pollution Prevention Plan (SWPPP)
5) Prevention of Triggering Debris Slides
6) Erosion Control Training

Sign-in Sheet

Name	Department	Date
Sean Avent	WRA	8/21/2014
[illegible]	WRA - Scott Yarger	8/21/2014
[illegible]	WRA - Erich Schickenberg	8/21/2014
[illegible]	WRA - Reuben Brandt	8/21/2014
[illegible]	WRA - Scott Batiuk	8/21/2014
[illegible]	WRA - Geoff Smick	8/21/2014
[illegible]	WRA - Dan Chase	8/21/2014
[illegible]	WRA - Lauren Kerr	8/21/2014
[illegible]	WRA - Rob Schell	8/21/2014
Pat Valgar[illegible]	WRA - Patricia Valcarcel	8/21/2014
[illegible]	WRA - Megan Stromberg	8/21/2014
	WRA	8/21/2014
	WRA	8/21/2014
	WRA	8/21/2014
	WRA	8/21/2014
	WRA	8/21/2014
	WRA	8/21/2014
	WRA	8/21/2014

COA 11.

By October 1 of each year, starting in 2012, the Mine Operator shall provide to the Planning Manager a report summarizing the date of the annual training, topics reviewed, and list of all employees attending the training. The Mine Operator shall annually train all mining staff, including outside vendors, contractors, or consultants who are responsible for implementation of any part of the mine operations or reclamation at Permanente Quarry, on the requirements and provisions of the RPA, the conditions of approval, and the MMRP.

COA 78d.

In areas such as the WMSA where fill slopes are steep and composed of loose material, controls shall be in place to prevent material from sloughing off into the PCRA and Permanente Creek. These controls shall include debris/silt fencing placed on outer edge of grading and excavation operations back-sloping excavations to prevent grade slope towards the creek, operations buffer areas that require the use of smaller grading equipment, temporary berms along the outer extent of operations closest to the creek, Mine Operator training regarding the prevention of triggering debris slides.

COA 78m.

Provide adequate erosion control training to all equipment and mine operators, site superintendants, and managers to ensure that stormwater and erosion controls are maintained and remain effective.

Lehigh Southwest Cement Company
Permanente Quarry

2014 Reclamation Plan Amendment Staff Training

8/19/2014

Training Topics

1) Reclamation Plan Amendment (RPA)
2) Environmental Impact Report (EIR) Mitigation Monitoring and Reporting Plan (MMRP)
3) Conditions of Approval (COA's)
4) Storm Water Pollution Prevention Plan (SWPPP)
5) Prevention of Triggering Debris Slides
6) Erosion Control Training

Sign-in Sheet

Name	Department	Date
Sean Avent	WRA	8/19/2014
Louie [illegible]	Quarry	8/19/2014
Michael Ambrose	Quarry	8/19/2014
Fidel G. Castillo	Quarry	8/19/2014
Joel Hernandez	Quarry	8/19/2014
Chris Pacheco	Quarry	8/19/2014
Amber Sporl	Quarry	8/19/2014
J. Rivas	Quarry	8/19/2014
Vicente Cortes	Quarry	8/19/2014
Jesse Vallejos	Quarry	8/19/2014
Hanan Butler	Quarry	8/19/2014
George Dias	Quarry	8/19/2014
orlando Salazar	Quarry	8/19/2014
Esteban Navarro	Quarry	8/19/2014
Cliff Maddocks	Quarry	8/19/2014
Jorge Moreno	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014

Lehigh Southwest Cement Company
Permanente Quarry

Name	Department	8/19/2014
Pastor G López	Quarry	8/19/2014
Marcus Lotin	Quarry	8/19/2014
F Novarro	Quarry	8/19/2014
Roberto Hernandez	Quarry	8/19/2014
Rogelio Flores	Quarry	8/19/2014
Nathen Castro	Quarry	8/19/2014
Hector Martinez	Quarry	8/19/2014
Antonio Berrospe	Quarry	8/19/2014
Adan Vega	Quarry	8/19/2014
José Valdez	Quarry	8/19/2014
Jimmy H.	Quarry	8/19/2014
Terry Tauke	Quarry	8/19/2014
Mario Beltrân	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014
	Quarry	8/19/2014

COA 11.

By October 1 of each year, starting in 2012, the Mine Operator shall provide to the Planning Manager a report summarizing the date of the annual training, topics reviewed, and list of all employees attending the training. The Mine Operator shall annually train all mining staff, including outside vendors, contractors, or consultants who are responsible for implementation of any part of the mine operations or reclamation at Permanente Quarry, on the requirements and provisions of the RPA, the conditions of approval, and the MMRP.

COA 78d.

In areas such as the WMSA where fill slopes are steep and composed of loose material, controls shall be in place to prevent material from sloughing off into the PCRA and Permanente Creek. These controls shall include debris/silt fencing placed on outer edge of grading and excavation operations back-sloping excavations to prevent grade slope towards the creek, operations buffer areas that require the use of smaller grading equipment, temporary berms along the outer extent of operations closest to the creek, Mine Operator training regarding the prevention of triggering debris slides.

COA 78m.

Provide adequate erosion control training to all equipment and mine operators, site superintendants, and managers to ensure that stormwater and erosion controls are maintained and remain effective.

APPENDIX D:

2013-2014 LIST OF BIOLOGICAL SURVEY REPORTS SUBMITTED TO COUNTY

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List of Biological Survey Reports Submitted to County, August 31, 2013- August 31, 2014

Date Conducted	Date Submitted to County	Title of Report	Surveys Conducted
September 6, 2013	September 9, 2013	Permanente Quarry Crusher Area Phase 3 – Biological Survey Results	woodrat nest.
September 12, 2013	September 13, 2013	Permanente Quarry Pipeline Installation Biological Survey Results	woodrat nest.
February 20, 2014	February 21, 2014	Permanente Quarry Western Wall Biological Surveys	nesting bird, woodrat nest, hibernating bat.
March 8-12, 2014	March 13, 2014	Permanente Quarry EMSA Regrading Area Phase 1 Biological Survey Results	nesting bird, woodrat nest, maternity roosting bat.
March 15, 2014	March 19, 2014	Permanente Quarry EMSA Regrading Area Phase 1 Biological Survey Results	nesting bird, woodrat nest, hibernating bat.
March 20, 2014	March 24, 2014	Permanente Quarry EMSA Regrading Area Phases 2 and 3 Biological Survey Results	nesting bird, woodrat nest, hibernating bat.
April 14, 2014	April 15, 2014	Permanente Quarry Pond 4a Area Vegetation Removal Biological Survey Results	nesting bird, woodrat nest, maternity roosting bat.

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APPENDIX E:

WATER QUALITY MONITORING MEMO

Golder Associates

TECHNICAL MEMORANDUM

Date:	9/23/14	**Project No.:**	0637109914
To:	Greg Knapp	**Company:**	Lehigh Southwest Cement Company
From:	George Wegmann, PG Bill Fowler, CEG		
cc:	Sean Avant	**Email:**	Greg.Knapp@hanson.biz

RE: COA 76 ANNUAL SUMMARY, LEHIGH PERMANENTE QUARRY

Golder Associates (Golder) has prepared this technical memorandum to document the activities completed at the Lehigh Permanente Quarry from July 1, 2013 through June 30, 2014 related to the Reclamation Plan Condition of Approval (COA) 76. COA 76 pertains to water quality monitoring and states the following:

> Within ninety (90) days of RPA approval, the Mine Operator shall begin and continue throughout the backfilling and reclamation phases and for 5 years following completion of reclamation and for 5 years following the start of groundwater discharge from the Quarry Pit into Permanente Creek as described on page 4.10-39 of the Final Environmental Impact Report, a Verification and Water Quality Monitoring Program. The Mine Operator shall implement the following:

a. Collect quarterly Quarry pit water samples and analyze for general water chemistry and dissolved and total metals, including selenium.
b. Perform quarterly electrical conductivity and pH measurements of the Quarry water.
c. Measure and record daily volume of any water that is pumped from the pit area.
d. Conduct annual seep surveys in March or April of each year within the Quarry pit. Any seeps shall be sampled for general water chemistry and minerals and dissolved metals, and the seep flow rate shall be estimated.
e. Perform routine testing of each of the various rock types that comprise the overburden to further characterize bulk and leachable concentrations of key metal constituents (selenium in particular). Such testing shall be performed until the average concentrations and the variability within a rock type is no longer changing significantly as new data are gathered.
f. Sample and test runoff from the EMSA and WMSA throughout and following reclamation to confirm the concepts and closure plans (i.e., that cover with non-limestone material and re-vegetation results in runoff water quality that meets Basin Plan Benchmarks and all other applicable water quality standards, including, but not limited to, a site specific NPDES permit for the Quarry and a TMDL for selenium in Permanente Creek). Stormwater runoff monitoring and sampling shall be conducted following the placement and final grading of the 1 foot run-of-mine non-limestone cover material to ensure that surface water discharging from this cover does not contain selenium at concentrations exceeding Basin Plan Benchmark values. Three rounds of representative surface water samples shall be collected and analyzed to verify rock cover performance prior to the placement of the vegetative growth layer.
g. Sample and test groundwater discharge from the Quarry Pit into Permanente Creek following reclamation as described on page 4.10-39 of the Final Environmental Impact Report to confirm that water quality in discharge meets Basin Plan Benchmarks and all other applicable water quality standards.

Golder Associates Inc.
425 Lakeside Drive
Sunnyvale, CA 94085 USA
Tel: (408) 220-9223 Fax: (408) 220-9224 www.golder.com

h. The data obtained through this mitigation measure shall be used to reevaluate the water balance components such as runoff and groundwater inflow and the water quality associated with these within the last five years of active mining. Based on the results of any refined water balance and water quality projections, the Mine Operator shall also review and refine the water management procedures. *(Implements Mitigation Measures 4.4-5 and 4.10-1b.).* All testing data shall be submitted to the Planning Office with the Annual Report by October 1 of each year.

The following provides a summary of tasks completed:.

a. Collect quarterly Quarry pit water samples and analyze for general water chemistry and dissolved and total metals, including selenium.

From July 1, 2013 through June 20, 2014, Golder collected samples from the Quarry pit via Pond 4A. The samples were analyzed for total metals and general water chemistry parameters. The sampling results of the Quarry pit water, including quarterly metals data, are listed on the attached Tables 1 and 2. Tables 1 and 2 also include the discharge data from Ponds 13b, 17, and 30.

b. Perform quarterly electrical conductivity and pH measurements of the Quarry water.

Electrical conductivity and pH measurements of the Quarry water (Pond 4a) are included on Table 1.

c. Measure and record daily volume of any water that is pumped from the pit area.

Daily records of volume of water pumped from the pit are included on Table 1 under Pond 4a.

d. Conduct annual seep surveys in March or April of each year within the Quarry pit. Any seeps shall be sampled for general water chemistry and minerals and dissolved metals, and the seep flow rate shall be estimated.

On April 28, 2014, Golder performed a seep survey within the Quarry pit. Two seeps were identified during the survey: one seep (Seep-850) was located in the southwest portion of the pit where it day-lighted on the 900 and 850 ft elevation benches; and the second seep (Seep-750) was identified by the western/northwestern portion of the pit emanating from above the pit floor along the northwestern pit wall by the Main Slide. Golder did not identify any additional seeps within the Quarry pit. During the seep survey, the two identified seeps were sampled and analyzed for general water chemistry and dissolved metals. The results of the sampling and the estimated flow rates are shown on Table 3 below.

Table 3: Quarry Pit Seep Data

Quarry Pit Seeps	**Seep-750**	**Seep-850**
Sample Date	**4/28/2014**	**4/28/2014**
Metals (dissolved, 200 series)		
Antimony (ug/L)	0.50 J	3.0
Arsenic (ug/L)	7.8	2.6
Barium (ug/L)	85	32
Beryllium (ug/L)	ND	ND
Cadmium (ug/L)	ND	0.71 J
Chromium (ug/L)	ND	ND
Cobalt (ug/L)	0.046 J	0.28 J
Copper (ug/L)	3.8	2.1
Lead (ug/L)	ND	ND

Quarry Pit Seeps	Seep-750	Seep-850
Sample Date	**4/28/2014**	**4/28/2014**
Mercury (ug/L)	ND	ND
Molybdenum (ug/L)	130	120
Nickel (ug/L)	2.7	65
Selenium (ug/L)	7.7	34
Silver (ug/L)	ND	ND
Thallium (ug/L)	ND	0.056 J
Vanadium (ug/L)	220	120
Zinc (ug/L)	ND	140
Calcium (mg/L)	24	190
Magnesium (mg/L)	6.9	62
Potassium (mg/L)	2.1	1.1
Sodium (mg/L)	270	20
Additional Parameters		
Bicarbonate (mg/L)	190	270
Total Dissolved Solids (mg/L)	860	980
Total Suspended Solids (mg/L)	ND	28
Hardness	89	740
Nitrate as NO3	2.9	1.2
Chloride (mg/L)	16	16
Fluoride (mg/L)	ND	ND
Sulfate as SO4 (mg/L)	430	500
Turbidity (NTU)	272	3.81
pH - Field (s.u.)	7.74	7.60
Temperature - Field (°C)	23.10	18.41
DO - Field (mg/L)	7.90	9.23
Electrical Conductivity - Field (µS/cm)	1418	769
ORP - Field (mV)	109.8	83.7
Estimated Flow Rate (GPM)	Less than 1	100

Notes:
Samples for dissolved metals analysis were field filtered.
J= Estimated Value (CLP Flag)

e. Perform routine testing of each of the various rock types that comprise the overburden to further characterize bulk and leachable concentrations of key metal constituents (selenium in particular). Such testing shall be performed until the average concentrations and the variability within a rock type is no longer changing significantly as new data are gathered

Golder and WRA collected samples of the following overburden material located within the pit: Santa Clara Formation, Greenstone, and Graywacke. The samples were analyzed for selenium. The results are summarized below:

Table 4: Quarry Overburden Data

Sample Type	Selenium TTLC (mg/kg)	Selenium STLC (mg/L)
Santa Clara Formation	ND	ND
Greenstone	ND	0.00062
Graywacke	ND	0.00150
Method Detection Limit	0.022	0.00026
ND = Not detected above the laboratory method detection limit; TTLC = total threshold limit concentration; STLC = soluble threshold limit concentration.		

COA 76 f, g, and h

These tasks will be completed going forward when appropriate based on the timeline outlined in COA 76 f, g, and h.

Attachments

Table 1
Table 2

Sample Location		Flow Rate		Turbidity	pH	Chlorine Residual	Temp	DO	EC	Chloride			TSS			Total Set Mat			TDS			O&G			TOC		
	Units	gpm	MGD	NTU	s.u.	mg/L	C	mg/L	µS/cm	mg/L			mg/L			mL/L/hr			mg/L			mg/L			mg/L		
	Test Method			Field	Field	Field	Field	Field	Field	EPA 300.0			SM2540D			SM2540F			SM2540C			EPA 1664			SM5310C		
	Date	Field		Result	Result	Result	Result	Result	Result	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL
Pond 4A Discharge	7/1/2013	424.6	0.611	4.32	8.03	ND				15	0.03	5.0				ND	0.1	0.10	860	5	10						
	7/2/2013	436.3	0.628	2.88	7.97								ND	0.3	1.0												
	7/3/2013	373.7	0.538	3.86	7.79																						
	7/4/2013	233.3	0.336																								
	7/5/2013	340.5	0.490	8.86	8.05																						
	7/6/2013	338.6	0.488	5.12	7.92																						
	7/7/2013	402.3	0.579	3.93	8.07																						
	7/8/2013	355.1	0.511	4.66	7.95																						
	7/9/2013	353.8	0.509	4.58	7.97	ND				16	0.03	12				ND	0.1	0.10	880	5	10						
	7/10/2013	353.7	0.509	7.01	7.98								ND	0.3	1.0												
	7/11/2013	299.0	0.431	4.78	8.08																						
	7/12/2013	271.8	0.391	7.34	7.93																						
	7/13/2013	421.2	0.607	7.05	7.95																						
	7/14/2013	311.4	0.448	2.58	7.99																						
	7/15/2013	414.8	0.597	2.25	7.97																						
	7/16/2013	223.2	0.321	3.22	7.98																						
	7/18/2013	2.0	0.003	3.44	7.89	ND				15	0.03	5.0				ND	0.1	0.10	830	5	10						
	7/19/2013	2.0	0.003	4.02	7.90								1.7	0.3	1.0												
	7/29/2013	0.0	0.000	3.52	8.01	ND				18	0.03	5.0							760	5	10	ND	0.80	5.0			
	7/30/2013	0.0	0.000	2.45	8.02								1.9	0.3	1.0												
	7/31/2013	0.0	0.000	4.34	7.87																						
	8/1/2013	0.0	0.000	4.50	7.78																						
	8/7/2013	2.0	0.003	2.27	7.90	ND				26	0.03	5.0				ND	0.1	0.10	780	5	10						
	8/8/2013	2.0	0.003	2.06	8.04								ND	0.3	1.0												
	8/10/2013	2.0	0.003	1.53	7.69																						
	8/17/2013	2.0	0.003	1.69	7.97																						
	8/19/2013	2.0	0.003	4.00	8.05																						
	8/20/2013	2.0	0.003	9.22	8.18																						
	8/23/2013	2.0	0.003	2.79	7.84	ND				41	0.03	5.0	0.40 J	0.3	1.0	ND*	0.1	0.10	870	5	10						
	8/26/2013	2.0	0.003	2.91	8.12																						
	8/29/2013	2.0	0.003	1.44	8.00	ND				44	0.03	5.0				ND	0.1	0.10	860	5	10	1.2 J^	0.80	1.4			
	9/6/2013	2.0	0.003	2.16	8.14																						
	9/7/2013	2.0	0.003	2.21	8.19																						
	9/8/2013	2.0	0.003	2.27	8.15				1103																		
	9/11/2013	2.0	0.003	2.54	8.09	ND				49	0.03	5.0	ND	0.3	0.50	ND	0.1	0.10	920	5	10						
	9/13/2013	2.0	0.003	3.09	7.95																						
	9/19/2013	2.0	0.003	1.03	8.07	ND				52	0.03	5.0				ND	0.1	0.10	840	5	10						
	9/20/2013	2.0	0.003	2.82	8.19																						

Table 1: Monitoring Data Summary
Lehigh Southwest Cement Company Permanente Quarry
October 2014

Sample Location		Flow Rate		Turbidity	pH	Chlorine Residual	Temp	DO	EC	Chloride			TSS			Total Set Mat			TDS			O&G			TOC		
	Units	gpm	MGD	NTU	s.u.	mg/L	C	mg/L	µS/cm	mg/L			mg/L			mL/L/hr			mg/L			mg/L			mg/L		
	Test Method			Field	Field	Field	Field	Field	Field	EPA 300.0			SM2540D			SM2540F			SM2540C			EPA 1664			SM5310C		
	Date	Field		Result	Result	Result	Result	Result	Result	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL
Pond 4A Discharge	9/23/2013	2.0	0.003	7.05	8.30																						
	9/25/2013	2.0	0.003	2.89	7.74	ND				55	0.03	5.0				ND	0.1	0.10	920	5	10						
	9/26/2013	2.0	0.003	2.20	7.98																						
	10/1/2013	2.0	0.003	2.22	8.12	ND	20.59	8.13	988	57^	0.60	10				ND	0.20	0.20	920	5.0	10						
	10/2/2013	2.0	0.003	3.97	8.10																						
	10/3/2013	2.0	0.003	5.65	8.19																						
	10/4/2013	2.0	0.003	4.10	8.14																						
	10/5/2013	0.0	0.000	3.80	7.33								3.0	0.30	0.50												
	10/7/2013	2.0	0.003	7.33	8.05																						
	10/10/2013	2.0	0.003	0.77	7.91	ND	18.36	7.94		61	0.60	10				ND	0.10	0.10	970*	5.0	10	1.4	0.80	1.4			
	10/11/2013	0.0	0.000	3.04	8.04								2.6^	0.30	0.50												
	10/15/2013	0.0	0.000	1.04	7.38	ND	17.40	7.78		71	0.75	12				ND	0.10	0.10	860	5.0	10						
	10/16/2013	2.0	0.003	1.32	8.08								1.2	0.30	0.50												
	10/17/2013	2.0	0.003	2.42	7.99																						
	10/18/2013	2.0	0.003	4.48	8.09																						
	10/21/2013	2.0	0.003	3.51	8.40																						
	10/22/2013	0.0	0.000	2.2	7.96	ND	18.8	6.9		70	0.60	10				ND	0.10	0.10	860	5.0	10						
	10/23/2013	0.0	0.000	1.2	6.75								3.2	0.30	0.50												
	10/28/2013	2.0	0.003	2.11	7.07																						
	10/29/2013	0.0	0.000	1.91	8.16	ND	14.75	7.48		66	0.60	10				ND	0.10	0.10	950	5.0	10						
	10/30/2013	2.0	0.003	2.57	8.28								5.6^	0.30	0.50												
	11/6/2013	2.0	0.003	2.51	8.29																						
	11/7/2013	2.0	0.003	4.31	7.41	ND	17.37	7.81	1092	69	0.60	10				ND	0.10	0.10	980	5.0	10						
	11/8/2013	2.0	0.003	4.53	7.82								2.8	0.30	0.50												
	11/13/2013	2.0	0.003	7.17	8.23																						
	11/14/2013	2.0	0.003	4.91	6.91	ND	14.63	7.82		72	0.75	12				ND	0.10	0.10	1100	5.0	10						
	11/15/2013	0.0	0.000	5.12	7.89								1.0^	0.30	0.50												
	11/19/2013	2.0	0.003	2.17	8.08																						
	11/20/2013	2.0	0.003	2.42	7.89	ND	13.42	7.85		78	0.30	0.50				ND	0.10	0.10	950	5.0	10	2.0^	0.80	1.4			
	11/21/2013	0.0	0.000	2.76	8.44								1.2	0.30	0.50												
	11/22/2013	0.0	0.000	3.14	7.88																						
	11/24/2013	0.0	0.000	3.16	7.81																						
	11/25/2013	2.0	0.003	3.97	7.04	ND	12.20	10.34		97	0.60	10				ND	0.10	0.10	950	5.0	10						
	11/26/2013	0.0	0.000	5.01	7.81								3.8	0.30	0.50												
	11/27/2013	2.0	0.003	1.22	7.94																						
	11/29/2013	2.0	0.003	8.62	8.13																						
	12/2/2013	2.0	0.003	4.00	7.81																						
	12/3/2013	2.0	0.003	2.87	7.21	ND	10.66	9.62		78 K	0.60	10				ND	0.10	0.10	880	5.0	10						
	12/4/2013	0.0	0.000	4.05	7.76								4.0	0.30	0.50												

Table 1: Monitoring Data Summary
Lehigh Southwest Cement Company Permanente Quarry
October 2014

Sample Location		Flow Rate		Turbidity	pH	Chlorine Residual	Temp	DO	EC	Chloride			TSS			Total Set Mat			TDS			O&G			TOC		
	Units	gpm	MGD	NTU	s.u.	mg/L	C	mg/L	µS/cm	mg/L			mg/L			mL/L/hr			mg/L			mg/L			mg/L		
	Test Method			Field	Field	Field	Field	Field	Field	EPA 300.0			SM2540D			SM2540F			SM2540C			EPA 1664			SM5310C		
	Date	Field		Result	Result	Result	Result	Result	Result	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL
Pond 4A Discharge	12/5/2013	0.0	0.000	3.84	7.09																						
	12/10/2013	0.0	0.000	2.23	7.09	ND	5.76	11.14		77	0.60	10				ND	0.10	0.10	930	5.0	10						
	12/11/2013	0.0	0.000	2.29	7.44								4.8	0.30	0.50												
	12/17/2013	0.0	0.000	1.55	7.81	ND	6.48	11.65		83	0.60	10				ND	0.10	0.10	990	5.0	10	1.1 J	0.80	1.4			
	12/18/2013	0.0	0.000	2.48	7.98								0.60^	0.30	0.50												
	2/28/2014	3.0	0.004	1.67	8.56	ND	13.55	10.00	1111	74	0.15	2.5	1.7	0.30	0.50	ND	0.10	0.10	900	5.0	10	ND	0.80	1.4			
	3/1/2014	634.8	0.914	2.52	8.14																						
	3/2/2014	609.6	0.878	3.92	7.91																						
	3/3/2014	536.9	0.773	14.26	8.07																						
	3/4/2014	485.1	0.698	6.41	7.82																						
	3/5/2014	511.4	0.736	3.76	8.04																						
	3/6/2014	545.4	0.785	1.71	8.01	ND	21.77	6.76		13	0.75	12				ND	0.10	0.10	1000	5.0	10						
	3/7/2014	543.9	0.783	1.87	8.10								1.5	0.30	0.50												
	3/8/2014	542.5	0.781	1.73	7.55																						
	3/9/2014	542.4	0.781	1.94	7.95																						
	3/10/2014	595.7	0.858	2.53	7.98																						
	3/11/2014	531.2	0.765	1.62	8.00																						
	3/12/2014	541.0	0.779	2.23	7.96																						
	3/13/2014	549.8	0.792	2.8	7.95	ND	21.63	8.24		12	0.15	2.5				ND	0.10	0.10	970	5.0	10						
	3/14/2014	548.5	0.790	1.57	8.09			9.93					3.6	0.30	0.50												
	3/15/2014	548.1	0.789	1.37	7.93																						
	3/16/2014	547.8	0.789	0.96	-																						
	3/17/2014	625.0	0.900	0.78	7.79																						
	3/18/2014	735.4	1.059	2.21	7.94																						
	3/19/2014	738.3	1.063	1.03	7.91																						
	3/20/2014	702.9	1.012	1.41	7.92	ND	20.57	6.65		13	0.60	10				ND	0.10	0.10	1000	5.0	10						
	3/21/2014	702.2	1.011	1.46	7.98								ND	0.30	0.50												
	3/22/2014	701.5	1.010	0.92	8.02																						
	3/23/2014	701.1	1.010	1.83	7.26																						
	3/24/2014	680.4	0.980	1.39	8.01																						
	3/25/2014	634.5	0.914	1.04	8.02																						
	3/26/2014	653.3	0.941	0.62	7.98	ND	20.90	9.02														1.2 J	0.80	1.4			
	3/27/2014	674.3	0.971	0.99	8.03			7.18		13	0.15	2.5	0.84	0.30	0.50	ND	0.10	0.10	1000	5.0	10						
	3/28/2014	618.0	0.890	0.95	7.98																						
	3/29/2014	602.8	0.868	1.09	7.95																						
	3/30/2014	602.0	0.867	0.82	8.05																						
	3/31/2014	665.1	0.958	2.16	7.55																						
	4/1/2014	614.5	0.885	7.44	7.55	ND	18.33	11.01	1171	16	0.60	10				ND	0.10	0.10	940	5.0	10	2.4^	0.80	1.4			

Sample Location		Flow Rate		Turbidity	pH	Chlorine Residual	Temp	DO	EC	Chloride			TSS			Total Set Mat			TDS			O&G			TOC		
	Units	gpm	MGD	NTU	s.u.	mg/L	C	mg/L	µS/cm	mg/L			mg/L			mL/L/hr			mg/L			mg/L			mg/L		
	Test Method			Field	Field	Field	Field	Field	Field	EPA 300.0			SM2540D			SM2540F			SM2540C			EPA 1664			SM5310C		
	Date	Field		Result	Result	Result	Result	Result	Result	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL
Pond 4A Discharge	4/2/2014	615.4	0.886	3.12	8.18								4.2	0.30	1.0												
	4/3/2014	614.6	0.885	1.95	7.38																						
	4/4/2014	612.8	0.882	7.92	7.81																						
	4/6/2014	567.1	0.817	2.17	8.01																						
	4/7/2014	536.4	0.772	1.44	8.10																						
	4/8/2014	559.8	0.806	1.76	7.93	ND	22.35	7.16		14	0.60	10				ND	0.10	0.10	930	5.0	10						
	4/9/2014	507.2	0.730	1.93	7.97								0.84	0.30	0.50												
	4/10/2014	537.5	0.774	1.54	7.94																						
	4/11/2014	619.8	0.892	1.68	7.96																						
	4/12/2014	527.8	0.760	1.63	8.06																						
	4/14/2014	531.7	0.766	1.70	8.00																						
	4/15/2014	545.4	0.785	1.25	8.00	ND	22.42	7.74		15	0.60	10				ND	0.10	0.10	840	5.0	10						
	4/16/2014	545.0	0.785	2.20	7.90								1.3	0.30	0.50												
	4/17/2014	504.8	0.727	1.37	7.72																						
	4/18/2014	480.5	0.692	2.00	7.99																						
	4/19/2014	470.4	0.677	2.36	8.04																						
	4/21/2014	436.9	0.629	1.71	8.00	ND	22.52	7.46		15	0.60	10				ND	0.10	0.10	960	5.0	10						
	4/22/2014	260.8	0.376	2.35	8.05								0.84	0.30	0.50												
Pond 30 Discharge	2/27/2014	15.0	0.022	58.23	7.49	ND	12.69	9.34	1261				26	0.30	1.0							ND	0.80	5.0			
	4/2/2014			8.37	6.69		12.45	14.74	966				13	0.30	1.0				1100	5.0	10	1.7 J	0.80	5.0	2.90	0.100	0.300
Pond 17 Discharge	9/10/2013	75.0	0.108	1.60	7.84	ND				29	0.03	12				ND	0.1	0.10	2100	5	10						
	9/11/2013	75.0	0.108	1.50	8.16								ND	0.3	0.50												
	9/12/2013	75.0	0.108	0.84	8.13																						
	9/13/2013	10.0	0.014	0.85	8.23	ND																1.2 J	0.80	1.4			
	9/14/2013	60.0	0.086	1.58	7.68																						
	9/15/2013	10.0	0.014	0.92	8.14																						
	9/16/2013	50.0	0.072	1.48	7.57																						
	9/17/2013	50.0	0.072	1.51	7.62																						
	9/18/2013	20.0	0.029	1.65	8.09	ND				110	0.03	25				ND	0.1	0.10	2000	5	10						
	9/19/2013	75.0	0.108	4.28	8.14								ND	0.3	0.50												
	9/20/2013	10.0	0.014	1.88	8.16																						
	9/21/2013	70.0	0.101	1.28	7.52																						
	9/22/2013	10.0	0.014	0.71	7.92																						
	9/23/2013	20.0	0.029	1.55	8.17																						
	9/24/2013	75.0	0.108	1.52	7.96	ND				110	0.03	5.0				ND	0.1	0.10	2000	5	10						
	9/25/2013	60.0	0.086	0.65	8.16								1.4	0.3	0.50												
	9/26/2013	60.0	0.086	1.18	8.04																						
	9/27/2013	60.0	0.086	0.55	7.01																						
	9/28/2013	30.0	0.043	0.83	8.11																						
	9/30/2013	75.0	0.108	0.90	8.09																						

Sample Location		Flow Rate		Turbidity	pH	Chlorine Residual	Temp	DO	EC	Chloride			TSS			Total Set Mat			TDS			O&G			TOC		
	Units	gpm	MGD	NTU	s.u.	mg/L	C	mg/L	µS/cm	mg/L			mg/L			mL/L/hr			mg/L			mg/L			mg/L		
	Test Method			Field	Field	Field	Field	Field	Field	EPA 300.0			SM2540D			SM2540F			SM2540C			EPA 1664			SM5310C		
	Date	Field		Result	Result	Result	Result	Result	Result	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL
Pond 17 Discharge	10/1/2013	0.5	0.001	0.19	8.15	ND	20.12	7.10		110^	1.5	25				ND	0.10	0.10	1700	5.0	10						
	10/2/2013	40.0	0.058	3.56	8.17																						
	10/3/2013	2.0	0.003	0.50	8.23																						
	10/4/2013	2.0	0.003	1.22	8.16								0.40 J	0.30	0.50												
	10/5/2013	80.0	0.115	1.78	8.16																						
	10/6/2013	10.0	0.014	0.55	8.03																						
	10/7/2013	20.0	0.029	1.60	8.12																						
	10/8/2013	5.0	0.007	0.83	8.15																						
	10/9/2013	20.0	0.029	1.35	8.15																						
	10/10/2013	0.3	0.000	4.37	8.04	ND	15.50	8.92		110	0.75	12				ND	0.10	0.10	1600*	5.0	10	1.3 J	0.80	1.4			
	10/11/2013	100.0	0.144	7.91	8.08								10^	0.30	0.50												
	10/12/2013	300.0	0.432	-	8.09																						
	10/13/2013	75.0	0.108	5.37	8.24																						
	10/14/2013	200.0	0.288	3.84	8.11																						
	10/15/2013	100.0	0.144	3.00	8.09	ND	16.80	8.13		160	0.75	12				ND	0.10	0.10	1100	5.0	10						
	10/16/2013	60.0	0.086	2.01	8.25																						
	10/17/2013	25.0	0.036	0.90	8.14																						
	10/18/2013	50.0	0.072	2.81	8.13								2.2	0.30	0.50												
	10/19/2013	50.0	0.072	1.36	8.00																						
	10/20/2013	20.0	0.029	1.22	7.94																						
	10/21/2013	10.0	0.014	3.39	7.93																						
	10/22/2013	100.0	0.144	2.69	8.05	ND	18.6	7.80		100	1.5	25				ND	0.10	0.10	1800	5.0	10						
	10/23/2013	3.5	0.005	3.60	8.24																						
	10/24/2013	10.0	0.014	3.00	7.90								7.0	0.30	0.50												
	10/27/2013	15.0	0.022	6.26	8.03																						
	10/30/2013	80.0	0.115	7.22	7.68	ND	15.47	7.22		65	0.75	12				ND	0.10	0.10	1800	5.0	10						
	10/31/2013	75.0	0.108	1.12	7.91								40^	0.30	0.50												
	11/1/2013	75.0	0.108	1.09	7.68																						
	11/2/2013	80.0	0.115	0.61	7.73																						
	11/3/2013	60.0	0.086	0.66	7.69																						
	11/4/2013	60.0	0.086	0.72	7.59																						
	11/5/2013	37.5	0.054	2.26	7.77																						
	11/6/2013	70.0	0.101	0.71	7.52																						
	11/7/2013	80.0	0.115	1.09	8.32	ND	15.42	7.11		110	0.15	2.5				ND	0.10	0.10	1700	5.0	10						
	11/8/2013	100.0	0.144	4.50	7.79																						
	11/9/2013	50.0	0.072	1.45	7.92								2.4	0.30	0.50												
	11/10/2013	50.0	0.072	1.64	7.78																						
	11/11/2013	50.0	0.072	1.67	8.11																						
	11/12/2013	50.0	0.072	1.92	8.27																						

Table 1: Monitoring Data Summary
Lehigh Southwest Cement Company Permanente Quarry
October 2014

Sample Location	Units	Flow Rate gpm	Flow Rate MGD	Turbidity NTU	pH s.u.	Chlorine Residual mg/L	Temp C	DO mg/L	EC µS/cm	Chloride mg/L			TSS mg/L			Total Set Mat mL/L/hr			TDS mg/L			O&G mg/L			TOC mg/L		
	Test Method			Field	Field	Field	Field	Field	Field	EPA 300.0			SM2540D			SM2540F			SM2540C			EPA 1664			SM5310C		
	Date	Field		Result	Result	Result	Result	Result	Result	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL
Pond 17 Discharge	11/13/2013	80.0	0.115	2.67	7.98																						
	11/14/2013	80.0	0.115	4.08	7.74	ND	17.91	7.27		93	0.75	12				ND	0.10	0.10	1300	5.0	10						
	11/15/2013	80.0	0.115	4.91	7.81								1.6^	0.30	0.50												
	11/16/2013	100.0	0.144	4.96	8.05																						
	11/17/2013	100.0	0.144	4.62	8.06																						
	11/18/2013	60.0	0.086	2.50	7.95																						
	11/19/2013	100.0	0.144	3.85	7.49																						
	11/20/2013	100.0	0.144	6.85	7.87	ND	15.15	8.02		80	0.60	10				ND	0.10	0.10	1300	5.0	10	1.1 J^	0.80	1.4			
	11/21/2013	100.0	0.144	4.47	7.63								6.0	0.30	0.50												
	11/22/2013	80.0	0.115	2.66	8.10																						
	11/23/2013	80.0	0.115	2.45	7.76																						
	11/24/2013	25.0	0.036	2.46	8.11																						
	11/25/2013	50.0	0.072	4.03	7.81	ND	12.33	9.34		110	0.75	12				ND	0.10	0.10	1200	5.0	10						
	11/26/2013	40.0	0.058	1.90	7.88								1.6	0.30	0.50												
	11/27/2013	25.0	0.036	1.65	8.08																						
	11/29/2013	30.0	0.043	1.72	7.88																						
	12/2/2013	15.0	0.022	1.39	7.92																						
	12/3/2013	20.0	0.029	1.91	7.75	ND	10.94	9.29		450 K	0.75	12				ND	0.10	0.10	1600	5.0	10						
	12/4/2013	30.0	0.043	1.41	7.74								2.2	0.30	0.50												
	12/5/2013	100.0	0.144	2.26	7.72																						
	12/6/2013	100.0	0.144	5.56	7.51																						
	12/7/2013	30.0	0.043	14.3	7.67																						
	12/10/2013	80.0	0.115	11.6	8.03	ND	4.89	12.42		100	0.60	10				ND	0.10	0.10	920	5.0	10						
	12/11/2013	0.0	0.000	8.8	8.11								1.2	0.30	0.50												
	12/12/2013	60.0	0.086	7.85	7.88																						
	12/17/2013	40.0	0.058	4.14	7.97	ND	10.18	10.11		110	0.60	10				ND	0.10	0.10	1100	5.0	10	1.5	0.80	1.4			
	12/18/2013	75.0	0.108	3.84	7.81								3.4^	0.30	0.50												
	12/19/2013	50.0	0.072	3.46	7.91																						
	12/21/2013	80.0	0.115	1.82	7.84																						
	12/23/2013	60.0	0.086	1.61	7.91																						
	12/24/2013	20.0	0.029	1.16	7.93																						
	12/26/2013	70.0	0.101	0.86	7.92																						
	12/27/2013	30.0	0.043	1.57	7.71	ND	7.65	10.70		89^	0.75	12	2.6	0.30	0.50	ND	0.10	0.10	1500	5.0	10						
	12/28/2013	75.0	0.108	1.22	7.55																						
	12/30/2013	150.0	0.216	2.21	7.76																						
	12/31/2013	70.0	0.101	3.58	7.82																						
	1/3/2014	75.0	0.108	4.05	7.72	ND	8.42	10.73		91	0.75	12	5.2	0.30	0.50	ND*	0.10	0.10	1800	5.0	10						
	1/4/2014	75.0	0.108	1.74	7.70																						
	1/6/2014	60.0	0.086	0.86	7.66																						
	1/7/2014	5.0	0.007	1.08	7.68																						

Sample Location		Flow Rate		Turbidity	pH	Chlorine Residual	Temp	DO	EC	Chloride			TSS			Total Set Mat			TDS			O&G			TOC		
	Units	gpm	MGD	NTU	s.u.	mg/L	C	mg/L	µS/cm	mg/L			mg/L			mL/L/hr			mg/L			mg/L			mg/L		
	Test Method			Field	Field	Field	Field	Field	Field	EPA 300.0			SM2540D			SM2540F			SM2540C			EPA 1664			SM5310C		
	Date	Field		Result	Result	Result	Result	Result	Result	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL
Pond 17 Discharge	1/8/2014	5.0	0.007	2.90	7.41																						
	1/9/2014	60.0	0.086	2.65	7.73	ND	9.17	10.63		110	0.75	12				ND	0.10	0.10	1600	5.0	10						
	1/10/2014	60.0	0.086	1.93	7.71								8.7	0.30	0.50												
	1/11/2014	100.0	0.144	1.35	7.66																						
	1/13/2014	75.0	0.108	3.32	7.65																						
	1/14/2014	40.0	0.058	3.18	7.70																						
	1/15/2014	40.0	0.058	4.55	7.73	ND	8.83	12.74		130	0.75	12				ND	0.10	0.10	1600	5.0	10						
	1/16/2014	20.0	0.029	3.77	7.55								2.9	0.30	0.50												
	1/17/2014	20.0	0.029	2.94	7.58																						
	1/18/2014	50.0	0.072	2.61	7.67																						
	1/22/2014	15.0	0.022	0.85	7.48																						
	1/23/2014	10.0	0.014	1.45	7.72	ND	10.73	9.91		110	0.75	12				ND	0.10	0.10	2000	5.0	10	1.0 J	0.80	1.4			
	1/24/2014	75.0	0.108	0.97	7.64								3.6	0.30	0.50												
	1/25/2014	50.0	0.072	2.99	7.56																						
	1/26/2014	15.0	0.022	1.09	7.47																						
	1/27/2014	50.0	0.072	2.87	7.49																						
	1/28/2014	70.0	0.101	3.68	7.42																						
	2/1/2014	5.0	0.007	2.02	7.76																						
	2/2/2014	70.0	0.101	1.31	8.25																						
	2/3/2014	15.0	0.022	1.61	7.7																						
	2/4/2014	1.0	0.001	1.74	7.25																						
	2/5/2014	40.0	0.058	0.92	7.85																						
	2/6/2014	70.0	0.101	13.7	7.83	ND	10.80			90	1.5	25	3.4	0.30	0.50	ND	0.10	0.10	1900	5.0	10	1.3 J	0.80	1.4			
	2/7/2014	10.0	0.014	27.1	7.78																						
	2/8/2014	60.0	0.086	30	7.61																						
	2/9/2014	50.0	0.072	14.7	7.88																						
	2/10/2014	40.0	0.058	16.3	7.88																						
	2/11/2014	40.0	0.058	18.6	7.41																						
	2/12/2014	50.0	0.072	4.73	7.85	ND	11.33	9.30		120	1.5	25				ND	0.10	0.10	1800	5.0	10						
	2/13/2014	5.0	0.007	4.38	7.93								3.0^	0.30	0.50												
	2/14/2014	150.0	0.216	3.18	7.91																						
	2/15/2014	40.0	0.058	1.48	7.97																						
	2/17/2014	10.0	0.014	2.13	7.75																						
	2/18/2014	10.0	0.014	1.56	7.71																						
	2/19/2014	80.0	0.115	1.21	7.76																						
	2/20/2014	40.0	0.058	3.02	7.77	ND	13.02	9.29		130	1.5	25				ND	0.10	0.10	2300	5.0	10						
	2/21/2014	50.0	0.072	9.51	7.98								20^	0.30	0.50												
	2/22/2014	40.0	0.058	9.13	7.82																						
	2/24/2014	75.0	0.108	5.04	7.70																						
	2/25/2014	20.0	0.029	4.14	7.86																						

Table 1: Monitoring Data Summary
Lehigh Southwest Cement Company Permanente Quarry
October 2014

Sample Location	Units / Test Method	Flow Rate gpm	Flow Rate MGD	Turbidity NTU Field	pH s.u. Field	Chlorine Residual mg/L Field	Temp C Field	DO mg/L Field	EC µS/cm Field	Chloride mg/L EPA 300.0			TSS mg/L SM2540D			Total Set Mat mL/L/hr SM2540F			TDS mg/L SM2540C			O&G mg/L EPA 1664			TOC mg/L SM5310C		
	Date	Field		Result	Result	Result	Result	Result	Result	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL
Pond 17 Discharge	2/26/2014	80.0	0.115	4.27	7.93																						
	2/27/2014	150.0	0.216	44.36	7.68																						
	2/28/2014	100.0	0.144	35.1	8.14	ND	14.65	8.09		73	0.75	12	19	0.30	0.50	0.10	0.10	0.10	1000	5.0	10						
	3/1/2014	100.0	0.144	16.1	7.88																						
	3/2/2014	105.0	0.151	20.77	7.88																						
	3/3/2014	50.0	0.072	16.86	7.62																						
	3/4/2014	60.0	0.086	10.85	7.92																						
	3/5/2014	75.0	0.108	12.63	7.86																						
	3/6/2014	1.0	0.001	3.05	8.06	ND	15.99	8.44		130	1.5	25				ND	0.10	0.10	1500	5.0	10						
	3/7/2014	0.0	0.000										80	0.30	0.50												
	3/22/2014	5.0	0.007	3.81	7.66																						
	3/29/2014	5.0	0.007	3.31	7.80																						
	3/30/2014	3.0	0.004	13.2	8.11	ND	16.07	9.83		96^	0.60	10	20	0.30	0.50	ND	0.10	0.10	720	5.0	10	3.0	0.80	1.4			
	3/31/2014	50.0	0.072	19.8	7.83																						
	7/1/2013	1.0	0.001	4.39	8.28	ND				55	0.03	5.0				ND	0.1	0.10	1200	5	10						
Pond 13A Discharge	7/2/2013	1.0	0.001	6.85	7.83								3.5	0.3	1.0												
into Pond 13B	7/3/2013	1.5	0.002	6.98	8.29																						
	7/5/2013	1.0	0.001	6.31	8.25																						
	7/6/2013	3.0	0.004	4.14	7.11																						
	7/7/2013	1.0	0.001	5.12	8.35																						
	7/8/2013	1.0	0.001	5.16	8.30																						
	7/9/2013	1.0	0.001	5.45	8.27	ND				50	0.03	12				ND	0.1	0.10	1200	5	10						
	7/10/2013	1.0	0.001	10.10	8.30								8.2	0.3	1.0												
	7/11/2013	1.0	0.001	5.45	8.12																						
	7/12/2013	1.0	0.001	7.33	8.26																						
	7/13/2013	2.0	0.003	10.09	8.32																						
	7/14/2013	1.0	0.001	6.50	8.33																						
	7/15/2013	1.0	0.001	4.91	8.33																						
	7/16/2013	1.0	0.001	4.58	8.25																						
	7/17/2013	1.0	0.001	5.26	8.31																						
	7/18/2013	1.0	0.001	2.64	8.23	ND				55	0.03	5.0				ND	0.1	0.10	1400	5	10						
	7/19/2013	1.0	0.001	3.12	8.31								3.1	0.3	1.0												
	7/20/2013	1.0	0.001	10.14	8.29																						
	7/21/2013	1.0	0.001	2.43	8.30																						
	7/22/2013	1.0	0.001	2.17	8.15																						
	7/23/2013	1.0	0.001	10.22	8.34																						
	7/24/2013	2.0	0.003	4.32	8.23																						
	7/25/2013	1.0	0.001	2.50	8.21	ND				53	0.03	5.0				ND	0.1	0.10	1200	5	10						
	7/26/2013	2.0	0.003	6.04	8.16								1.0	0.3	1.0												

Sample Location		Flow Rate		Turbidity	pH	Chlorine Residual	Temp	DO	EC	Chloride			TSS			Total Set Mat			TDS			O&G			TOC		
	Units	gpm	MGD	NTU	s.u.	mg/L	C	mg/L	µS/cm	mg/L			mg/L			mL/L/hr			mg/L			mg/L			mg/L		
	Test Method			Field	Field	Field	Field	Field	Field	EPA 300.0			SM2540D			SM2540F			SM2540C			EPA 1664			SM5310C		
	Date	Field		Result	Result	Result	Result	Result	Result	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL
	7/27/2013	1.0	0.001	2.84	8.16																						
	7/29/2013	1.0	0.001	4.95	8.27	ND				68	0.03	5.0				ND	0.1	0.10	1300	5	10	ND	0.80	5.0			
	7/30/2013	1.0	0.001	4.21	8.24								3.7	0.3	1.0												
Pond 13A Discharge	7/31/2013	1.0	0.001	3.40	8.27																						
into Pond 13B	8/1/2013	1.0	0.001	1.85	8.37																						
	8/2/2013	1.0	0.001	1.65	8.33																						
	8/3/2013	1.0	0.001	10.16	8.34																						
	8/4/2013	1.0	0.001	4.23	8.34																						
	8/5/2013	1.0	0.001	9.84	8.11																						
	8/6/2013	2.0	0.003	9.92	8.19																						
	8/7/2013	1.0	0.001	1.79	8.29	ND				66	0.03	5.0				ND	0.1	0.10	1300	5	10						
	8/8/2013	1.0	0.001	2.85	8.31								1.7	0.3	1.0												
	8/9/2013	1.0	0.001	1.92	8.27																						
	8/10/2013	1.0	0.001	1.84	8.24																						
	8/11/2013	1.0	0.001	1.70	8.12																						
	8/12/2013	1.0	0.001	2.14	8.16																						
	8/13/2013	0.0	0.000																								
	8/14/2013	1.0	0.001	1.50	8.34	ND				56	0.03	5.0				ND	0.1	0.10	1400	5	10						
	8/15/2013	1.0	0.001	2.22	8.21								10	0.3	1.0												
	8/17/2013	1.0	0.001	2.55	7.11																						
	8/18/2013	1.0	0.001	4.91	7.29																						
	8/19/2013	1.0	0.001	2.45	8.41																						
	8/20/2013	1.0	0.001	2.30	8.32																						
	8/21/2013	2.0	0.003	5.22	7.31																						
	8/22/2013	0.5	0.001	2.88	8.29	ND				54	0.03	12				ND	0.1	0.10	1400	5	10						
	8/23/2013	0.5	0.001	2.39	8.37								1.9	0.3	1.0												
	8/24/2013	2.0	0.003	2.91	8.39																						
	8/25/2013	0.5	0.001	2.40	8.29																						
	8/26/2013	2.0	0.003	3.10	8.21																						
	8/27/2013	0.5	0.001	11.60	7.94																						
	8/28/2013	0.5	0.001	2.91	8.18	ND				54	0.03	5.0				ND	0.1	0.10	1300	5	10	1.7 J^	0.80	5.0			
	8/29/2013	0.5	0.001	2.84	8.32								6.0	0.3	1.0												
	8/30/2013	0.5	0.001	15.50	8.03																						
	8/31/2013	0.5	0.001	3.17	8.11																						
	9/1/2013	0.5	0.001	3.25	8.23																						
	9/3/2013	0.3	0.000	1.65	7.91																						
	9/4/2013	0.3	0.000	3.23	8.39	ND				53	0.03	12				ND	0.1	0.10	1400	5	10	1.5^	0.80	1.4			
	9/5/2013	1.0	0.001	1.56	8.37								ND	0.3	0.50												
	9/6/2013	0.5	0.001	6.52	8.26																						
	9/7/2013	0.5	0.001	6.44	8.19																						

Table 1: Monitoring Data Summary
Lehigh Southwest Cement Company Permanente Quarry
October 2014

Sample Location		Flow Rate		Turbidity	pH	Chlorine Residual	Temp	DO	EC	Chloride			TSS			Total Set Mat			TDS			O&G			TOC		
	Units	gpm	MGD	NTU	s.u.	mg/L	C	mg/L	µS/cm	mg/L			mg/L			mL/L/hr			mg/L			mg/L			mg/L		
	Test Method			Field	Field	Field	Field	Field	Field	EPA 300.0			SM2540D			SM2540F			SM2540C			EPA 1664			SM5310C		
	Date	Field		Result	Result	Result	Result	Result	Result	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL
	9/8/2013	0.5	0.001	6.39	8.21																						
	9/9/2013	0.5	0.001	6.29	8.19																						
Pond 13A Discharge	9/10/2013	0.0	0.000	15.40	8.30	ND				16	0.03	12	25	0.3	0.50	0.22	0.1	0.10	1400	5	10						
into Pond 13B	9/11/2013	0.0	0.000	0.99	8.11																						
	9/12/2013	0.0	0.000	5.23	8.07																						
	9/13/2013	0.0	0.000	1.57	8.31																						
	9/14/2013	0.5	0.001	2.92	8.35																						
	9/15/2013	0.1	0.000	1.33	8.21																						
	9/16/2013	180.0	0.259	0.29	8.13																						
	9/17/2013	40.0	0.058	0.23	8.19																						
	9/18/2013	4.0	0.006	3.26	7.73	ND				100	0.03	12				ND	0.1	0.10	1600	5	10						
	9/19/2013	0.5	0.001	1.53	8.20								1.4	0.3	0.50												
	9/20/2013	0.5	0.001	1.95	8.26																						
	9/21/2013	0.5	0.001	2.91	8.33																						
	9/22/2013	1.0	0.001	2.33	8.10																						
	9/23/2013	0.3	0.000	1.41	8.30																						
	9/24/2013	0.3	0.000	1.34	8.18	ND				71	0.03	5.0				ND	0.1	0.10	1500	5	10						
	9/25/2013	0.5	0.001	0.88	8.18																						
	9/26/2013	0.5	0.001	1.01	8.19																						
	9/27/2013	0.2	0.000	0.68	8.30																						
	9/28/2013	0.5	0.001	1.59	8.38																						
	9/30/2013	0.3	0.000	1.66	8.29																						
	10/1/2013	0.3	0.000	0.84	8.28	ND	18.20	8.33		65^	0.60	10				ND	0.20	0.20	1600	5.0	10						
	10/2/2013	0.3	0.000	3.35	8.28																						
	10/3/2013	0.3	0.000	0.77	8.33																						
	10/4/2013	0.3	0.000	1.2	8.36								1.0	0.30	0.50												
	10/5/2013	0.5	0.001	2.37	8.36																						
	10/6/2013	0.0	0.000	1.12	8.39																						
	10/7/2013	0.0	0.000	0.68	8.37																						
	10/8/2013	0.3	0.000	0.99	8.09																						
	10/9/2013	0.3	0.000	1.33	8.16																						
	10/10/2013	0.3	0.000	0.75	8.21	ND	18.22	7.59		58	0.75	12				ND	0.10	0.10	1300*	5.0	10	1.1 J	0.80	1.4			
	10/11/2013	0.3	0.000	1.26	8.24																						
	10/12/2013	1.0	0.001	1.06	7.95								0.60^	0.30	0.50												
	10/13/2013	0.3	0.000	0.54	8.11																						
	10/14/2013	0.5	0.001	1.03	7.91																						
	10/15/2013	0.0	0.000	0.85	8.26	ND	19.62	2.00		69	0.75	12				ND	0.10	0.10	1500	5.0	10						
	10/16/2013	0.0	0.000	0.65	8.41																						
	10/17/2013	0.0	0.000	1.81	8.34																						
	10/18/2013	0.0	0.000	3.03	8.28								ND	0.30	0.50												

Table 1: Monitoring Data Summary
Lehigh Southwest Cement Company Permanente Quarry
October 2014

Sample Location		Flow Rate		Turbidity	pH	Chlorine Residual	Temp	DO	EC	Chloride			TSS			Total Set Mat			TDS			O&G			TOC		
	Units	gpm	MGD	NTU	s.u.	mg/L	C	mg/L	µS/cm	mg/L			mg/L			mL/L/hr			mg/L			mg/L			mg/L		
	Test Method			Field	Field	Field	Field	Field	Field	EPA 300.0			SM2540D			SM2540F			SM2540C			EPA 1664			SM5310C		
	Date	Field		Result	Result	Result	Result	Result	Result	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL	Result	MDL	RL
	10/19/2013	0.0	0.000	1.9	8.36																						
Pond 13A Discharge	10/20/2013	1.0	0.001	0.88	8.32																						
into Pond 13B	10/21/2013	1.0	0.001	1.68	8.35																						
	10/22/2013	0.0	0.000	1.07	8.12	ND	17.5	6.73		67	0.75	12				ND	0.10	0.10	1300	5.0	10						
	10/23/2013	2.0	0.003	1.14	8.23								ND	0.30	0.50												
	10/24/2013	2.0	0.003	0.78	8.23																						
	10/25/2013	0.3	0.000	0.77	8.11																						
	10/26/2013	0.5	0.001	0.73	8.07																						
	10/27/2013	0.3	0.000	2.52	8.11																						
	10/28/2013	0.5	0.001	1.07	8.11																						
	10/29/2013	0.5	0.001	1.01	8.16	ND	14.04	3.91		64	0.75	12				ND	0.10	0.10	1400	5.0	10						
	10/30/2013	0.5	0.001	0.68	8.19								1.8^	0.30	0.50												
	10/31/2013	0.3	0.000	1.03	7.92																						
	11/1/2013	0.3	0.000	0.60	8.30																						
	11/2/2013	0.5	0.001	0.72	8.18																						
	11/3/2013	0.5	0.001	0.78	8.21																						
	11/4/2013	0.5	0.001	0.73	8.17																						
	11/5/2013	2.5	0.004	0.97	7.99																						
	11/6/2013	0.5	0.001	0.66	8.21																						
	11/7/2013	0.5	0.001	1.01	8.19	ND	17.41	7.11		63	0.75	12				ND	0.10	0.10	1600	5.0	10						
	11/8/2013	1.5	0.002	13.3	7.96								7.4	0.30	0.50												
	11/9/2013	0.5	0.001	0.98	8.09																						
	11/10/2013	0.5	0.001	1.19	8.07																						
	11/11/2013	0.3	0.000	1.07	8.04																						
	11/12/2013	20.0	0.029	>1000	7.51																						
	11/13/2013	20.0	0.029	27.8	7.94																						
	11/14/2013	0.5	0.001	61	8.02	ND	16.98	6.94		59	0.75	12				ND	0.10	0.10	1400	5.0	10						
	11/15/2013	0.0	0.000										220^	0.30	0.50												
	2/27/2014	3.0	0.004	833.8	7.99	ND	16.44	8.90		36	0.75	12	28	0.30	0.50	ND	0.10	0.10	1200	5.0	10	ND	0.80	1.4			
	2/28/2014	10.0	0.014	74.0	8.16																						
	3/1/2014	3.0	0.004	49.5	8.06																						

Notes: all samples are grab samples, except for TSS samples. TSS sampes are 24-hr composites from the Pond discharge samples. The date listed for 24-hour composites is when sampling was finished.
J = Detected but below the Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ).
ND = Analyte not detected at or above the reporting limit.
^ Lab blank contained trace amount of oil & grease.
* Analysis exceeded sampling holding time limit.
Only days are shown for when discharges occurred.

Table 2: Metals Data Summary
Lehigh Southwest Cement Company Permanente Quarry
October 2014

Sample Location	Sample Date	Antimony (ug/L)				Arsenic (ug/L)				Beryllium (ug/L)				Cadmium (ug/L)				Copper (ug/L)				Chromium (ug/L)				Hexachrome (ug/L)			
		1638				1638 DRC				1638				1638				1638				1638 DRC				218.6			
		Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier
Pond 4A	10/30/13	3.11	0.011	0.042	-	1.32	0.047	0.158	-	ND	0.053	0.158	U	1.22	0.007	0.021	-	1.72	0.042	0.126	-	0.652	0.079	0.237	-	-	-	-	-
	12/17/13	2.87	0.011	0.042	-	1.07	0.009	0.032	-	ND	0.053	0.158	U	0.373	0.007	0.021	-	2.55	0.042	0.126	F	0.643	0.395	1.18	B, Ft	ND	0.0050	0.010	-
	3/6/14	5.68	0.011	0.042	-	1.63	0.009	0.032	-	ND	0.053	0.158	U	1.31	0.007	0.021	-	1.63	0.042	0.126	F	0.265	0.009	0.032	F	ND	0.0050	0.010	-
	4/1/14	5.11	0.011	0.042	-	1.70	0.009	0.032	-	ND	0.053	0.158	U	1.11	0.007	0.021	-	2.33	0.042	0.126	F	0.623	0.009	0.032	F	ND	0.0050	0.010	-
Pond 17	9/13/13	2.10	0.011	0.042	-	0.478	0.006	0.026	-	ND	0.053	0.158	-	0.285	0.007	0.021	-	2.48	0.042	0.126	-	0.425	0.047	0.158	-	0.41	0.02	0.20	-
	12/17/13	1.21	0.011	0.042	-	0.504	0.009	0.032	-	ND	0.053	0.158	U	0.102	0.007	0.021	-	3.45	0.042	0.126	F	0.956	0.395	1.18	B, Ft	ND	0.0050	0.010	-
	2/6/14	1.91	0.011	0.042	-	0.606	0.047	0.158	-	ND	0.053	0.158	U	0.221	0.007	0.021	-	4.77	0.042	0.126	F	3.53	0.158	0.474	Ft	ND	0.0050	0.010	-
Pond 13A/13B	9/4/13	0.613	0.010	0.040	J	1.22	0.006	0.025	-	ND	0.051	0.152	-	0.043	0.007	0.020	-	2.83	0.040	0.121	-	0.499	0.045	0.152	-	ND	0.02	0.20	-
	2/27/14	0.779	0.011	0.042	-	0.705	0.009	0.032	-	ND	0.053	0.158	U	0.094	0.007	0.021	-	5.64	0.042	0.126	-	3.43	0.009	0.032	-	ND [1]	0.0050	0.010	-
Pond 30	2/27/14	0.505	0.011	0.042	-	1.93	0.009	0.032	-	ND	0.053	0.158	U	0.134	0.007	0.021	-	7.47	0.042	0.126	F	11.1	0.009	0.032	Ft	ND	0.0050	0.010	-
	4/2/14	0.720	0.011	0.042	-	0.854	0.009	0.032	-	ND	0.053	0.158	U	0.156	0.007	0.021	-	4.07	0.042	0.126	-	6.73	0.009	0.032	-	ND	0.0050	0.010	-

Notes:

1 = sample collected on 2/28/2014 for hexchrome.

9/4/13 field and bottle blanks contained concentrations of Cr, Cu, Pb, and Zn above the reporting limit. Ni was also found in the bottle blank.

9/13/2013 field blank contained concentrations of Cr, Cu, Pb, and Zn above the reporting limit.

All locations were grab samples collected via "clean hands/dirty hands" EPA sampling method

J = Estimated value because blank spike had a low recovery of 70%.

MDL = Method detection limit

N = Spike recovery was not within acceptance criteria. Result is estimated.

F = Analyte detected above the RL in field blank.

Ft = Analyte detected at trace concentration in field blank.

M = Method blank contained trace detection of this analyte.

MDL = Method detection limit

B = Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

ND = Not detected at or above the indicated MDL or RL.

mg/L = milligrams per liter; ng/L = nanograms per liter; ug/L = micrograms per liter

RL = Reporting limit; U = Result is ≤ the method detection limit.

Table 2: Metals Data Summary
Lehigh Southwest Cement Company Permanente Quarry
October 2014

Sample Location	Sample Date	Lead (ug/L)				Mercury (ng/L)				Nickel (ug/L)				Selenium (ug/L)				Silver (ug/L)				Thallium (ug/L)				Zinc (ug/L)			
		1638				1631E				1638 DRC				1638 DRC				1638				1638				1638			
		Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier	Result	MDL	RL	Qualifier
Pond 4A	10/30/13	0.075	0.006	0.026	-	10.4	0.200	0.500	-	16.9	0.263	1.05	-	29.6	0.105	0.316	-	ND	0.005	0.021	N, U	0.317	0.003	0.011	-	4.68	0.06	0.21	-
	12/17/13	0.042	0.006	0.026	F	6.24	0.200	0.500	-	14.1	1.32	5.26	-	20.4	0.021	0.063	-	ND	0.005	0.021	U	0.237	0.003	0.011	-	4.65	0.06	0.21	F
	3/6/14	0.047	0.006	0.026	F	1.30	0.200	0.500	-	59.4	0.053	0.211	-	33.8	0.021	0.063	-	ND	0.005	0.021	U	0.174	0.003	0.011	-	56.8	0.06	0.21	F
	4/1/14	0.024	0.006	0.026	B, F	1.30	0.200	0.500	-	73.7	0.053	0.211	-	53.1	0.021	0.063	-	ND	0.005	0.021	U	0.183	0.003	0.011	-	58.0	0.06	0.21	F
Pond 17	9/13/13	0.029	0.006	0.026	-	10.8	0.200	0.500	-	8.36	0.247	1.05	-	19.0	0.024	0.072	-	ND	0.005	0.021	N	0.157	0.003	0.011	-	8.94	0.06	0.21	-
	12/17/13	0.055	0.006	0.026	F	13.2	0.200	0.500	-	8.36	1.32	5.26	-	7.66	0.021	0.063	-	0.006	0.005	0.021	B	0.154	0.003	0.011	-	7.04	0.06	0.21	F
	2/6/14	0.124	0.006	0.026	F	17.1	0.200	0.500	-	25.6	0.526	2.11	-	27.6	0.105	0.316	-	0.012	0.005	0.021	B	0.318	0.003	0.011	-	12.1	0.06	0.21	F
Pond 13A/13B	9/4/13	0.071	0.006	0.025	-	9.22	0.200	0.500	-	3.96	0.237	1.01	-	2.42	0.023	0.069	-	ND	0.005	0.020	-	0.027	0.003	0.010	-	12.1	0.06	0.20	-
	2/27/14	0.644	0.006	0.026	-	19.7	0.200	0.500	-	7.37	0.053	0.211	-	22.8	0.021	0.063	-	0.011	0.005	0.021	B	0.041	0.003	0.011	-	9.01	0.06	0.21	-
Pond 30	2/27/14	0.300	0.006	0.026	F	22.4	0.200	0.500		15.0	0.053	0.211	-	14.6	0.021	0.063	-	0.011	0.005	0.021	B	0.068	0.003	0.011	-	18.9	0.06	0.21	F
	4/2/14	0.151	0.006	0.026	-	12.0	0.200	0.500	-	8.86	0.053	0.211	-	29.2	0.021	0.063	-	0.008	0.005	0.021	B	0.061	0.003	0.011	-	15.9	0.06	0.21	-

Notes:

1 = sample collected on 2/28/2014 for hexchrome.

9/4/13 field and bottle blanks contained concentrations of Cr, Cu, Pb, and Zn above the reporting limit. Ni was also found in the bottle blank.

9/13/2013 field blank contained concentrations of Cr, Cu, Pb, and Zn above the reporting limit.

All locations were grab samples collected via "clean hands/dirty hands" EPA sampling method

J = Estimated value because blank spike had a low recovery of 70%.

MDL = Method detection limit

N = Spike recovery was not within acceptance criteria. Result is estimated.

F = Analyte detected above the RL in field blank.

Ft = Analyte detected at trace concentration in field blank.

M = Method blank contained trace detection of this analyte.

MDL = Method detection limit

B = Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

ND = Not detected at or above the indicated MDL or RL.

mg/L = milligrams per liter; ng/L = nanograms per liter; ug/L = micrograms per liter

RL = Reporting limit; U = Result is ≤ the method detection limit.

APPENDIX F:

SEDIMENTATION BASIN 13A AND 13B BIOLOGICAL MONITORING MEMO

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ENVIRONMENTAL CONSULTANTS

Memorandum

To: Greg Knapp, Lehigh Hanson
Cc: Cliff Maddocks, Lehigh Hanson
Dan Zacharisen, Lehigh Hanson

From: Sean Avent
avent@wra-ca.com
ext. 112

Date: August 21, 2014

Subject: Permanente Quarry Sedimentation Basins 13a And 13b Cleaning and Redesign Project – Biological Survey Results Summary

The purpose of this memorandum is to summarize the actions taken to avoid and/or minimize impacts to biological resources during the cleaning, redesign and grading of the Sedimentation Basins 13a and 13b Project.

Sediment Basins 13a and 13b are located uphill of Pond 13, which lies within Permanente Creek. The sedimentation basins are designed to capture stormwater runoff from the hillsides above. Lehigh Hanson redesigned the operational sedimentation basins to increase holding capacity and retention for stormwater runoff. The redesign included removal of the berm separating Sedimentation Basins 13a and 13b to create a single and larger sloped basin which could have a rubber liner installed. Sedimentation Basins 13a and 13b are in the Crusher/Support Area within the Reclamation Plan Amendment Boundary but outside of the PCRA Subareas.

Vegetation removal and sediment basin cleaning occurred between November 11, 2013 and November 15, 2013. Removal of the berm and subsequent grading occurred between November 25, 2013 and December 5, 2013.

To perform due diligence and to the greatest extent assure that no sensitive biological resources were impacted, Lehigh Hanson took measures to protect sensitive wildlife species when working in areas near Permanente Creek.

California Red-Legged Frog (CRLF)

The Project Area is outside of the PCRA Subareas, therefore COAs 59-61 regarding CRLF did not apply. However, to perform due diligence, several measures were taken to ensure protection of CRLF. WRA qualified biologists conducted pre-construction surveys on November 7 and 8 2013, which consisted of two night time surveys immediately preceding the date of construction (see Appendix A, CRLF Pre-construction Survey Memo). The surveys found no signs of CRLF.

A biological monitor was on site and observed all vegetation clearing and sediment removal occurring from November 11 - 15, 2013. Grading occurred between November 25 and December 5, 2013 for which a biological monitor was present as well. In addition, a biological exclusion fence was installed between Pond 13 in Permanente Creek and the construction area to ensure that no wildlife entered the construction area from the PCRA. After the completion of the exclusion fence, biological monitoring was limited to twice daily checks occurring prior to start of work in the morning and a second check mid-day. All construction took place during dry days and avoided the dawn and dusk hours to minimalize potential for CRLF activity. No precipitation occurred during the construction periods. Construction monitoring logs are included as Appendix A.

Avian Species

COA 46 states that ground disturbance and vegetation removal activity "should occur between September 1 and January 30, outside of the breeding season for most bird species." Construction activity for this project took place within this time period, therefore pre-construction nesting bird surveys were not required or warranted. Biological construction monitors did not observe any nests or breeding bird activity prior to or during construction.

Bat Species

COAs 48-52, governing the protection of bat species, did not apply to this construction activity due to the timing and location of the project, and lack of tree removal. No potential bat roosting habitat was removed during this project, therefore COAs 48 and 49 did not apply. The construction area was more than 100 feet from woodland habitat, no trees were felled during construction activity, and no bat roosts were destroyed.

San Francisco Dusky Footed Woodrat

The Project Area was located in active quarry and ruderal herbaceous grassland communities with pockets of willows surrounding the sedimentation basins. Construction activity did not take place in woodland or scrub/chaparral communities therefore COA 53 did not apply. Although two woodrat nests were observed by a WRA biologist outside of the Project Area to the north, this area was not disturbed and nest dismantling was not required or warranted.

Summary

In anticipation of work required around the cleaning and regrading of Sedimentation Basins 13a and 13b, WRA biologists performed preconstruction surveys, installed an exclusion fence, and performed daily construction monitoring to ensure no CRLF were impacted by the Project. The work was also timed to avoid nesting bird season and bat hibernation season. Although COAs regarding the protection of avian, bat and woodrat species did not apply, special attention was given to make sure these biological resources were not affected. Per the Final Conditions of Approval and mitigation measures within the Environmental Impact Report, all requirements for proceeding with vegetation removal and ground disturbance have been met.

APPENDIX A:

DAILY CONSTRUCTION MONITORING LOGS AND CALIFORNIA RED-LEGGED FROG BIOLOGICAL MONITORING MEMO

ENVIRONMENTAL CONSULTANTS

August 21, 2014

Greg Knapp
Lehigh Hanson
24001 Stevens Creek Boulevard
Cupertino, California 95014

RE: Summary of Pre-construction Surveys and Biological Monitoring for California Red-legged Frog at Pond 13 and Sediment Basins 13a and 13b at the Permanente Quarry, Cupertino, California.

Dear Mr. Knapp,

The purpose of this letter is to provide the results of the pre-construction surveys for California red-legged frog (*Rana draytonii*; CRLF) conducted by WRA for the sediment and vegetation removal work at the operational sedimentation basins at the Lehigh Permanente Quarry located in Cupertino California. Surveys were conducted per the direction of the Permanente Quarry Environmental Manager and are consistent with due diligence surveys historically performed at Permanente Quarry.

The entirety of the sediment removal work-areas was visually surveyed on the two consecutive nights immediately preceding sediment removal work on November 7th and 8th, 2013. The two surveys began no earlier than one hour after sunset. Areas immediately surrounding the work areas and the adjacent banks of Permanente Creek were also inspected for presence of CRLF.

At the time of the surveys, Pond 13, inline with Permanente Creek was inundated but contained high densities of western mosquitofish (*Gambusia affinis*). Sediment Basin 13b was dry and the uphill Sedimentation Basin 13a was wetted. CRLF were not observed within or immediately adjacent to Pond 13, or Sedimentation Basins 13a or 13b. Weather conditions during the survey were within the tolerances of CRLF and within the prescribed conditions of the U.S. Fish and Wildlife Service *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog August 2005*.

Pond 14 was surveyed as a reference location. Pond 14, located at the northeast corner of the Permanente Quarry, is known to support CRLF. CRLF were observed in abundance at Pond 14 on both October 23rd and 24th, suggesting that climactic conditions were suitable to detect CRLF, should they occur.

Based on the results of the two pre-construction surveys, Pond 13, and Sedimentation Basins 13a and 13b were determined to be uninhabited by CRLF. Furthermore, CRLF were not encountered during sediment removal activities.
Please feel free to contact me should you have any questions.

Sincerely,

Sean Avent
Associate Biologist

PERMANENTE QUARRY PONDS 13A AND 13B SEDIMENT BASIN PROJECT
DAILY CONSTRUCTION MONITORING LOG

SITE: __Lehigh Permanente Quarry - Pond 13A & Pond 13B **DATE:**____12/5/2013_______

TIME ONSITE: ____0900/1215________ **TIME OFFSITE:** __1000/1415____________

CONSTRUCTION START TIME:__930_______ **CONSTRUCTION STOP TIME:**_1415_

SUNRISE:_____0702_____________________ **SUNSET:**__1646_________________

*Construction should occur only between ½ hour after sunrise and ½ hour before sunset.

BIOLOGIST NAME: ___ Sean Avent____________________________________

Weather conditions: ____Sunny, clear, partly cloudy by afternoon. High of 55 degrees Fahrenheit per www.wunderground.com. Wind 0-5mph. Maximum humidity of 65.____

Creekbed condition: __ Creekbed condition: No creek in immediate activity area, though Pond 13A would drain directly into Pond 13, which is in the channel of Permanente Creek. However, the Permanente Creek channel immediately upstream and downstream of Pond 13 does not presently have flowing or standing water.

CRLF Observed: Yes___ No_X__ If yes, fill out the following:

Species: ________________________________

Location: ____ Time:________________

Agency contact: ____

Other Species Observed: __________ Unknown nonbreeding birds outside of the construction area.____

Construction Activity: __Sediment basin grading and sediment removal. Fill was brought to Pond 13A by a 7770 truck, and then a Volvo excavator placed the fill in the pond to build the slope up. Previously excavated sediment was hauled to the Pit. Exclusion fence installation ____

Notes/other observations: Sedimentation basins contain no vegetation. Pond 13A is dry. Pond 13B has a small amount of turbid water in the bottom. All activity took place in Pond 13A and 13B. WRA biologist surveyed the site at 0900 prior to construction and saw no signs of California red-legged frog. WRA biologists left the site and returned at 1215. Subsequent inspections showed no sign of any frog species. While construction activity was taking place in Pond 13A, an exclusion fence was placed along the berm/access road at the western end of Pond 13B, between the pond and Permanente Creek, to prevent frogs from entering the work area. WRA left the site after the fence was placed.

____
Biologist signature

2169-G East Francisco Blvd., San Rafael, CA 94901 (415) 454-8868 tel (415) 454-0129 fax info@wra-ca.com www.wra-ca.com

ENVIRONMENTAL CONSULTANTS

PERMANENTE QUARRY PONDS 13A AND 13B SEDIMENT BASIN PROJECT
DAILY CONSTRUCTION MONITORING LOG

SITE: __Lehigh Permanente Quarry - Pond 13A & Pond 13B **DATE:**___12/4/2013_______

TIME ONSITE: ____0930/1200_________ **TIME OFFSITE:** __0945/1400____________

CONSTRUCTION START TIME:__1000_______ **CONSTRUCTION STOP TIME:**_see notes_

SUNRISE:______0702_____________________ **SUNSET:**___1646__________________

*Construction should occur only between ½ hour after sunrise and ½ hour before sunset.

BIOLOGIST NAME: ___Scott Batiuk, Sean Avent_____________________________________

Weather conditions: ____Sunny, mostly clear, cloudy by afternoon. High of 52 degrees Fahrenheit per www.wunderground.com. Gentle breeze. Maximum humidity of 64.____

Creekbed condition: __ Creekbed condition: No creek in immediate activity area, though Pond 13A would drain directly into Pond 13, which is in the channel of Permanente Creek. However, the Permanente Creek channel immediately upstream and downstream of Pond 13 does not presently have flowing or standing water. ______________________

CRLF Observed: Yes___ No_X__ If yes, fill out the following:

Species: ______________________________

Location: ____ Time:_______________

Agency contact: ____

Other Species Observed: __________ Unknown birds outside of the ponds.

Construction Activity: __Detention pond backfilling and redesigning. Fill was brought to Pond 13A by a 7770 truck, and then a Volvo excavator placed the fill in the pond to build the slope up.____

Notes/other observations: Both ponds contain no vegetation. Pond 13A is dry. Pond 13B has a small amount of turbid water. All activity took place in Pond 13A. WRA biologists surveyed the site at 0930 prior to construction and saw no signs of California red-legged frog. WRA biologists left the site and returned at 1200. Subsequent inspections showed no sign of any frog species. While construction activity was taking place in Pond 13A, an exclusion fence was placed along the berm/access road at the western end of Pond 13B, between the pond and

Permanente Creek, to prevent frogs from entering the work area. WRA left the site after the fence was placed.

Biologist signature

ENVIRONMENTAL CONSULTANTS

PERMANENTE QUARRY POND 13A AND 13B SEDIMENT BASIN PROJECT
DAILY CONSTRUCTION MONITORING LOG

SITE: Lehigh Permanente Quarry—Ponds 13A & 13B **DATE:** 11/27/2013

TIME ONSITE: 0700 **TIME OFFSITE:** 1500

CONSTRUCTION START TIME: 0730 **CONSTRUCTION STOP TIME:** 1500

SUNRISE: 0700 **SUNSET:** 1643

*Construction should occur only between ½ hour after sunrise and ½ hour before sunset.

BIOLOGIST NAME: Scott Batiuk

Weather conditions: Sunny, scattered clouds. High of 63 degrees Fahrenheit per www.wunderground.com. Gentle breeze. Maximum humidity of 89.

Creekbed condition: No creek in immediate activity area, though Pond 13A would drain directly into Pond 13, which is in the channel of Permanente Creek. However, the Permanente Creek channel immediately upstream and downstream of Pond 13 does not presently have flowing or standing water.

CRLF Observed: Yes___ No_X__ If yes, fill out the following:

Species: ______________________

Location: ______________________ Time: ____________

Agency contact: ______________________

Other Species Observed: Unknown birds outside of the ponds.

Construction Activity: Detention pond backfilling and redesigning. Pond 13B was first reshaped, then the barrier between Pond 13A and Pond 13B was breached so that the water from Pond 13A flowed into Pond 13B. A Volvo excavator was used for construction activity.

Notes/other observations: Ponds appear to be scraped clean of vegetation in waterbody and on all sides of banks. This is likely the result of scheduled cleanout activities during the prior two days. Pond 13A has turbid water with no visible animal activity. Pond 13B was completely dry at the beginning. The barrier between Pond 13A and Pond 13B was breached at 1410, and all water flowed directly into Pond 13B. No visible animal activity in the water flowing from Pond 13A to Pond 13B. No water entered Permanente Creek as a result of construction activity.

Biologist signature

ENVIRONMENTAL CONSULTANTS

PERMANENTE QUARRY PONDS 13A AND 13B SEDIMENT BASIN PROJECT
DAILY CONSTRUCTION MONITORING LOG

SITE: __Lehigh Permanente Quarry - Pond 13A & Pond 13B **DATE:** 11/11/2013

TIME ONSITE: 06:50 **TIME OFFSITE:** 1430

CONSTRUCTION START TIME: 0735 **CONSTRUCTION STOP TIME:** 1415

SUNRISE: 0638 **SUNSET:** 1642

*Construction should occur only between ½ hour after sunrise and ½ hour before sunset.

BIOLOGIST NAME: Reuben Brandt

Weather conditions: ____Partly cloudy. High of 60 degrees Fahrenheit per www.wunderground.com. Wind 5-10mph.

Creekbed condition: __ Creekbed condition: No creek in immediate activity area, though Pond 13A would drain directly into Pond 13, which is in the channel of Permanente Creek. However, the Permanente Creek channel immediately upstream and downstream of Pond 13 does not presently have flowing or standing water. Sediment basin 13a retained water.

CRLF Observed: Yes___ No_X__ If yes, fill out the following:

Species: ____________________

Location: ____________________ Time: ____________

Agency contact: ____________________

Other Species Observed: Nonbreeding birds outside of the construction area._Woodrat nests in the willows uphill from Pond 13a were not disturbed.

Construction Activity: Continuation of sediment basin vegetation removal and sediment cleanout. Excavated sediment was side cast to dry out before hauling away.

Notes/other observations: Both sedimentation basins contained vegetation, which was removed. Pond 13A was mostly dry. Pond 13B has a fair amount of water. All activity took place in Pond 13A and 13B. WRA biologist was onsite for all vegetation and sediment removal activities. Monitoring and pre-work inspections showed no sign of any frog species. While construction activity was taking place in Pond 13A, BMP's were reinforced along the berm/access road to sediment from flowing downhill past pond 13b.

____
Biologist signature

ENVIRONMENTAL CONSULTANTS

PERMANENTE QUARRY PONDS 13A AND 13B SEDIMENT BASIN PROJECT
DAILY CONSTRUCTION MONITORING LOG

SITE: __Lehigh Permanente Quarry - Pond 13A & Pond 13B **DATE:** 11/12/2013

TIME ONSITE: 06:50 **TIME OFFSITE:** 1430

CONSTRUCTION START TIME: 0735 **CONSTRUCTION STOP TIME:** 1415

SUNRISE: 0638 **SUNSET:** 1641

*Construction should occur only between ½ hour after sunrise and ½ hour before sunset.

BIOLOGIST NAME: Reuben Brandt

Weather conditions: ____Partly cloudy. High of 60 degrees Fahrenheit per www.wunderground.com. Wind 5-10mph.

Creekbed condition: __ Creekbed condition: No creek in immediate activity area, though Pond 13A would drain directly into Pond 13, which is in the channel of Permanente Creek. However, the Permanente Creek channel immediately upstream and downstream of Pond 13 does not presently have flowing or standing water. Sediment basin 13a retained water.

CRLF Observed: Yes___ No_X__ If yes, fill out the following:

Species: ____________________

Location: ____________________ Time: __________

Agency contact: ____________________

Other Species Observed: __________ Nonbreeding birds outside of the construction area._Woodrat nests in the willows uphill from Pond 13a were not disturbed.

Construction Activity: __Continuation of sediment basin vegetation removal and sediment cleanout. Excavated sediment was side cast to dry out before hauling away.

Notes/other observations: Both sedimentation basins contained vegetation, which was removed. Pond 13A was mostly dry. Pond 13B has a fair amount of water. All activity took place in Pond 13A and 13B. WRA biologist was onsite for all vegetation and sediment removal activities. Monitoring and pre-work inspections showed no sign of any frog species. While construction activity was taking place in Pond 13A, BMP's were reinforced along the berm/access road to sediment from flowing downhill past pond 13b.

Biologist signature

ENVIRONMENTAL CONSULTANTS

PERMANENTE QUARRY PONDS 13A AND 13B SEDIMENT BASIN PROJECT
DAILY CONSTRUCTION MONITORING LOG

SITE: __Lehigh Permanente Quarry - Pond 13A & Pond 13B **DATE:**____11/25/2013______

TIME ONSITE: ____0800________ **TIME OFFSITE:** __1430__________

CONSTRUCTION START TIME:__0815_______ **CONSTRUCTION STOP TIME:**_1415_

SUNRISE:______0702____________________ **SUNSET:**__1646_______________

*Construction should occur only between ½ hour after sunrise and ½ hour before sunset.

BIOLOGIST NAME: ___ Reuben Brandt_________________________________

Weather conditions: ____Sunny, clear. High of 62 degrees Fahrenheit per www.wunderground.com. Wind 5-10mph.

Creekbed condition: __ Creekbed condition: No creek in immediate activity area, though Pond 13A would drain directly into Pond 13, which is in the channel of Permanente Creek. However, the Permanente Creek channel immediately upstream and downstream of Pond 13 does not presently have flowing or standing water. Sediment basin 13a retained water.

CRLF Observed: Yes___ No_X__ If yes, fill out the following:

Species: ______________________________

Location: ____ Time:______________

Agency contact: ____

Other Species Observed: __________ Unknown nonbreeding birds outside of the construction area.____

Construction Activity: __Sediment basin vegetation removal and sediment cleanout. Excavated sediment was side cast to dry out before hauling away.

Notes/other observations: Both sedimentation basins contained vegetation, which was removed. Pond 13A was mostly dry. Pond 13B has a fair amount of water. All activity took place in Pond 13A and 13B. WRA biologist was onsite for all vegetation and sediment removal activities. Monitoring and pre-work inspections showed no sign of any frog species. While construction activity was taking place in Pond 13A, BMP's were placed along the berm/access road to sediment from flowing downhill past pond 13b.

____
Biologist signature

wra
ENVIRONMENTAL CONSULTANTS

PERMANENTE QUARRY PONDS 13A AND 13B SEDIMENT BASIN PROJECT
DAILY CONSTRUCTION MONITORING LOG

SITE: __Lehigh Permanente Quarry - Pond 13A & Pond 13B **DATE:** 11/26/2013

TIME ONSITE: 0800 **TIME OFFSITE:** 1430

CONSTRUCTION START TIME: 0815 **CONSTRUCTION STOP TIME:** 1415

SUNRISE: 0702 **SUNSET:** 1646

*Construction should occur only between ½ hour after sunrise and ½ hour before sunset.

BIOLOGIST NAME: ___ Reuben Brandt

Weather conditions: ____Partly cloudy. High of 60 degrees Fahrenheit per www.wunderground.com. Wind 5-10mph.

Creekbed condition: __ Creekbed condition: No creek in immediate activity area, though Pond 13A would drain directly into Pond 13, which is in the channel of Permanente Creek. However, the Permanente Creek channel immediately upstream and downstream of Pond 13 does not presently have flowing or standing water. Sediment basin 13a retained water.

CRLF Observed: Yes___ No_X__ If yes, fill out the following:

Species: ____________________

Location: ____________________ Time: ____________

Agency contact: ____________________

Other Species Observed: __________ Nonbreeding birds outside of the construction area._Woodrat nests in the willows uphill from Pond 13a were not disturbed.

Construction Activity: __Continuation of sediment basin vegetation removal and sediment cleanout. Excavated sediment was side cast to dry out before hauling away.

Notes/other observations: Both sedimentation basins contained vegetation, which was removed. Pond 13A was mostly dry. Pond 13B has a fair amount of water. All activity took place in Pond 13A and 13B. WRA biologist was onsite for all vegetation and sediment removal activities. Monitoring and pre-work inspections showed no sign of any frog species. While construction activity was taking place in Pond 13A, BMP's were reinforced along the berm/access road to sediment from flowing downhill past pond 13b.

Biologist signature

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APPENDIX G:

UPDATED STORMWATER POLLUTION PREVENTION PLAN

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STORMWATER POLLUTION PREVENTION PLAN

STORMWATER POLLUTION PREVENTION PLAN

Lehigh Southwest Cement Company
Permanente Plant and Quarry
24001 Stevens Creek Boulevard
Cupertino, California

Submitted To: Lehigh Southwest Cement Company and Hanson Permanente Cement, Inc.
24001 Stevens Creek Blvd.
Cupertino, CA 95014

Submitted By: Golder Associates Inc.
425 Lakeside Drive
Sunnyvale, CA 94085

May 16, 2014

Project No. 123-8150-201

Golder Associates

Stormwater Pollution Prevention Plan (SWPPP)
Project Information and Certification

May 2014
Regional Water Quality Control Board Order No. R2-2014-0010
NPDES Permit No. CA0030210

Project Information

Prepared for:	Lehigh Southwest Cement Company and Hanson Permanente Cement, Inc. 24001 Stevens Creek Blvd. Cupertino, CA 95014
Contact:	Alan Sabawi, Plant Manager (408) 996-4231
CIWQS Place No.:	273205

Reviewing Agency

Jurisdiction:	Regional Water Quality Control Board, Central Coast Region
Permit Number:	CA0030210
Contact:	John Madigan, P.E. at (510) 622-2405

Project Engineer

Prepared by:	Golder Associates Inc. 425 Lakeside Drive Sunnyvale, CA 94085 (408) 220-9223 (408) 220-0224 (fax)
Contact:	Tim Bauters, Ph.D., P.E.
Project Number:	123-8150-201

Plan Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Alan Sabawi
Plant Manager

5/16/14
Date

Record of Revisions

Revision Number	Prepared by	Description of Revision	Date of Revision
	Original Issue Golder	All	May 2014

Table of Contents

1.0 INTRODUCTION 1
2.0 STORMWATER PLANNING AND ORGANIZATION 3
2.1 Position Responsibilities 3
2.2 Pollution Prevention Team 3
2.2.1 Team Responsibilities 3
2.2.2 Responsible Persons 3
2.3 Other Requirements and Existing Facility Plans 4
3.0 FACILITY DESCRIPTION 5
3.1 Facility Location and Layout 5
3.2 Surrounding Activities and Structures 5
3.3 Site Drainage 5
3.3.1 Pond 13B (Discharge Point No. 002) 6
3.3.2 Pond 9 (Discharge Point No. 003) 6
3.3.3 Pond 17 (Discharge Point No. 004) 7
3.3.4 Pond 20 (Discharge Point No. 005) 7
3.3.5 Pond 30 (Discharge Point No. 006) 7
3.3.6 Reclaim Water System 8
3.4 Locations of Exposed Industrial Activities and Industrial Materials 8
3.5 Erosion Potential 8
4.0 DESCRIPTION AND ASSESSMENT OF INDUSTRIAL ACTIVITIES AND MATERIALS, POTENTIAL POLLUTANT SOURCES, AND POLLUTANTS 9
4.1 Quarry, Primary Crusher, Rock Plant, and Cement Plant 10
4.2 Surge Pile 10
4.3 Rock Plant Equipment Storage 10
4.4 EMSA 10
4.5 Cement Plant Stockpile Storage 11
4.6 Electrical, Vehicle, and Equipment Storage Area 11
4.7 Truck and Equipment Maintenance 11
4.8 Truck Washing Area 12
4.9 Former Aluminum Plant Equipment Storage 12
4.10 Additional Areas 12
4.10.1 QC Laboratory 12
4.10.2 Wastewater Treatment Plant 12
4.11 Non-Stormwater Discharges 12
5.0 BEST MANAGEMENT PRACTICES 13
5.1 Good Housekeeping 13
5.2 Preventative Maintenance 14

5.3 Spill and Leak, Prevention and Response 14
5.4 Material Handling and Waste Management 15
5.5 Fuel, Oil, Used Oil, and Antifreeze Delivery and Pickup 15
5.6 Leakage of Oil from Stored Equipment and Vehicles 16
5.7 Equipment/Vehicle Fueling 16
5.8 Erosion and Sediment Control 16
5.9 Employee Training Program 17
5.10 Quality Assurance and Record Keeping 17
6.0 ADVANCED STRUCTURAL, SOURCE CONTROL, AND TREATMENT BMPS 18
6.1 Overhead Coverage 18
6.2 Stormwater Retention Basins 18
6.3 Particle Filtration 18
6.4 Secondary Containment 19
6.5 Advanced Erosion and Sediment Control 19
6.5.1 Erosion Control 19
6.5.2 Sediment Control 20
7.0 MONITORING AND REPORTING PROGRAM 22
8.0 REFERENCES 23

List of Tables

Table 1 Pollution Prevention Team
Table 2 Materials Inventory
Table 3 Activity, Sources, Potential Pollutants, and Recommended BMPs

List of Figures

Figure 1 Regional Setting
Figure 2 Site Vicinity
Figure 3 SWPPP Site Map Overview
Figure 4 Catchment Discharge Point 002
Figure 5 Catchment Discharge Point 003
Figure 6 Catchment Discharge Point 005
Figure 7 Catchment Discharge Point 006

List of Appendices

Appendix A BMP Inspection Form
Appendix B Employee Training Log
Appendix C California Stormwater Quality Association (CASQA) BMP Handbook Fact Sheets

1.0 INTRODUCTION

Golder Associates Inc. (Golder) has prepared this Stormwater Pollution Prevention Plan (SWPPP) for the Permanente Plant (Facility) located at 24001 Stevens Creek Blvd., Cupertino, Santa Clara County. The Facility is a limestone quarry and cement production facility that also produces construction aggregate. Lehigh Southwest Cement Company operates and Hanson Permanente Cement, Inc., (Lehigh) owns the Facility.

The Facility's surface water discharges, including stormwater, are regulated by waste discharge requirements (WDRs) in Order Number R2-2014-0010, National Pollutant Discharge Elimination System (NPDES) Permit Number CA0030210 (NPDES Permit), and Cease and Desist Order (CDO) Number R2-2014-0011. With an effective date of May 1, 2014, the NPDES permit prohibits any process water-related discharges except through a single, treated, discharge point (Discharge Point 001, Pond 4A), such that all remaining discharge points are comprised of stormwater and/or authorized non-stormwater. The CDO allows limited process water discharges until October 1, 2014 and establishes other interim prohibitions as well as interim effluent limitations that apply to the Facility discharges until October 1, 2017 when the prohibitions and limitations in the NPDES Permit will be in full effect.

Golder has prepared this SWPPP on behalf of Lehigh consistent with Provision C.6.a of the NPDES Permit and item a in Table 4 of the CDO. The NPDES Permit requires Lehigh to prepare a SWPPP that contains information and describes measures consistent with the requirements in Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities, NPDES General Permit No. CAS000001 (State Water Board Order No. 97-03-DWQ), Section A, Storm Water Pollution Prevention Plan Requirements (General Permit). The NPDES Permit Provision VI.C.6 also provides SWPPP requirements.

The CDO requires Lehigh to prepare a SWPPP that identifies measures to ensure compliance with NPDES Permit prohibitions and discharge limitations applicable to stormwater discharges. The prohibitions limit discharges from Discharge Point Nos. 002 – 006 (Ponds 13B, 9, 17, 20 and 30) except as a result of precipitation or to discharge stored water and the effluent limitations include numerical limits applied to total suspended solids (TSS), oil and grease (O&G), pH, settleable matter, and turbidity. The NPDES Permit also includes stormwater action levels for certain metals, conductivity, visible oil, and visible color that will be considered in this SWPPP.

Stormwater in several drainage areas, or catchment areas, of the Facility are comingled with process waters, and therefore, the NPDES Permit requires that these catchment areas be discharged through a single, treated discharge point (Discharge Point No. 001) after October 1, 2014. The CDO requires a separate pollution prevention plan for the catchments that have comingled process water and stormwater, which will be discharged through a single, treated discharge point (Discharge Point No. 001).

The purpose of the SWPPP is to protect surface water quality by reducing the amount of pollutants in stormwater runoff for Discharge Point Nos. 002 through 006. The industrial activities at the Facility generally include mining, processing of minerals, production of Portland cement, and crushing of limestone and other rock types quarried onsite to create construction aggregates.

The SWPPP has two major objectives:

- To identify and evaluate sources of pollutants associated with industrial activities that may affect the quality of stormwater discharges from the Facility; and
- To identify and implement site-specific Best Management Practices (BMPs) to reduce or prevent pollutants associated with industrial activities in stormwater discharges.

Preparation of this SWPPP does not guarantee compliance with the CDO or NPDES Permit. It is the responsibility of Lehigh to implement the necessary BMPs and recommendations set forth in this document.

This SWPPP has been prepared by Golder for the exclusive use of Lehigh. Golder prepared this SWPPP based upon information provided by Lehigh and a site visit conducted by George Wegmann and Mark Naugle, PE of Golder on April 21, 2014.

2.0 STORMWATER PLANNING AND ORGANIZATION

This section of the SWPPP identifies specific individuals that comprise the Lehigh Pollution Prevention Team (PPT) that are responsible for developing, implementing, and revising the SWPPP. The PPT will review the SWPPP annually and update the SWPPP as necessary. This SWPPP is a public domain document.

2.1 Position Responsibilities

The Plant Manager provides overall management of the implementation of this SWPPP. The Stormwater Team Leader/ Environmental Manager provides coordination of the implementation of this SWPPP.

2.2 Pollution Prevention Team

The PPT will assist the Plant Manager implement the SWPPP, identify necessary SWPPP revisions, and conduct required monitoring activities. The Lehigh PPT is further described in the following sections.

2.2.1 Team Responsibilities

The PPT is comprised of several key individuals as shown in Table 1. Each member is listed in the table along with his/her job title and responsibilities. The PPT is responsible for:

- Implementing the SWPPP.
- Assisting in SWPPP maintenance and modification.
- Holding regular meetings to review the overall operation of BMPs.
- Establishing responsibilities for sampling, inspections, operations and maintenance, and availability for emergency situations.
- Arranging for training of all team members in the operation, maintenance and inspections of BMPs.
- Conducting good housekeeping inspections of the Facility. Any spills, leaks or other potential sources of pollutants will be identified and removed.

2.2.2 Responsible Persons

Alan Sabawi, Plant Manager, is the Responsible Person (RP) for stormwater pollution prevention at this facility, and is responsible for oversight of:

- SWPPP development
- Implementation and revision of the SWPPP
- Implementation of monitoring program activities required in the NPDES Permit

The designated Alternate RP, Ricardo Del Valle, Assistant Plant Manager, will perform these duties in the absence of the RP.

2.3 Other Requirements and Existing Facility Plans

The Facility's air emissions are regulated by a Title V - Major Facility Review Permit issued by the Bay Area Air Quality Management District (BAAQMD). According to BAAQMD Condition 24621, Lehigh maintains and implements a Fugitive Dust Control Plan (Lehigh 2010) consistent with the Title V permit. Control measures identified in this plan will reduce the generation of particulates that could be exposed to stormwater at the Facility.

The NPDES Permit requires that Lehigh develop a Facility Reliability Assurance Plan (FRAP) no later than May 16, 2014 that describes measures in place to ensure the reliability of the Facility's system in preventing inadequately treated wastewater from being discharged and in preventing catastrophic failures of ponds. Wastewater will be referred to herein as process water and includes process water from the Reclaim Water System, Quarry, and Primary Crusher and stormwater which comingles with process water.

The NPDES Permit requires that Lehigh maintain a BMP Plan in usable condition and available for reference and use by all appropriate personnel. The BMP Plan shall be developed and implemented to minimize the potential impact of periodic discharges to Permanente Creek, to prevent the accidental release of toxic or hazardous substances into the environment, and to minimize and mitigate the effects of any such releases using equipment and techniques available and practical for such use. The BMP Plan will be consistent with U.S. EPA's Guidance Manual for Developing Best Management Practices (October 1993, EPA 833-B-93-004) and will, at minimum, include BMPs described in NPDES General Permit No. CAS000001 (State Water Board Order No. 97-03-DWQ), Section A, Storm Water Pollution Prevention Plan Requirements.

Other plans that describe the management of materials and practices at this facility, which may affect the management of stormwater include:

- Spill Prevention Control and Countermeasure Plan (SPCC)
- Hazardous Materials Business Plan (HMBP)
- Emergency Contingency Plan
- Reclamation Plan Amendment

3.0 FACILITY DESCRIPTION

The following sections describe the Facility layout, industrial activities, and significant materials. Significant materials are those materials that should be considered when assessing potential stormwater pollutants.

3.1 Facility Location and Layout

The Facility is located at 24001 Stevens Creek Road in the southern San Francisco Bay Area, in the foothills of unincorporated western Santa Clara County, just west of the City of Cupertino as shown on Figures 1 and 2. The climate of the southern San Francisco Bay Area is Mediterranean, characterized by mild, wet winters and warm, dry summers.

Lehigh mines and processes minerals at the Facility and produces Portland cement and construction aggregate from limestone and stone quarried onsite. As shown on Figure 2, the Facility consists mainly of an active mining area (quarry), primary crusher, a cement plant, rock plant, material storage areas, and roads and a conveyor system for transporting the processed materials.

3.2 Surrounding Activities and Structures

Land to the west of the Facility is open space. Stevens Creek Quarry is located to the south of the Facility (Figure 2) along with rural residential areas and small agricultural operations including some vineyards. Land uses to the east of the Facility include open space and recreational areas along with residential subdivisions. North of the Facility is open space and recreational areas. The areas surrounding the Facility that might produce run-on include vegetated slopes.

3.3 Site Drainage

The Facility lies within the Permanente Creek watershed. Permanente Creek discharges into southern San Francisco Bay. Precipitation that falls within the Facility is managed within six catchment areas. These catchment areas are shown on Figure 3. The catchment areas are identified by the retention basins or ponds where stormwater runoff within the catchment areas is captured. The ponds discharge via standpipe and culverts to Permanente Creek.

The pond discharges are identified in the NPDES permit as Discharge Point Nos. 001 through 006. The stormwater related catchment areas and associated discharge locations are listed below:

- Pond 13B (Discharge Point No. 002)
- Pond 9 (Discharge Point No. 003)
- Pond 17 (Discharge Point No. 004)
- Pond 20 (Discharge Point No. 005)
- Pond 30 (Discharge Point No. 006)

Each of the stormwater drainage areas are described in the following sections. As noted previously, stormwater in several catchment areas (Discharge Point 001, Reclaim Water System including the Cement Plant, Rock Plant, and Truck Wash) of the Facility are comingled with process waters. The CDO requires a separate pollution prevention plan for these catchment areas, which provides further detail about the Reclaim Water System sources.

The following table summarizes the estimated stormwater runoff.

Catchment	Catchment Area (acres)	Estimated Peak Runoff 10-yr, 6-hr storm (cfs)
Pond 9	75	48.2
Pond 13B	11	10
Pond 17	110	93.6
Pond 20	45	44.5
Pond 30	95	40.4

Source: Golder 2014 Facility Reliability Assurance Plan.

Note: Pond 17 includes the entire Rock Plant catchment area, which is now directed to the Reclaim Water System (see Section 3.3.3)

3.3.1 Pond 13B (Discharge Point No. 002)

Pond 13B is located upgradient of the north bank of Permanente Creek. Stormwater runoff is collected near the top of the slope and is conveyed via culverts down to Pond 13B. The location of Pond 13B and the associated catchment is provided in Figure 4.

Water in Pond 13B is typically retained, evaporates, and/or infiltrates. Pond 13B also has an overflow pipe to allow direct discharge to Permanente Creek if the water level in the pond reaches the elevation of the overflow pipe. The inlet to the overflow pipe is at the top of the pond side slope at the downgradient end of the pond. The overflow pipe is a 24 inch corrugated metal pipe (CMP) that conveys the overflow waters down the slope, approximately fifty feet, in a controlled fashion into Permanente Creek. Since at least May 2007, no direct discharge from Pond 13B through this overflow pipe has been observed. In the future, Lehigh plans to install a low permeability liner in Pond 13B to reduce infiltration.

3.3.2 Pond 9 (Discharge Point No. 003)

Pond 9 is located adjacent to a road, and the north bank of Permanente Creek is adjacent to the other side of that road, south of the cement plant. The location of Pond 9 and the associated catchment, including the Dinky Shed Catchment, is provided in Figure 5. Pond 9 receives stormwater runoff from upgradient roads and hillsides, the Surge Pile, the cement plant stockpile storage, upper equipment storage area, and pumped water from the Dinky Shed Catchment. Pond 9 also currently receives excess process and/or storm water from the Reclaim Water System that is pumped from Pond 11, which is permitted under the CDO until October 1, 2014. A groundwater seep originating near the western portion of the rock plant may reach Pond 9 via a half CMP pipe and drainage swale.

The Dinky Shed Catchment receives stormwater runoff from a lower section of the Facility's Rock Plant access road. (Runoff from the upper section of the road flows to Pond 17.) Water from the Dinky Shed Catchment is pumped into Pond 9.

The Pond 9 discharge is treated with a filtration system.

3.3.3 Pond 17 (Discharge Point No. 004)

Pond 17 was previously designed to discharge stormwater flows from the Rock Plant area to Permanente Creek. However, the discharge pipe from Pond 17 to the creek has been plugged, and Pond 17 now receives Rock Plant process waters and/or localized stormwater that is either returned to the Rock Plant for on-site reuse or is diverted to the Cement Plant Reclaim Water System also for onsite re-use. For this reason, Pond 17 (Discharge Point No. 004) has been omitted from this plan.

3.3.4 Pond 20 (Discharge Point No. 005)

Pond 20 is located at the base of a slope south of the historical, non-operational, former Aluminum Plant and general plant entry road. The location of Pond 20 and the associated catchment is provided in Figure 6. Pond 20 is a shallow depression that receives stormwater runoff from the slope, former Aluminum Plant, the cement plant stockpile storage, and the entry road directly or from Pond 19, which drains the same catchment area. A portion of the stormwater runoff from the upper, western portion of Pond 20 catchment is conveyed downslope in a trench located next to the access road along the southern boundary of this catchment area, and into detention basin SB-7 (Figure 7). There is an outlet structure in SB-7 and discharge from this basin is then conveyed through an underground pipe and trench to Pond 20. The discharge from Pond 20 continues to flow easterly through vegetation, including Pond 21, and enters Permanente Creek near the entry road overpass.

3.3.5 Pond 30 (Discharge Point No. 006)

Pond 30 receives stormwater from the East Materials Storage Area (EMSA) and access roads. The location of Pond 30 and the associated catchment is provided in Figure 7. Stormwater runoff from the access road starting near the cement plant is conveyed downslope alongside the access road and is collected in detention basins (Ponds 31A and 31B) near the top of the slope and is conveyed via pipeline and drainage swales down to Pond 30. The operational areas around the eastern portion of the EMSA have been redirected to route flow into Pond 30. There is an outlet standpipe in Pond 30 that overflows through an underground pipe towards the east into vegetation and enters Permanente Creek near the entry road overpass.

3.3.6 Reclaim Water System

The Reclaim Water System is a complex combination of stormwater and non-stormwater process water from the Quarry, Rock Plant, Primary Crusher, Cement Plant, and Truck Wash, the control of which is not specifically included in this SWPPP. Further detail about the Reclaim Water System sources is included in the Pollution Prevention Plan.

3.4 Locations of Exposed Industrial Activities and Industrial Materials

Significant industrial activities and materials that could be exposed to stormwater in catchment areas for Discharge Point Nos. 002, 003, 005, and 006 include:

- Settled dust and particulates from mining of limestone and overburden in the Quarry
- Storage of overburden in the EMSA
- Settled dust and particulates from rock crushing at the Primary Crusher
- Onsite material transport by trucks on facility roads
- Fueling and servicing of equipment and vehicles
- Cement plant stockpile storage
- Settled dust and particulates from cement processing
- Electrical and/or vehicle and equipment storage areas
- Truck washing

The locations of these activities and materials are shown on Figure 3.

3.5 Erosion Potential

The Facility is primarily unpaved, except for the cement plant area. Erosion of non-vegetated areas can cause sediment mobilization and increased sediment loading in stormwater discharges. Additional sources of disturbed sediments include overburden in the EMSA and erosion from haul roads. The majority of the drainage pathways at the Facility flow toward retention ponds or are pumped from low lying areas into the respective retention ponds.

4.0 DESCRIPTION AND ASSESSMENT OF INDUSTRIAL ACTIVITIES AND MATERIALS, POTENTIAL POLLUTANT SOURCES, AND POLLUTANTS

The NPDES Permit establishes the monitoring program for stormwater and includes discharge limitations or action levels for the following potential stormwater pollutants:

- Discharge Limitations:
  - total suspended solids (TSS)
  - oil and grease (O&G)
  - pH
  - settleable matter
  - turbidity
- Action Levels:
  - conductivity
  - metals: chromium VI, mercury, nickel, selenium, thallium
  - visible oil
  - visible color

Industrial activities and materials at the facility that are potential sources of these pollutants include: materials the facility mines, crushes, and processes; materials storage; equipment fueling and maintenance; truck and equipment transport, repairs, maintenance, and washing; settled dust and particulates resulting from facility operations; and wastewater treatment.

Lehigh mines and processes limestone at the facility and produces Portland cement and construction aggregate. Overburden and limestone that is not suitable for cement manufacturing is deposited in materials storage areas or sold as construction rock. Finished Portland cement is shipped by bulk truck or trucked in bags to offsite commercial markets. Additionally, regulated hazardous materials are stored at the facility for use in all aspects of facility operations. An HMBP for the facility has been prepared and a copy is kept onsite and provided to local enforcement agencies.

Table 2 lists materials used outside of the Reclaim Water System and Discharge Point 001 that could be potential stormwater pollutants. The table provides a summary of industrial activities where stormwater run-off could originate along with potential sources of pollutants, potential pollutants, and the BMPs to prevent pollutants from entering the stormwater discharges. (Note, the Reclaim Water System and Discharge Point 001 are included in the PPP and BMP Plan). The most likely sources of stormwater pollutants are industrial processes that result in the release of dust and particles, oil and grease, metals, and high pH liquids. Potential pollutant sources are discussed further by area and process in the following sections.

4.1 Quarry, Primary Crusher, Rock Plant, and Cement Plant

As discussed in Section 1.0 and 3.3, the catchment areas that include stormwater from the Quarry, Rock Plant, and Cement Plant are not included in this SWPPP; however, dust generated from activities in these areas can migrate to other catchment areas, settle on exposed surfaces and potentially pollute stormwater. Fugitive dust emissions are controlled by implementing the Fugitive Dust Control Plan (Lehigh 2010). Also, as identified in Table 3, the Facility frequently sweeps paved areas to remove settled dust.

4.2 Surge Pile

Rock sourced from the quarry operation is stockpiled in the Surge Pile. As needed, this rock is transported by conveyor system to the Rock Plant for the production of aggregate. Stormwater contacting the Surge Pile can be exposed to pollutants including TSS, high pH, settleable matter, turbidity, conductivity, and metals. Stormwater runoff is conveyed through a drainage ditch along an access road to Pond 9. Several rock check dams within the ditch slow the runoff flows to reduce the particulate load in this runoff water.

During a rain event, portions of the dust suppression water applied to the rock on the conveyor may come into contact with stormwater that drains to Pond 9. The Facility will implement measures to collect the dust suppression water in sumps for conveyance to the Reclaim Water System prior to October 1, 2014.

4.3 Rock Plant Equipment Storage

The Facility stores inactive vehicles, tires, and equipment including process equipment in this area located along the western portion of the Rock Plant. The equipment is stored outdoors and exposed to stormwater. Stormwater in this area may be exposed to TSS, O&G, settleable matter, turbidity, conductivity, metals, visible oil, and visible color. Stormwater from this area flows to Pond 9 along an access road. The Facility maintains BMPs to reduce the flow velocity to reduce the amount of particles in the stormwater. Additionally, water discharged from Pond 9 is filtered. As part of good housekeeping procedures outlined in Section 5.0, these materials will be removed or covered.

4.4 EMSA

Soils and rock types not used in the cement process that are also mined are collectively described as overburden. Overburden and any unsuitable limestone are deposited in the EMSA according to a design described in the Quarry Reclamation Plan. Stormwater contacting the EMSA may be exposed to pollutants including TSS, high pH, settleable matter, turbidity, conductivity, and metals. Stormwater runoff from the EMSA flows through two retention ponds (Ponds 31A and 31B), drainage ditches, and culverts to Pond 30 to settle particles and reduce potential pollutants before discharge.

4.5 Cement Plant Stockpile Storage

Limestone is stockpiled in this storage area prior to processing in the cement plant. The limestone is transported by conveyor to the Cement Plant. Berms are present in the area to reduce stormwater run-on. Stormwater contacting limestone can be exposed to pollutants including TSS, high pH, settleable matter, turbidity, conductivity, and metals. The stormwater falling within the Cement Plant Stockpile Storage area flows in approximately equal proportions to Pond 9 and Pond 20. The stormwater flows along access roads and the Facility maintains BMPs to reduce the flow velocity to reduce the amount of particles in the stormwater. Water discharged from Pond 9 is filtered.

4.6 Electrical, Vehicle, and Equipment Storage Area

The Facility stores inactive vehicles, tires, and equipment including process equipment in this area. The Facility also stores fuel and materials for equipment maintenance in this area (oils, lubricants, etc.). The materials for equipment maintenance are stored indoors within secondary containment. The electrical substation for the Facility is also located in this area.

Although stored indoors, spill and leaks associated with the transfer of the materials used for equipment maintenance (See Section 4.6) can be tracked outdoors and be exposed to stormwater. The tires, vehicles, equipment, and process equipment are stored outdoors and exposed to stormwater. Stormwater in the Electrical, Vehicle, and Equipment Storage Area may be exposed to TSS, O&G, settleable matter, turbidity, conductivity, metals, visible oil, and visible color. Stormwater from this area flows to Pond 9 along an access road. The Facility maintains BMPs to reduce the flow velocity to reduce the amount of particles in the stormwater. Water discharged from Pond 9 is filtered.

4.7 Truck and Equipment Maintenance

Heavy equipment and trucks are used, repaired and maintained at the Facility. Routine fueling and maintenance are performed in specific maintenance and fueling areas that are in catchment areas not included in this SWPPP; however, repairs and maintenance can occur at any location of the facility due to equipment malfunction or due to operational constraints. Materials stored in the covered fuel and maintenance area or on the quarry service trucks that may pollute stormwater include diesel fuel, used and unused motor oil, miscellaneous lubricants, hydraulic fluids, and anti-freeze. These materials are delivered to the site on an as needed basis and the site implements the SPCC in regard to spill prevention including providing SPCC procedures to third party suppliers.

Leaks and spills of oil from containers and filters during transfer operations can expose stormwater to pollutants. Leaks and spills of oil from the tanks or drums could expose these materials to stormwater. Oil and fluid leaks from equipment during Facility operations could expose these materials to stormwater. The potential sources of stormwater pollutants from truck and equipment maintenance include:

- Leaks and spills of petroleum products during transfer operations
- Leaks and spills of used oil from the tank and drums
- Leaking of oil and fluids from trucks

4.8 Truck Washing Area

The Facility maintains wheel and vehicle washers near the Facility entrance. The washwater is collected and pumped to the Reclaim Water System. Customer vehicles and/ or equipment pass through the washers to prevent trackout onto public roads. Facility vehicles also pass through the washer before exiting the Facility. This area is routinely inspected to ensure washwater is contained and properly conveyed to the Reclaim Water System.

4.9 Former Aluminum Plant Equipment Storage

In an area directly northwest of the former Aluminum Plant, the Facility stores inactive vehicles and process equipment. The equipment is stored outdoors and is exposed to stormwater. Stormwater in this area appears to pond adjacent to the Former Aluminum Plant and may be exposed to TSS, O&G, settleable matter, turbidity, conductivity, metals, visible oil, and visible color. As part of good housekeeping procedures outlined in Section 5.0, these materials will be removed or covered.

4.10 Additional Areas

4.10.1 QC Laboratory

The Facility includes a materials testing or Quality Control (QC) Laboratory located along the northeast portion of the site (Figure 3). Chemical storage is indoors; however, raw materials including gravel are currently stored outdoors at the QC Laboratory Parking Lot. As part of good housekeeping procedures outlined in Section 5.0, these materials will be removed and the parking lot will be used for employee parking only and outside the scope of the stormwater program.

4.10.2 Wastewater Treatment Plant

The Facility operates a small wastewater treatment plant to treat domestic wastewater. This plant is permitted and discharges effluent to a thickener tank to be used as part of the Reclaim Water System. Sodium Hypochlorite is stored within this plant under cover and in secondary containment. While not anticipated to be significant amount, any stormwater runoff from the Wastewater Treatment Plant will be directed to the western access road and retained on-site.

4.11 Non-Stormwater Discharges

The Facility will implement measures to ensure non-stormwater process water discharges in contact with industrial areas do not occur.

5.0 BEST MANAGEMENT PRACTICES

Non-structural, or operational, BMPs generally consist of processes, prohibitions, procedures, schedule of activities, etc., that reduce potential for exposure of stormwater discharges. The following BMPs are applicable to Facility activities within catchments for Discharge Points Nos. 002 through 006. The Facility activities and associated BMPs are summarized on Table 3. Additionally, as noted in Section 2.3, a separate BMP Plan will be prepared and maintained at the Facility.

5.1 Good Housekeeping

The Facility will implement the good housekeeping BMPs described below.

- Observe all outdoor areas associated with industrial activities including stormwater discharge locations, drainage areas, conveyance systems, waste handling/disposal areas, and perimeter areas impacted by off-Facility materials or stormwater run-on to determine housekeeping needs. Any identified debris, waste, spills, tracked materials, or leaked materials shall be cleaned and disposed of properly.
- Before the wet season, inspect storm drain inlets and other conveyances, sedimentation traps and basins, retention ponds, and other BMPs in place at the Facility to assess efficacy. Remove accessible deposited sediment or debris as needed.
- Sweep paved areas of the Facility daily during the storm season (October 1 through May 30) and weekly during the remainder of the year. Use a regenerative truck sweeper and sweep inaccessible areas by hand. Conduct comprehensive and focused sweeping of paved areas before forecasted rain events.
- Place drip pans under equipment stored or parked for a week or longer
- Minimize or prevent materials tracking
- Minimize or reduce dust generated from industrial activities
- Ensure that Facility areas impacted by rinse/wash waters are cleaned as soon as possible
- Cover stored industrial materials that can be readily mobilized by contact with stormwater
- Contain stored non-solid industrial materials (e.g., liquid, powder, etc.) that can be transported or dispersed via wind or contact with stormwater
- Prevent disposal of any rinse/washwaters or industrial materials into the stormwater system
- Minimize or reduce stormwater discharges from non-industrial areas (e.g., stormwater flows from upland, non-industrial areas or from employee parking area) that contact industrial areas of the Facility

Good housekeeping measures are implemented in the maintenance areas to avoid spills or leaks being tracked outside. Per the Facility's SPCC Plan (LFR Inc. 2006), the following activities occur:

- A member of the PPT observes parking lots, driveways, and storage areas and removes trash and debris on a regular basis.
- Oils, other liquids, chemicals and used oils/liquids are stored in labeled containers with tight-fitting lids and secondary containment in the maintenance area or covered storage area.

- Suitable spill kits are maintained near the maintenance area and oil storage area
- Facility personnel promptly implement established spill cleanup procedures for leaks and spills. These procedures are detailed in the SPCC Plan
- In the event that vehicle or movable equipment maintenance or repairs are performed in uncovered areas, a member of the PPT inspects the area where the maintenance or repair occurred and ensures that waste products, including pollutant-containing fluids deposited or spilled on the ground as a result of the maintenance or repair are cleaned up.

Additionally, per the Reclamation Plan, the BMPs within the reclamation plan boundary are inspected during the rainy season at least once a month and after any significant rain event.

5.2 Preventative Maintenance

The Facility implements the preventative maintenance procedures described below.

- Identify equipment and systems used outdoors that may spill or leak potential stormwater pollutants
- Observe the identified equipment and systems to detect leaks, or identify conditions that may result in the development of leaks
- Establish an appropriate schedule for maintenance of identified equipment and systems
- Establish procedure for prompt maintenance and repair of equipment, and maintenance of systems when conditions exist that may result in the development of spills of leaks

A member of the PPT performs monthly visual inspections using checklists that include checking for signs of deterioration of equipment, containers, and metal accessories that are stored outside. The inspection identifies corrosion, structural failure, spills, leaks, etc. and equipment is repaired/ replaced as needed. The Facility performs inspections consistent with the SPCC, the HMBP, and this SWPPP. An example SWPPP BMP inspection form is included in Appendix A. Completed forms can be maintained in Appendix A and must be maintained for five years.

5.3 Spill and Leak, Prevention and Response

The Facility implements the spill prevention procedures described below consistent with the Facility SPCC and HMBP.

- Establish procedure and/or controls to minimize spills and leaks
- Develop and implement spill and leak response procedures to prevent industrial materials from discharging through the stormwater conveyance system. Spilled or leaked material shall be cleaned and disposed of properly.
- Identify and describe all necessary and appropriate spill and leak response equipment, location(s) of spill and leak response equipment, and spill or leak response equipment maintenance procedures
- Identify and train appropriate spill and leak response personnel

Facility personnel properly label and use lids to seal cans and drums storing liquids and use spigots, pumps, and funnels to dispense and transfer liquids to reduce the possibility of spills. Drip pans or other protective devices are used for liquid transfer operations to catch incidental spillage and drips from dispensing products from drums, barrels, or dispenser pumps. Used liquids, including petroleum hydrocarbons and coolant, are stored under cover and within secondary containment pending removal by a hazardous waste disposal contractor. Containers of products like paint, solvents, or cleaners are completely emptied before disposal in the solid waste garbage, returned to the supplier, or handled as hazardous waste if not empty. Spill cleanup kits are maintained near the material storage areas consistent with the SPCC.

Spills must be immediately reported to proper authorities. Reporting is required for spills of oil or hazardous substances greater than the reportable quantities described in CFR Title 40, Parts 302.4 and 117 and the Facility's SPCC and HMBP. Forms for describing significant spills and leaks and recording response procedures are included in the Facility's SPCC and HMBP.

5.4 Material Handling and Waste Management

The following material handling and waste management procedures are implemented as described below.

- Control dust generation by implementing the control measures in the Fugitive Dust Control Plan (Lehigh 2010)
- Prevent or minimize handling of industrial materials or wastes that can be readily mobilized by contact with stormwater during a storm event
- Cover waste disposal containers and materials storage containers when not in use
- If practicable, cover outdoor materials 48 hours ahead of likely storm events forecast at 50 percent or greater probability
- Divert run-on and stormwater generated from within the Facility away from all stockpiled materials
- Clean all spills of industrial materials/wastes that occur during handling in accordance with the spill response procedures in the Facility's SPCC and HMBP
- Observe and clean as appropriate, any other material/waste handling equipment or containers that can be contaminated by contact with industrial materials or wastes.

Equipment leak prevention and spill cleanup procedures are discussed in Sections 5.2 and 5.3.

5.5 Fuel, Oil, Used Oil, and Antifreeze Delivery and Pickup

Fuel, oil delivery and used oil and used antifreeze pickup is attended by a Facility representative. The lower most drain and outlets of delivery vehicles are inspected for evidence of leakage prior to filling and prior to departure. The ground surface is inspected for spills and drips and corrective action is taken as needed. The drains and outlets are tightened, adjusted, or replaced to prevent liquid discharge while in transit. If a spill due to a hose connection/equipment failure were to occur, the spilled material would be contained using spill kit material, and the resulting contaminated clean-up materials would be transferred to a storage container for off-site disposal. These procedures as well as a notification to vendors providing these services are included in the Facility's SPCC.

5.6 Leakage of Oil from Stored Equipment and Vehicles

Occasionally fuel, hydraulic oil, or engine oil may drip from stored vehicles and equipment. Any such leakage should be identified during daily inspection of the Facility and reported to the Stormwater Team Leader so that corrective actions can be taken to:

- Repair the equipment to eliminate the leak
- Contain the leak, using absorbent "diapers" or pads, or a pan or bucket, until equipment can be repaired
- Containerize and properly dispose of used absorbent materials, and replace that material used in the spill kit

5.7 Equipment/Vehicle Fueling

Equipment and vehicle fueling activities have the potential to contribute spillage of gasoline or diesel fuel. To ensure this activity does not contribute to hydrocarbon contamination of stormwater, the following BMPs are implemented and these activities are performed consistent with the Facility's SPCC:

- Fueling during heavy rainfall events will be avoided
- Fueling of equipment or vehicles will be attended by an operator
- Spill response kits with appropriate absorbent materials (oil dry, absorbent booms and pillows/pads) will be maintained and absorbents deployed at the time of a spill to insure complete and immediate clean up
- Used absorbent materials will be containerized and properly disposed of and materials used will be replaced in the spill kit

5.8 Erosion and Sediment Control

The majority of the Facility ground surface is unpaved. To prevent soil erosion and sediment transport in stormwater, the Facility implements the erosion and sediment control procedures described below to the extent practicable.

- Maintain effective perimeter controls; site entrances and exits are paved and swept to control discharges or tracking of erodible materials
- Control dust generation by implementing the control measures in the Fugitive Dust Control Plan (Lehigh 2010)
- Divert runoff from within the Facility away from erodible materials
- Maintain drainage and erosion control systems and all-weather working surfaces at the site
- Maintain vegetation on intermediate slopes, including track walking, hydroseeding and placement of mulch or straw on sparsely vegetated inactive earth surfaces prior to October 1 of each year. Advanced erosion and sediment control, structural controls, and specific implementation details are also discussed in Section 6.

5.9 Employee Training Program

The Facility implements the employee training program procedures described below and consistent with the SPCC and HMBP.

- Ensure that all team members implementing the various compliance activities in the SWPPP are adequately trained to implement the requirements of the NPDES Permit, including but not limited to: BMP implementation, BMP effectiveness evaluations, visual observations, and monitoring activities.
- Prepare or acquire appropriate training manuals or training materials
- Identify which personnel need to be trained, their responsibilities, and the type of training they shall receive
- Provide a training schedule
- Maintain documentation of all completed training classes and the personnel that received training in the SWPPP

The Facility has an established training program. The PPT will provide annual training for current and future employees. The PPT will provide training for new employees within 30 days. This training will include good housekeeping procedures, preventive maintenance, spill prevention and response, BMP maintenance, and record keeping.

Facility employees that have direct responsibilities in areas of the Facility that have the potential to impact stormwater will receive SWPPP training annually. More frequent training will be conducted as necessary to address employee turnover. All PPT and employee training is to be documented and the records will be stored with the SWPPP. Records of employee training are to be kept for at least 5 years. Employee training records may be kept on the form provided in Appendix B.

5.10 Quality Assurance and Record Keeping

The Facility implements the quality assurance and record keeping procedures described below.

- Develop and implement management procedures to ensure that appropriate staff implements all elements of the SWPPP, including the monitoring and reporting program in the NPDES Permit
- Develop a method of tracking and recording the implementation of BMPs identified in the SWPPP (BMP Inspection and Preventative Maintenance Log, Appendix A)
- Maintain the BMP implementation records, training records, and records related to any spills and clean-up related response activities for a minimum of five (5) years

The PPT or plant manager is responsible for ensuring that all elements of the SWPPP are implemented, that BMP implementation is tracked and recorded, and that all records required by the NPDES Permit and SWPPP are maintained for a minimum of 5 years. Quality assurance activities undertaken will be documented and entered into the SWPPP records.

6.0 ADVANCED STRUCTURAL, SOURCE CONTROL, AND TREATMENT BMPS

Structural BMPs are to be considered when non-structural BMPs have been ineffective. Structural BMPs consist of structural devices that reduce or prevent pollutants in stormwater discharges. Examples include:

- Overhead coverage
- Retention ponds, basins or surface impoundments
- Berms or other run-on/run-off channeling devices
- Secondary containment structures
- Treatment through inlet controls, filtration, or vegetative swales that reduce the pollutants in surface waters discharged from the site

The following structural controls are implemented at the Facility.

6.1 Overhead Coverage

The Facility stores petroleum products and other fluids and materials associated with equipment maintenance under cover to the extent practicable. This overhead coverage reduces or prevents the potential for stormwater pollutants associated with these activities from contacting or entering stormwater. These potential pollutants include TSS, O&G, metals, and visible oil.

6.2 Stormwater Retention Basins

Several stormwater retention basins are located at the Facility: Pond 9, Pond 13B, Pond 30, Pond 31A, Pond 31B, and SB-7. The locations of the stormwater retention basins are shown on Figure 3 and more detailed views are shown on Figures 4, 5, 6, and 7. Per the NPDES Permit requirement, the Pond 4A quarry water discharge will be treated (up to 400 gallons per minute) by October 1, 2014. Pond 17 is not included as a stormwater retention basin because of its current use. Pond 20, given its configuration as a drainage throughput, and not a traditional "pond," does not contain freeboard necessary to accomplish retention of stormwater flows.

Retention basins allow particulates to settle before stormwater is discharged. Potential pollutants mitigated by the retention basins include TSS, settleable matter, turbidity, conductivity, and metals. Annual sediment removal from these basins should be performed to maintain retention capacity and reduce potential pollutant exceedances associated with particulates.

6.3 Particle Filtration

The facility operates a particle filtration system at Pond 9 to filter stormwater before discharge. The filtration system consists of a series of sand filters. Pond 9 water is pumped through the filtration system and then is discharged to the Pond 9 discharge pipe. The backwash from the sand filters is pumped back to Pond 9.

6.4 Secondary Containment

The Facility uses secondary containment for the storage of petroleum products and other fluids and materials associated with equipment maintenance and hazardous materials. The secondary containment reduces or prevents the potential exposure of these materials to stormwater.

6.5 Advanced Erosion and Sediment Control

Activities that generate the potential for erosion and sediment migration include transport and storage of limestone, unsuitable limestone, and overburden rock and soil. Operations at the site expose slopes and access roads to erosion. Erosion or sediment controls are generally commenced as soon as practicable following completion of soil/ rock disturbing activities. The storm water drainage systems in place have been designed to divert storm water away from operational areas and to stormwater retention basins.

Specific narrative descriptions of BMPs that are implemented at the Facility, to the extent practicable, are listed by category in each of the following sections. Additionally, copies of California Stormwater Quality Association (CASQA) BMP Handbook fact sheets for erosion and sediment control BMPs are included for implementation guidance and reference in Appendix C.

6.5.1 Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in storm water runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles. The Facility will incorporate erosion control measures that are effective and result in the reduction of sediment related pollutants in stormwater discharges. The Facility will implement the following practices for effective temporary and longer-term erosion control during soil disturbing activities:

- Preserve existing vegetation where practicable and when feasible.
- Implement temporary erosion control measures with focused implementation prior to the wet season.
- Stabilize non-active areas prior to the wet season.
- Control erosion in concentrated flow paths by applying erosion control products and maintaining swales as required.
- Apply hydroseed for vegetation development or other longer-term erosion control such as non-limestone rock to areas deemed available for longer-term controls (e.g. areas no longer planned for soil disturbance).

Sufficient erosion control materials will be maintained on-site to allow implementation in conformance with the SWPPP. This includes implementation of BMPs in active areas and non-active areas before the onset of rain.

The BMPs that should be considered for implementation to prevent erosion include:

- Scheduling: Operating activities will be scheduled with the incorporation of both soil stabilization and sediment control measure BMPs to reduce the discharge of pollutants. The schedule will limit exposure of disturbed soil to wind, rain, and stormwater run-on and run-off where practicable.
- Preservation of Existing Vegetation: Existing vegetation will be maintained to the extent practicable.
- Hydroseeding: Hydroseeding or other longer-term erosion control such as placement of non-limestone rock will be applied in areas deemed available for longer-term controls to protect disturbed soil areas from soil erosion. The hydroseeding materials will be applied after final grading operations. The application of hydroseeding materials will be performed in accordance with manufacturer's specifications.
- Geotextile and Mats: Geotextile, erosion control matting (ECM), or non-limestone rock should be installed in all v-ditches where the erosive potential exceeds the resistance of the native compacted soil; the application of ECM will be performed in accordance with manufacturer's specifications. ECMs, should not include any synthetic component because of this material's potential adverse impact to Wildlife
- Slope Protection:
  - Slope drains consist of a pipe used to intercept and direct surface runoff into a stabilized watercourse, trapping device, or retention basin. Slope drains are used with earth dikes and drainage ditches to intercept and direct surface flow away from slope areas to protect cut or fill slopes.
  - Compost Blankets can be applied to protect disturbed soil areas from soil erosion, and can be used as an alternative to hydroseeding, particularly on steeper slopes.
- Soil Binders
  - Soil binding consists of application and maintenance of a soil stabilizer to exposed soil surfaces including unpaved roads. Soil binders are materials applied to the soil surface to temporarily prevent water and wind induced erosion of exposed soils. Examples of soil binders that are recommended include:
    - Earthguard®: a useful soil stabilizing emulsion specifically formulated to reduce erosion and sediment runoff. Earthguard can be applied by water truck or by spray application.
    - Gorilla-Snot®: a useful biodegradable liquid copolymer used to stabilize and solidify any soil or aggregate as well as provide erosion control and dust suppression.
    - Posi-Shell®: a spray-applied, mineral mortar coating, similar to stucco that is the ideal erosion control solution when immediate performance is imperative. Posi-Shell effectively stabilizes steep slopes, controls dust and controls erosion.

6.5.2 Sediment Control

Sediment controls are structural measures that are intended to complement and enhance the selected erosion control measures and reduce sediment discharges from disturbed soil areas. Sediment controls are designed to intercept and settle out or filter soil particles that have been detached and transported by the force of water.

Sufficient quantities of temporary sediment control materials will be maintained on-site to allow implementation of temporary sediment controls in the event of predicted rain and for rapid response. This includes implementation requirements of BMPs in active areas and non-active areas that require deployment before the onset of rain. The BMPs that should be considered for implementation to prevent sediment migration from disturbed soil areas include:

- Fiber Rolls (or straw wattles): Fiber rolls or straw wattles can be installed surrounding the entire outside perimeter of the disturbed soil area as well as surrounding stockpiles. Fiber rolls should be placed along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope lengths and spread runoff as sheet flow Fiber rolls, should not include any synthetic component because of this material's potential adverse impact to Wildlife.
- Check Dams: Check dams are small dams, which can be either temporary or permanent, built across a minor channel, v-ditch, swale, bioswale, or larger drainage ditch. Check dams reduce erosion and gullying in the channel or ditch and allow sediments and pollutants to settle by slowing down the surface waters.
- Gravel Bag Berm: Gravel bag berms can be installed along the down gradient perimeter of disturbed soil areas to prevent run-off if there is a sufficient structural base for support and stabilization of the gravel bags. Gravel bags can also be used alongside access roads to reduce flow velocities and settle out particles.
- Sweeping: Paved areas will be swept daily during the storm season (October 1 through May 30) and weekly during the remainder of the year. The Facility uses a truck sweeper and sweeps inaccessible areas by hand. Comprehensive and focused sweeping of the paved areas is conducted before anticipated rain events.
- Storm Drain Inlet Protection: Drain inlets (DIs) within the facility should receive drain inlet protection. The DIs will consist of filter fabric (inverse witches' hats) to filter out any sediment and pollutants before run-off enters the storm drainage systems. DI protection will be installed in a manner that will not cause ponding or pose a threat to traffic safety. If ponding does cause an issue, the source of the ponding will be identified and corrective actions taken if necessary. During critical operations where potential exists of non-stormwater entering the storm drain inlet, the inlet should be sealed off with urethane sheets, plastic covers, or an equivalent product. Once the critical operation is completed the DIs should be opened up again.
- Flocculent: Flocculent use may need to be approved by the RWQCB. Floc logs introduce a flocculent into the stormwater to promote and accelerate sedimentation in the stormwater basins. The placement of floc logs should be upstream of the stormwater basins to introduce the flocculent upstream, so it is well mixed with the surface water run-off.

7.0 MONITORING AND REPORTING PROGRAM

The monitoring and reporting program (MRP) is provided in Attachment E to the NPDES Permit. The NPDES Permit Section VI.C.6.a includes requirements for this SWPPP and an annual report. According to VI.C.6.b, the Annual Stormwater Report must be submitted by July 1 providing data for the previous wet weather season. The Annual Stormwater Report will include, at a minimum, the following:

- tabulated summary of all sampling results and a summary of visual observations taken during inspections;
- comprehensive discussion of the compliance record and any corrective actions taken or planned to ensure compliance with this Order; and
- comprehensive discussion of source identification and control programs for constituents that do not have effluent limitations (see action levels Section 4.0).

8.0 REFERENCES

Golder Associates, 2014. Facility Reliability Assurance Plan Lehigh Southwest Cement Company Permanente Plant and Quarry, 24001 Stevens Creek Boulevard, Cupertino, California. May 16, 2014.

Lehigh Southwest Cement Company Permanente Cement Plant (Lehigh). 2010. Fugitive Dust Control Plan. September 10, 2010. Revised January 20, 2011.

LFR Inc. 2006. Spill Prevention, Control and Countermeasures (SPCC) Plan. June 21, 2006. Revised by Lehigh November 10, 2011.

TABLES

Table 1: Stormwater Pollution Prevention Team

Name	Position	Duties and Activities
Alan Sabawi	Plant Manager	Responsible Person, provides overall management of the Permanente Quarry Stormwater Pollution Prevention Program
Ricardo Del Valle	Assistant Plant Manager	Alternate Responible Person (see above)
Jim Kertis	Environmental Manager	Provides coordination of the Stormwater Pollution Prevention Program
Dan Zachriasen	Quarry Manager	Provides maintenance personnel and resources to perform inspection and repair of stormwater pollution prevention facilities and equipment.
Chow Yip	Environmental Engineer	Provides technical supports for the implementation of the Stormwater Pollution Prevention Program

Table 2: Materials Inventory

Product or Material	Maximum Quantity	Handling Frequency	Storage Method	Storage Location	Receiving Location	Shipping Location	Likelihood of Contact with Stormwater[1]
Waste Material Storage		Daily	Stockpile	Eastern Material Storage Area	Same	NA	Likely
Limestone		Daily	Stockpile	Surge Pile	Same		Likely
Limestone		Daily	Stockpile	Cement Plant Stockpile Storage	Same		Likely
Lubricating Oil	880 gallons	Daily	Inside Building	Electrical, Vehicle and Equipment storage	Same	NA	Unlikely
Chemsearch High Core-Petroleum	275 gallons	Daily	Inside Building	Electrical, Vehicle and Equipment Storage	Same	NA	Unlikely
D-Limonene	165 gallons	Daily	Inside Building	Electrical, Vehicle and Equipment Storage	Same	NA	Unlikely
Lubricating Oil	1,600 gallons	Daily	Inside Building	Electrical, Vehicle and Equipment Storage	Same	NA	Unlikely
Grease	350 gallons	Daily	Inside Building	Electrical, Vehicle and Equipment Storage	Same	NA	Unlikely
Petroleum Contaminated (Oil and Grease) Debris	2,000 pounds	Daily	Waste dumpster	Electrical, Vehicle and Equipment Storage, Oily Debris Waste Dumpsters	Same	NA	Possible
Sodium Hypochlorite Solution	360 gallons	Daily	AST	Sewage Treatment Plant, Water Treatment Area	Same	NA	Unlikely
Materials Testing Chemicals and Wastes (Liquids)	<100 gallons	Daily	Inside Building	QC Lab	Same	NA	Unlikely
Materials Testing Chemicals (Solids)	<50 kg	Daily	Inside Building	QC Lab	Same	NA	Unlikely

Notes:
1. Likelihood determined based on storage method; unlikely - stored indoors or under permanent cover, possible - temporary cover, likely - uncovered.

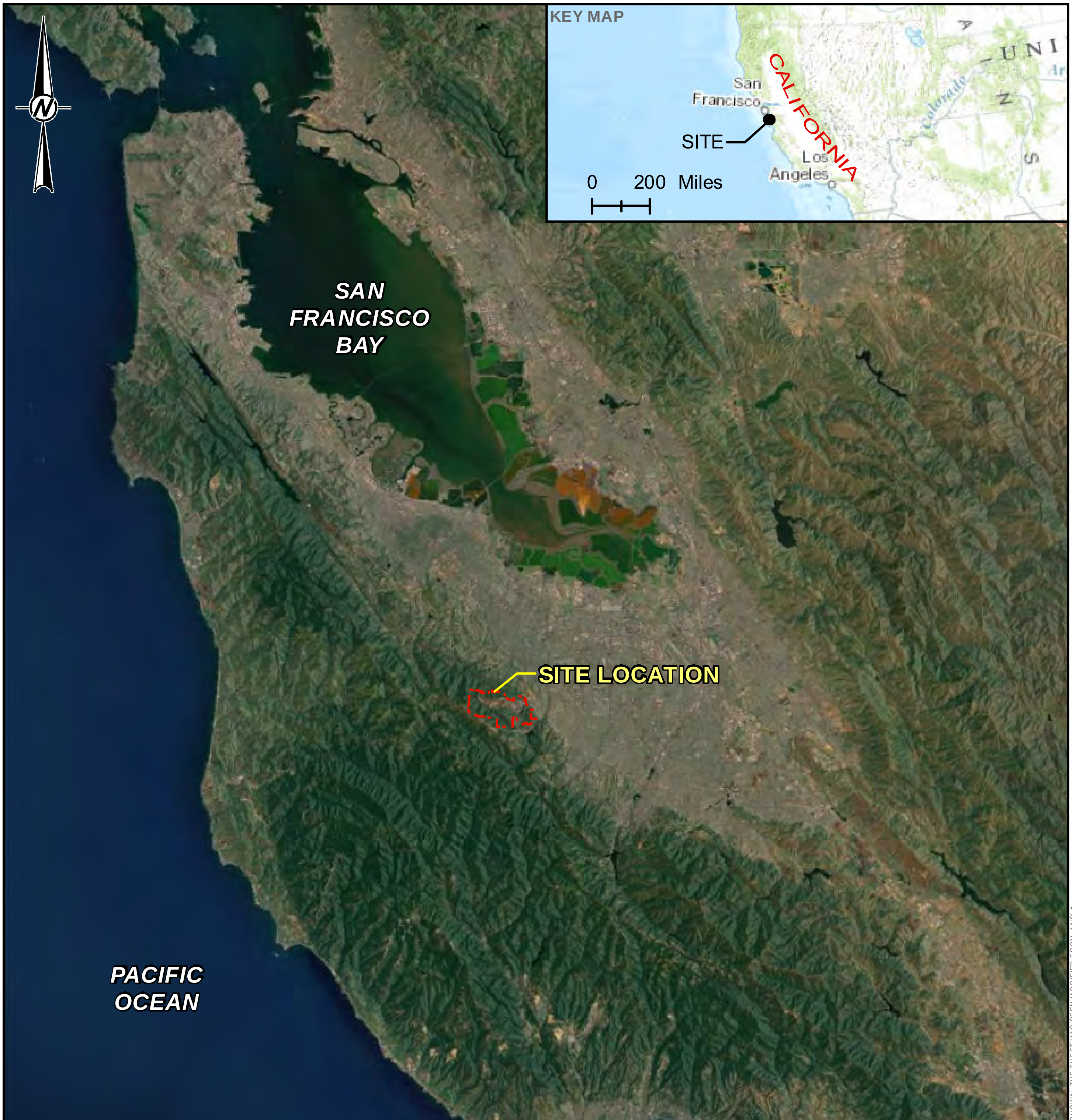
Table 3: Activity, Sources, Potential Pollutants, and Recommended BMPs

Activity	Source	Potential Pollutant	Recommended BMPs
Equipment repair and maintenance. Parking and maintenance of trucks	Potential equipment spills and leaks	O&G Visible Oil	Minimize equipment service outside of maintenance area during wet weather
			Use dry cleanup methods, sweep paved areas of the Facility daily during the storm season (October 1 through May 30) and weekly during the remainder of the year and conduct focused and comprehensive sweeping before forecasted rain events.
			Implement proper spill prevention control measures
			Train employees on proper cleanup and spill response
			Prohibit hosing off driveways, parking lots, and other paved areas unless contained and disposed to sanitary sewer
			Apply absorbent pads to leaks or spills, then properly dispose. Properly maintain all vehicles to prevent leakage
			In the event that vehicle or movable equipment maintenance or repairs are performed in uncovered areas, Inspect the area where the maintenance or repair occurred and cleanup waste products, including pollutant-containing fluids deposited or spilled on the ground.
Waste material storage	Erosion and sediment migration, track out of materials, dust migration and settlement	TSS, pH, settleable matter, turbidity, metals, conductivity, visible color	Implement control measures in the Fugitive Dust Control Plan
			Maintain all drainage and erosion control systems and all-weather working surfaces at the site
			Phase placement operations to ensure that non-limestone materials are placed on top of limestone waste materials
			Temporarily stabilize active, disturbed reclamation areas undergoing reclamation fill placement before and during rain events expected to produce runoff. Stabilization methods include combined BMPs that protect materials from rain, manage runoff, and reduce erosion. Do not perform reclamation activities involving grading, hauling, and placement of backfill materials during wet weather
			Cover active haul roads with non-limestone materials where exposed limestone surfaces are present when safe and necessary
			Stabilize inactive areas, such as temporary stockpiles or inactive excavations using an appropriate combination of BMPs to cover the exposed rock material, intercept runoff, reduce its flow velocity, and provide a sediment control mechanism (such as silt fencing, fiber rolls, or hydroseeded vegetation). Standard soil stabilization BMPs include sedimentation basins, geotextiles, mats, erosion control blankets, vegetation, silt fence surrounding the stockpile perimeter, and fiber rolls at the base and on side slopes.
			Divert all runoff generated from disturbed active and inactive reclamation areas to temporary basins or temporary vegetated infiltration basins. Divert drainage from non-limestone materials directly to sediment control facilities.
			Install up-gradient berms where limestone fines or stockpiles are placed, to protect against stormwater run-on, and install ditches and down-gradient berms to promote infiltration rather than run-off.
			Replace the limestone rock and materials that are currently used in the existing BMP ditches and cover or otherwise separate runoff from limestone rock in the existing sediment pond embankments. Reconstruct or reline all existing stormwater conveyances and check dam structures that are constructed or lined with limestone rock using non-limestone material (e.g. greenstone, breccias, greywacke, metabasalt).
			Cover large limestone surfaces that would remain exposed during the rainy season with interim covers composed of non-limestone rock types

Table 3: Activity, Sources, Potential Pollutants, and Recommended BMPs

Activity	Source	Potential Pollutant	Recommended BMPs
Truck traffic	Potential spills and leaks, track out of materials, dust generation	O&G, TSS, Conductivity, pH, Settleable Matter, Turbidity, Metals, Visible Oil	Implement control measures in the Fugitive Dust Control Plan
			Use dry cleanup methods, sweep paved areas of the Facility daily during the storm season (October 1 through May 30) and weekly during the remainder of the year and conduct focused and comprehensive sweeping before forecasted rain events.
			Remove tire debris and residue routinely and dispose of residue appropriately.
			Speed limit is a maximum of 15 mph at any and all facility locations
Cement plant stockpile storage	Stored materials	TSS, Conductivity, pH, Settleable Matter, Turbidity, Metals	Implement control measures in the Fugitive Dust Control Plan
			Maintain berms to divert runon around material storage areas and convey runoff through pipes and non-erodable features (rock-line drainages)
			Install energy dissipating devices to slow the velocity of storm water drainage and prevent erosion
			Route runoff to sedimentation basins
Truck washing	Wash water	O&G, TSS, Conductivity pH, Settleable Matter, Turbidity,	Discharge excess washwater to Reclaim Water System
			Clean area of washwater residue that might contact stormwater before anticipated rain events
Rock crushing	Settling dust, tracking of materials	TSS, Conductivity, pH, Settleable Matter, Turbidity, Metals	Implement control measures in the Fugitive Dust Control Plan.
			Use dry cleanup methods, sweep paved areas of the Facility daily during the storm season (October 1 through May 30) and weekly during the remainder of the year and conduct focused and comprehensive sweeping before forecasted rain events.
Cement processing	Settling dust, tracking of materials	TSS, Conductivity, pH, Settleable Matter, Turbidity, Metals	Implement control measures in the Fugitive Dust Control Plan.
			Use dry cleanup methods, sweep paved areas of the Facility daily during the storm season (October 1 through May 30) and weekly during the remainder of the year and conduct focused and comprehensive sweeping before forecasted rain events.
Wastewater treatment	Potential spills and leaks of wastewater and treatment chemicals	TSS, Conductivity, pH, Settleable Matter, Turbidity	Conduct inspections and maintenance consistent with HMBP

FIGURES



LEGEND

Property Boundary

NOTES

REFERENCE

SERVICE LAYER CREDITS: SOURCES: ESRI, DELORME, HERE, TOMTOM, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, AND THE GIS USER COMMUNITY

CLIENT
LEHIGH SOUTHWEST CEMENT CO. PERMANENTE
SANTA CLARA COUNTY, CA

PROJECT
STORMWATER POLLUTION PREVENTION PLAN

TITLE
REGIONAL SETTING

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-05-15
PREPARED	DZF
DESIGN	DZF
REVIEW	GW
APPROVED	TB

PROJECT No.	CONTROL	Rev.	FIGURE
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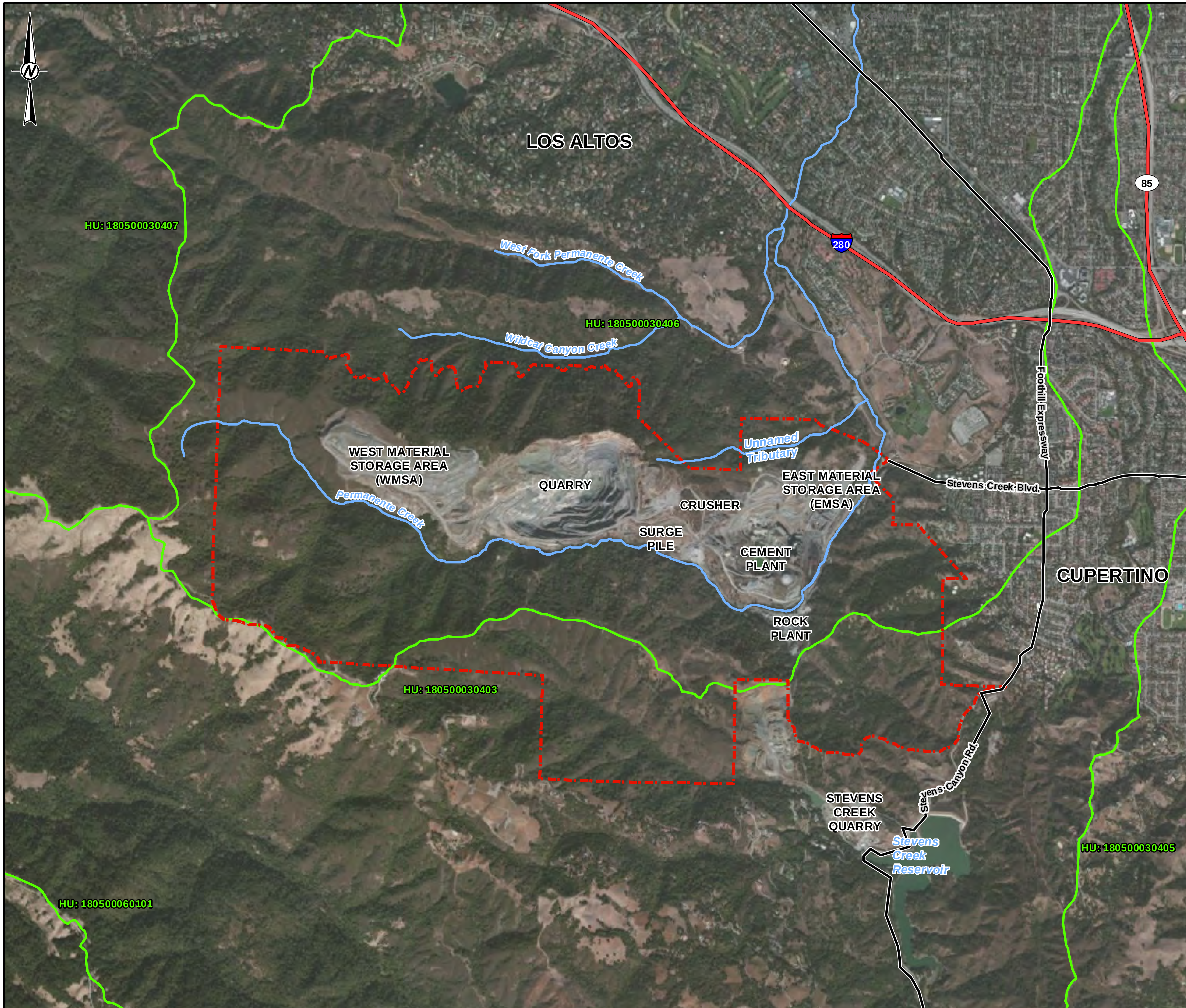

LEGEND

- Stream
- Property Boundary
- Watershed Boundary and Hydrologic Unit

NOTES

1) LOCATIONS BASED ON CONVERSION FROM LOCAL COORDINATES OR GOOGLE EARTH PLACEMENTS

REFERENCE

1) SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
2) COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA III FIPS 0403 FEET
3) HYDROLOGIC UNITS: WATERSHED BOUNDARY DATASET (WBD), 2014. USGS AND USDA-NRCS.

CLIENT
LEHIGH SOUTHWEST CEMENT CO. PERMANENTE
SANTA CLARA COUNTY, CA

PROJECT
STORMWATER POLLUTION PREVENTION PLAN

TITLE
SITE VICINITY

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-05-15
PREPARED	DZF
DESIGN	DZF
REVIEW	GW
APPROVED	TB

PROJECT No.	CONTROL	Rev.	FIGURE
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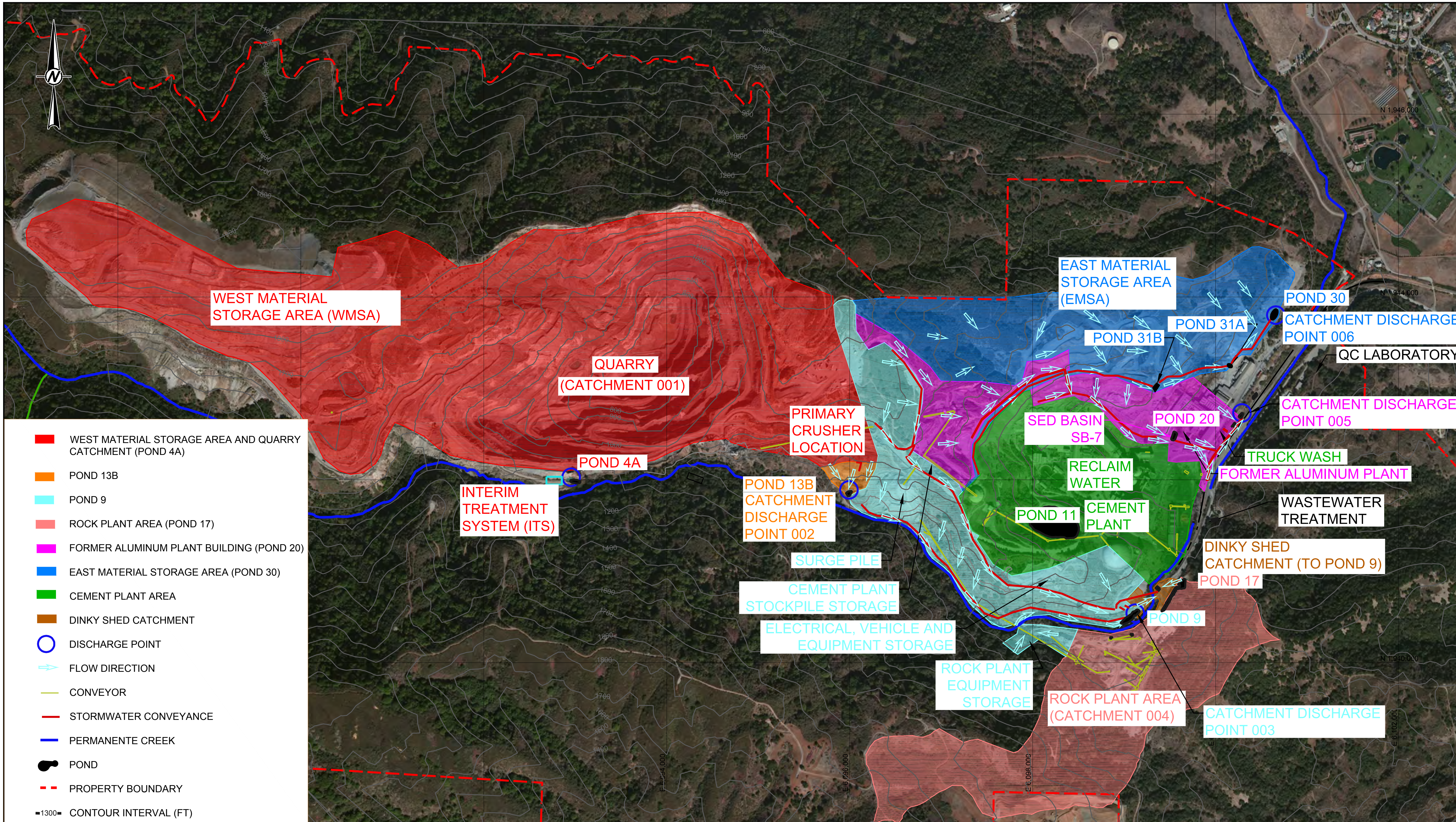

NOTES:
QUARRY, CEMENT PLANT, AND ROCK PLANT AREAS ARE INCLUDED FOR REFERENCE

REFERENCES:
SPATIAL REFERENCE: NAD 1983 STATEPLANE CALIFORNIA III FIPS 0403 FEET

TOPOGRAPHY SHOWN IS BASED ON AERIAL SURVEY PERFORMED JUNE 2013, PROVIDED BY ALPHA SURVEYING

BASE MAPS:
Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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SCALE FEET

CLIENT
LEHIGH SOUTHWEST CEMENT CO. PERMANENTE
SANTA CLARA COUNTY, CA

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-05-02
PREPARED	SK
DESIGN	TB
REVIEW	GW
APPROVED	TB

PROJECT
STORMWATER POLLUTION PREVENTION PLAN

TITLE
SWPPP SITE MAP OVERVIEW

PROJECT No.	CONTROL	Rev.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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SCALE FEET

CLIENT	LEHIGH SOUTHWEST CEMENT CO. PERMANENTE SANTA CLARA COUNTY, CA
PROJECT	STORMWATER POLLUTION PREVENTION PLAN
CONSULTANT	Golder Associates
YYYY-MM-DD	2014-05-02
PREPARED	SK
DESIGN	TB
REVIEW	GW
APPROVED	TB

TITLE
SWPPP SITE MAP OVERVIEW
CATCHMENT DISCHARGE POINT 002

PROJECT No.	CONTROL	Rev.	FIGURE
12381502		----	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

CLIENT
LEHIGH SOUTHWEST CEMENT CO. PERMANENTE
SANTA CLARA COUNTY, CA

PROJECT
STORMWATER POLLUTION PREVENTION PLAN

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-05-02
PREPARED	SK
DESIGN	TB
REVIEW	GW
APPROVED	TB

TITLE
SWPPP SITE MAP OVERVIEW
CATCHMENT DISCHARGE POINT 003

PROJECT No.	CONTROL	Rev.	FIGURE
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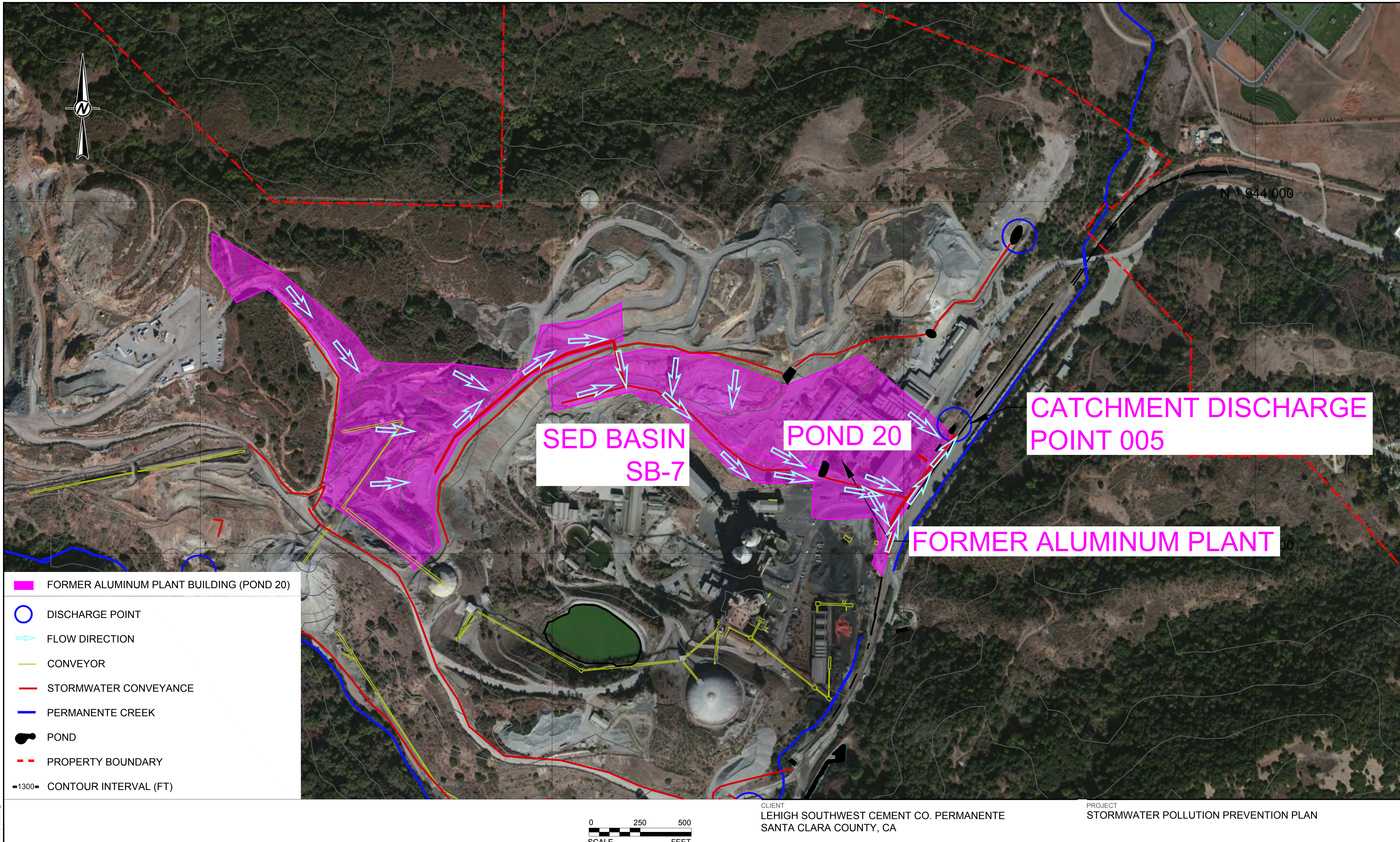


CLIENT
LEHIGH SOUTHWEST CEMENT CO. PERMANENTE
SANTA CLARA COUNTY, CA

PROJECT
STORMWATER POLLUTION PREVENTION PLAN

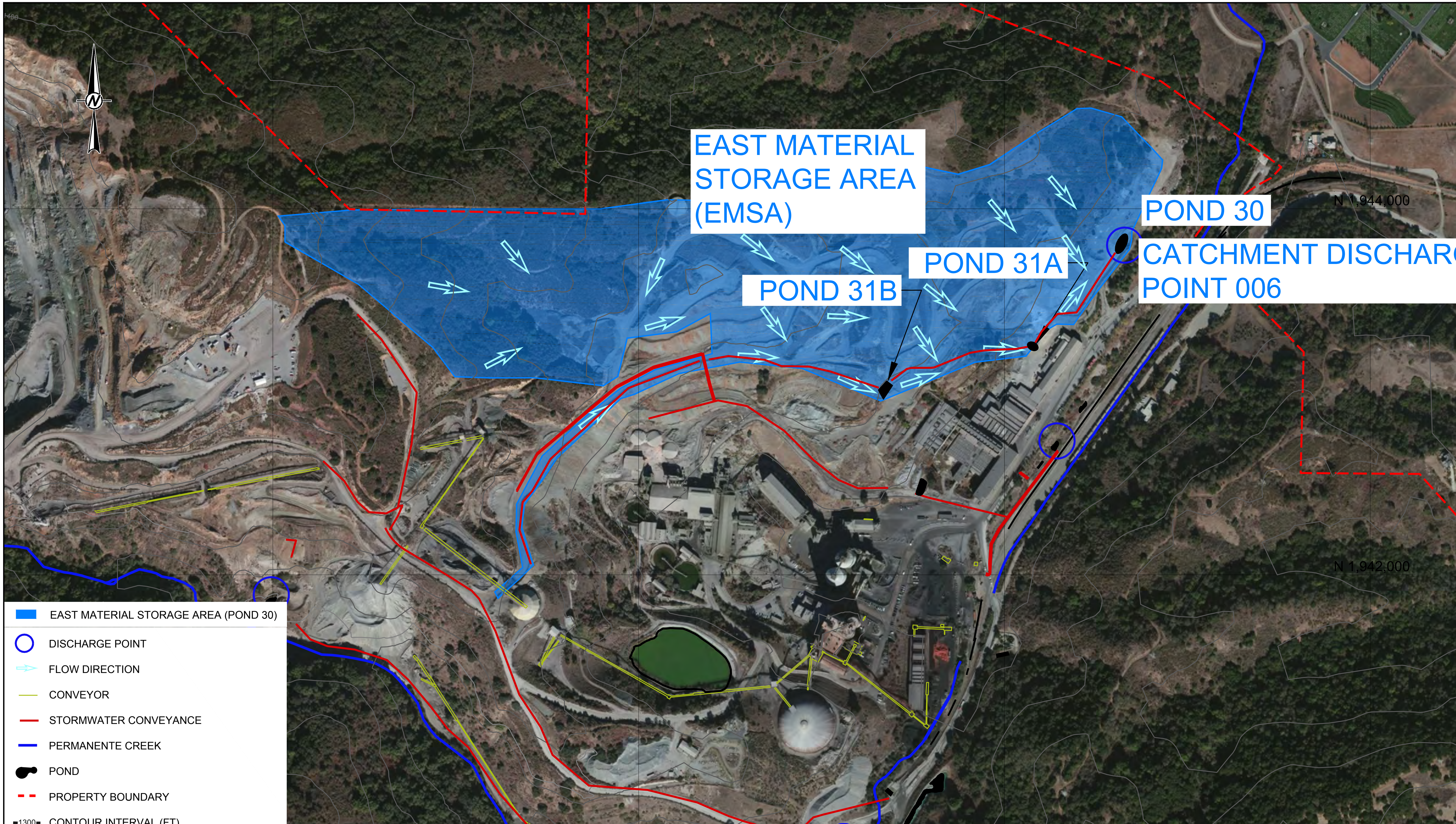
CONSULTANT
Golder Associates

YYYY-MM-DD	2014-05-02
PREPARED	SK
DESIGN	TB
REVIEW	GW
APPROVED	TB

TITLE
SWPPP SITE MAP OVERVIEW
CATCHMENT DISCHARGE POINT 005

PROJECT No.	CONTROL	Rev.	FIGURE
12381502		----	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



0 250 500
SCALE FEET

CLIENT
LEHIGH SOUTHWEST CEMENT CO. PERMANENTE
SANTA CLARA COUNTY, CA

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-05-02
PREPARED	SK
DESIGN	TB
REVIEW	GW
APPROVED	TB

PROJECT
STORMWATER POLLUTION PREVENTION PLAN

TITLE
SWPPP SITE MAP OVERVIEW
CATCHMENT DISCHARGE POINT 006

PROJECT No.	CONTROL	Rev.	FIGURE
12381502		----	7

APPENDIX A

BMP INSPECTION LOG

BMP Inspection and Preventative Maintenance Log

Lehigh Permanente Plant

Inspection Date: ______________________ **Inspector:** ______________________

Activity/ Area	Recommended BMPs	Inspected/ BMPs Implemented?		If No BMP Implemented, or if Maintenance Needed, List Needed Follow-up Actions	Date Follow-up Completed	
		Yes	No		Date	By
Waste material storage	Implement control measures in the Fugitive Dust Control Plan					
	Maintain all drainage and erosion control systems and all-weather working surfaces at the site					
	Phase placement operations to ensure that non-limestone materials are placed on top of limestone waste materials when feasible					
	Temporarily stabilize active, disturbed reclamation areas undergoing reclamation fill placement before and during rain events expected to produce runoff. Stabilization methods include combined BMPs that protect materials from rain, manage runoff, and reduce erosion. Do not perform reclamation activities involving grading, hauling, and placement of backfill materials during wet weather					
	Cover active haul roads with non-limestone materials where exposed limestone surfaces are present when safe and necessary					
	Stabilize inactive areas, such as temporary stockpiles or inactive excavations using an appropriate combination of BMPs to cover the exposed rock material, intercept runoff, reduce its flow velocity, release runoff as sheet flow, and provide a sediment control mechanism (such as silt fencing, fiber rolls, or hydroseeded vegetation). Standard soil stabilization BMPs include sedimentation basins, geotextiles, mats, erosion control blankets, vegetation, silt fence surrounding the stockpile perimeter, and fiber rolls at the base and on side slopes.					
	Divert all runoff generated from disturbed active and inactive reclamation areas to temporary basins or temporary vegetated infiltration basins. Divert drainage from non-limestone materials directly to sediment control facilities.					
	Install up-gradient berms where limestone fines or stockpiles are placed, to protect against stormwater run-on, and install ditches and down-gradient berms to promote infiltration rather than run-off.					
	Replace the limestone rock and materials that are currently used in the existing BMP ditches and cover or otherwise separate runoff from limestone rock in the existing sediment pond embankments where feasible. Reconstruct or reline to extent practicable existing stormwater conveyances and check dam structures that are constructed or lined with limestone rock using non-limestone material (e.g. greenstone, breccias, greywacke, metabasalt).					
	Cover to extent practicable large limestone surfaces that would remain exposed during the rainy season with interim covers composed of non-limestone rock types					

BMP Inspection and Preventative Maintenance Log
Lehigh Permanente Plant

Activity/ Area	Recommended BMPs	Inspected/ BMPs Implemented?		If No BMP Implemented, or if Maintenance Needed, List Needed Follow-up Actions	Date Follow-up Completed	
		Yes	No		Date	By
All Operations (Discharge Point Nos. 002 through 006)	Place drip pans with absorbent pads under equipment stored or parked for a week or longer.					
	Remove or store under cover abandoned or broken equipment or materials no longer considered for future use that have the potential to expose stormwater to pollutants.					
	Inspect trucks and other heavy equipment for evidence of leaks and promptly (as soon as reasonably possible and in no case later than in advance of forecasted rainfall events) cleanup spills, drips, or leaks.					
	Conduct inspections and maintenance consistent with HMBP					
	Use dry cleanup methods, apply absorbent pads to leaks or spills, then properly dispose. Use absorbent pads and not granular absorbents outdoors.					
	Train employees on proper cleanup and spill response annually and within 30 days for new hires.					
	Replace split, torn, unraveling, or slumping fiber rolls. Remove sediment accumulation when the sediment accumulation reaches 1/3 of the designated storage depth.					
	Inspect the following for debris, waste, spills, tracked materials, leaked materials, and deposited sediment: Stormwater discharge locations Drainage areas Conveyance systems (clean before October 1 and as needed) Material handling areas Perimeter areas impacted by off-facility materials or stormwater run-on					
	Non-stormwater discharges are discharged to the RWS.					
	Identify equipment and systems used outdoors that may spill or leak potential stormwater pollutants. Observe the identified equipment and systems to detect leaks, or identify conditions that may result in the development of leaks. Check for the following: Deterioration of equipment, containers, and metal accessories that are stored outside Corrosion, structural failure, spills, leaks, etc.					
	Cover stored industrial materials that can be readily mobilized by contact with storm water					

BMP Inspection and Preventative Maintenance Log
Lehigh Permanente Plant

Activity/ Area	Recommended BMPs	Inspected/ BMPs Implemented?		If No BMP Implemented, or if Maintenance Needed, List Needed Follow-up Actions	Date Follow-up Completed	
		Yes	No		Date	By
Equipment repair and maintenance Parking and maintenance of trucks	Minimize equipment service outside of maintenance area during wet weather					
	Use dry cleanup sweep paved areas three times weekly during the storm season (October 1 through May 30) and weekly during the remainder of the year. Use vacuum sweeper and sweep inaccessible areas by hand or using a vacuum. Conduct focused and comprehensive sweeping before forecasted rain events.					
	Implement proper spill prevention control measures.					
	Train employees on proper spill cleanup and response					
	Prohibit hosing off driveways, parking lots, and other paved areas unless contained and disposed to sanitary sewer					
	Apply absorbent pads to leaks or spills, then properly dispose. Properly maintain all vehicles to prevent leakage					
	In the event that vehicle or movable equipment maintenance or repairs are performed in uncovered areas, Inspect the area where the maintenance or repair occurred and cleanup waste products, including pollutant-containing fluids deposited or spilled on the ground as results of the maintenance or repair.					
Truck traffic	Implement control measures in the Fugitive Dust Control Plan					
	Use dry cleanup methods, sweep paved areas of the Facility daily during the storm season (October 1 through May 30) and weekly during the remainder of the year and conduct focused and comprehensive sweeping before forecasted rain events.					
	Remove tire debris and residue routinely and dispose of residue appropriately.					
	Speed limit is a maximum of 15 mph at any and all facility locations					
Truck Fueling	Use spill and overflow protection					
	Minimize run-on of stormwater into fueling area					
	Use dry cleanup methods. Use absorbent pads and not granular absorbents outdoors.					
	Implement proper spill prevention controls					
	Train employees on proper spill cleanup and response					
Cement plant stockpile storage	Implement control measures in the Fugitive Dust Control Plan					
	Maintain berms to divert run-on around material storage areas and convey runoff through pipes and non-erodible features (rock-line drainages)					
	Install energy dissipating devices to slow the velocity of storm water drainage and prevent erosion					
	Route runoff to sedimentation basins					
Truck washing	Discharge excess washwater to Reclaim Water System					
	Clean area of washwater residue that might contact stormwater before anticipated rain events					

BMP Inspection and Preventative Maintenance Log
Lehigh Permanente Plant

Activity/ Area	Recommended BMPs	Inspected/ BMPs Implemented?		If No BMP Implemented, or if Maintenance Needed, List Needed Follow-up Actions	Date Follow-up Completed	
		Yes	No		Date	By
Rock crushing	Implement control measures in the Fugitive Dust Control Plan.					
	Use dry cleanup methods, sweep paved areas of the Facility daily during the storm season (October 1 through May 30) and weekly during the remainder of the year and conduct focused and comprehensive sweeping before forecasted rain events.					
Cement processing	Implement control measures in the Fugitive Dust Control Plan.					
	Use dry cleanup methods, sweep paved areas of the Facility daily during the storm season (October 1 through May 30) and weekly during the remainder of the year and conduct focused and comprehensive sweeping before forecasted rain events.					
Wastewater treatment	Conduct inspections and maintenance consistent with HMBP					

APPENDIX B

EMPLOYEE TRAINING LOG

Employee Training Record

Describe the annual training of employees on the SWPPP, addressing spill response, good housekeeping, and material management practices

FACILITY____

Date	Attendees	Trainer/Title	Training Materials	PPT		All Employees				
				SWPPP Implementation	Monitoring Procedures	Spill Prevention and Response	Good Housekeeping	Preventive Maintenance	BMP Maintenance	Record Keeping

APPENDIX C

CALIFORNIA STORMWATER QUALITY ASSOCIATION (CASQA) BMP HANDBOOK FACT SHEETS

Section 3
Erosion and Sediment Control BMPs

3.1 Erosion Control

Erosion control is any source control practice that protects the soil surface and prevents soil particles from being detached by rainfall, flowing water, or wind. Erosion control consists of using project scheduling and planning to reduce soil or vegetation disturbance (particularly during the rainy season), preventing or reducing erosion potential by diverting or controlling drainage, as well as preparing and stabilizing disturbed soil areas. Erosion control BMPs that can be used to fulfill these objectives are shown in Table 3-1. It should be noted that several additional BMPs, such as Check Dams (SE-4) and Fiber Rolls (SE-5) can be used for erosion control, by reducing slope length or steepness, as well as for sediment control (i.e., perimeter control or retention of sediment). These BMPs have been included in this handbook as sediment control BMPs and are shown in Table 3-2.

Table 3-1 Erosion Control BMPs

BMP#	BMP Name
EC-1	Scheduling
EC-2	Preservation of Existing Vegetation
EC-3	Hydraulic Mulch[1]
EC-4	Hydroseeding[1]
EC-5	Soil Binders[1]
EC-6	Straw Mulch[1]
EC-7	Geotextiles & Mats[1]
EC-8	Wood Mulching
EC-9	Earth Dikes and Drainage Swales
EC-10	Velocity Dissipation Devices
EC-11	Slope Drains
EC-12	Streambank Stabilization
EC-13	Reserved[2]
EC-14	Compost Blankets[3]
EC-15	Soil Preparation / Roughening[3]
EC-16	Non-Vegetative Stabilization[3]

1) BMP fact sheet updated in 2009
2) BMP fact sheet removed in 2009 (formerly PAM)
3) New BMP fact sheet added in 2009

All inactive soil disturbed areas on the project site, and most active areas prior to the onset of rain, must be protected from erosion. Soil disturbed areas may include relatively flat areas as well as slopes. Typically, steep slopes and large exposed areas require the most robust erosion controls; flatter slopes and smaller areas still require protection, but less costly materials may be appropriate for these areas, allowing savings to be directed to the more robust BMPs for steep slopes and large exposed areas. Additional guidance on the selection of temporary slope stabilization methods is provided in Appendix F. To be effective, erosion control BMPs for slopes at disturbed areas must be protected from concentrated flows.

Some erosion control BMPs can be used effectively to temporarily prevent erosion by concentrated flows. These BMPs, used alone or in combination, prevent erosion by intercepting, diverting, conveying, and discharging concentrated flows in a manner that prevents soil detachment and transport. Temporary concentrated flow conveyance controls may be required to direct run-on around or through the project in a non-erodible fashion. Temporary concentrated flow conveyance controls include the following BMPs:

- EC-9, Earth Dikes and Drainage Swales
- EC-10, Velocity Dissipation Devices
- EC-11, Slope Drains

3.2 Sediment Control

Sediment control is any practice that traps soil particles after they have been detached and moved by rain, flowing water, or wind. Sediment control measures are usually passive systems that rely on filtering or settling the particles out of the water or wind that is transporting them.

Sediment control practices include the BMPs listed in Table 3-2.

Sediment control BMPs include those practices that intercept and slow or detain the flow of stormwater to allow sediment to settle and be trapped. Sediment control practices can consist of installing linear sediment barriers (such as silt fences, gravel bag berms, or fiber rolls); and constructing check dams, a sediment trap or sediment basin to retain sediment on site. Linear sediment barriers are typically placed below the toe of exposed and erodible slopes, down-slope of exposed soil areas, around soil stockpiles, and at other appropriate locations along the site perimeter. As mentioned in Section 3.1, some BMPs are dual-purpose, such as Fiber Rolls and Check Dams. By reducing effective slope length or steepness, these BMPs reduce erosion as well as promote sedimentation.

Table 3-2 Temporary Sediment Control BMPs

BMP#	BMP Name
SE-1	Silt Fence[1]
SE-2	Sediment Basin[1]
SE-3	Sediment Trap
SE-4	Check Dam[1]
SE-5	Fiber Rolls[1]
SE-6	Gravel Bag Berm[1]
SE-7	Street Sweeping and Vacuuming
SE-8	Sandbag Barrier[1]
SE-9	Straw Bale Barrier
SE-10	Storm Drain Inlet Protection[1]
SE-11	Active Treatment Systems[1]
SE-12	Temporary Silt Dike[2]
SE-13	Compost Socks and Berms[2]
SE-14	Biofilter Bags[2]

1) BMP fact sheet updated in 2009
2) New BMP fact sheet added in 2009

Sediment control BMPs are most effective when used in conjunction with erosion control BMPs. The combination of erosion control and sediment control is the most effective means to prevent sediment from leaving the project site and potentially entering storm drains or receiving waters. The General Permit requires that sediment controls be established and maintained at all sites and requires the combined use with erosion controls to protect disturbed areas at most sites.

3.3 Wind Erosion Control

Wind erosion control consists of applying water or other dust palliatives to prevent or minimize dust nuisance. Wind erosion control BMPs are shown in Table 3-3.

Table 3-3 Wind Erosion Control BMPs

BMP#	BMP Name
WE-1	Wind Erosion Control[1]
1) BMP fact Sheet updated in 2009	

Other BMPs that control wind erosion are EC-1 through EC-8, and EC-14 through EC-16, shown in Section 3.1 of this handbook. Be advised that some of the dust palliatives/chemical dust suppression agents may have potential water quality impacts. A sampling and analysis protocol to test for stormwater contamination from exposure to such compounds is required in the SWPPP.

3.4 Tracking Control BMPs

Tracking control consists of preventing or reducing the tracking of sediment off-site by vehicles leaving the construction area. Tracking control BMPs are shown in Table 3-4. Street Sweeping and Vacuuming (SE-7) is also a tracking control practice. All sites must have a stabilized construction entrance and implement controls to prevent off-site tracking of sediment or other loose construction-related materials. These controls should be inspected daily.

Table 3-4 Temporary Tracking Control BMPs

BMP #	BMP Name
TC-1	Stabilized Construction Entrance/ Exit
TC-2	Stabilized Construction Roadway
TC-3	Entrance/Outlet Tire Wash

Attention to control of tracking sediment off site is essential, as dirty streets and roads near a construction site create a nuisance to the public and can generate complaints to elected officials and regulators. These complaints often result in immediate inspections and regulatory actions.

3.5 Erosion and Sediment Control BMP Fact Sheet Format

A BMP fact sheet is a short document that presents detailed information about a particular BMP. Typically each fact sheet contains the information outlined in Figure 3-1. Fact sheets for each of the above activities are provided in Section 3.6.

The fact sheets also contain side bar presentations with information on BMP categories, targeted constituents, removal effectiveness, and potential alternatives.

EC-xx Example Fact Sheet

Description and Purpose

Suitable Applications

Limitations

Implementation

Costs

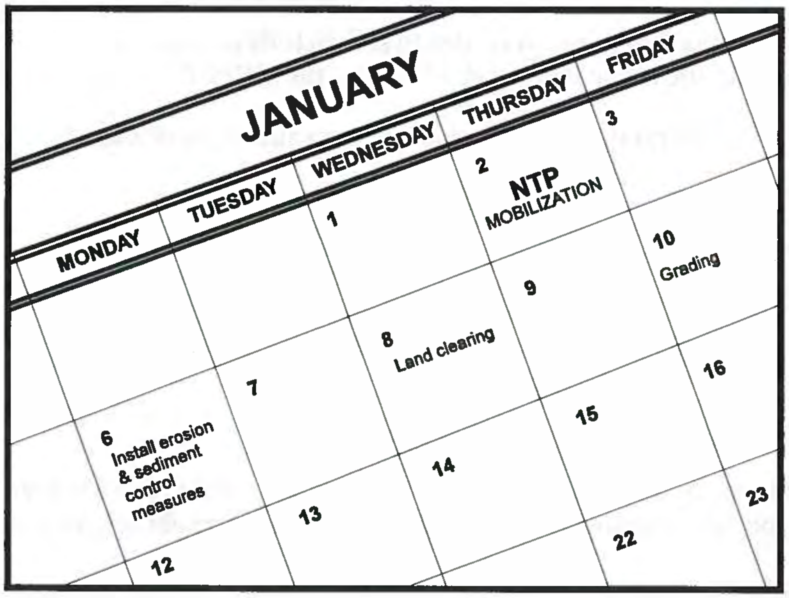
Inspection and Maintenance

References

Figure 3-1
Example Fact Sheet

3.6 BMP Fact Sheets

BMP fact sheets for erosion, sediment, wind, and tracking controls follow. The BMP fact sheets are individually page numbered and are suitable for inclusion in SWPPPs. Copies of the fact sheets can be individually downloaded from the CASQA BMP Handbook web site at http://www.casqa.org.



Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.

- Plan the project and develop a schedule showing each phase

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of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

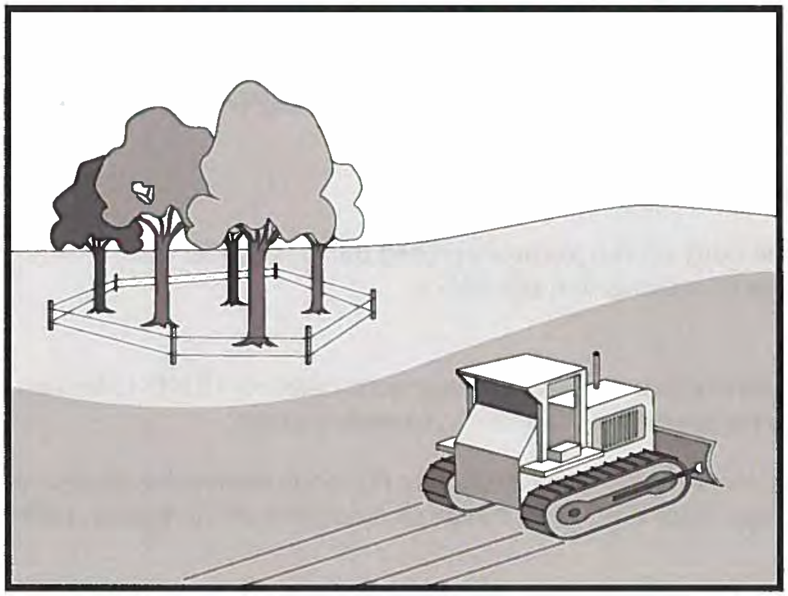
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation Of Existing Vegetation EC-2



Categories		
EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

Limitations

- Requires forward planning by the owner/developer,

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contractor, and design staff.

- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.

- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
  - Orange colored plastic mesh fencing works well.
  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.

- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.

- Consider the impact of grade changes to existing vegetation and the root zone.

- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.

- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of $10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
  - Fertilize stressed or damaged broadleaf trees to aid recovery.
  - Fertilize trees in the late fall or early spring.

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.

- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

References

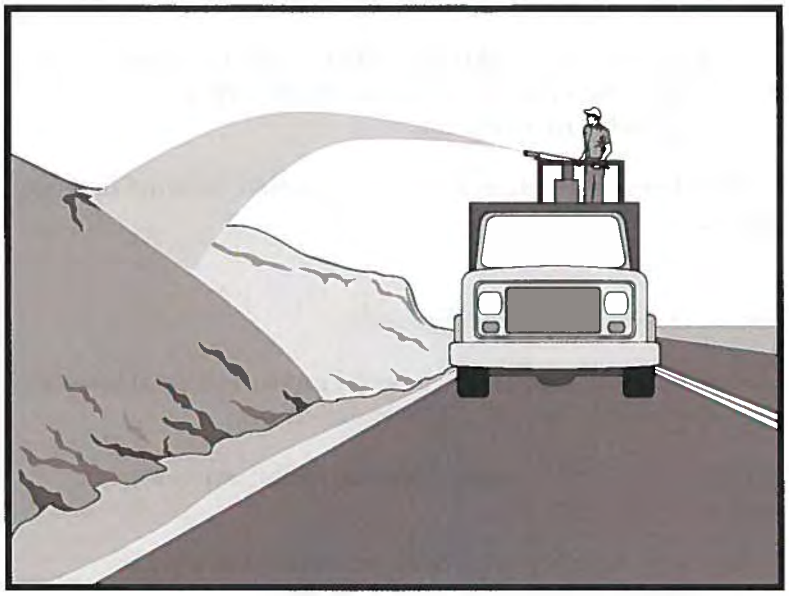
County of Sacramento Tree Preservation Ordinance, September 1981.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydraulic Mulch EC-3



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-4 Hydroseeding

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

EC-16 Non-Vegetative Stabilization

Description and Purpose

Hydraulic Mulch consists of various types of fibrous materials mixed with water and sprayed onto the soil surface in slurry form to provide a layer of temporary protection from wind and water erosion.

Suitable Applications

Hydraulic mulch as a temporary, stand alone, erosion control BMP is suitable for disturbed areas that require temporary protection from wind and water erosion until permanent soil stabilization activities commence. Examples include:

- Rough-graded areas that will remain inactive for longer than permit-required thresholds (e.g., 14 days) or otherwise require stabilization to minimize erosion or prevent sediment discharges.
- Soil stockpiles.
- Slopes with exposed soil between existing vegetation such as trees or shrubs.
- Slopes planted with live, container-grown vegetation or plugs.
- Slopes burned by wildfire.

Hydraulic mulch can also be applied to augment other erosion control BMPs such as:

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- In conjunction with straw mulch (see EC-6 Straw Mulch) where the rate of hydraulic mulch is reduced to 100-500 lbs per acre and the slurry is applied over the straw as a tackifying agent to hold the straw in place.
- Supplemental application of soil amendments, such as fertilizer, lime, gypsum, soil bio-stimulants or compost.

Limitations

In general, hydraulic mulch is not limited by slope length, gradient or soil type. However, the following limitations typically apply:

- Most hydraulic mulch applications, particularly bonded fiber matrices (BFMs), require at least 24 hours to dry before rainfall occurs.
- Temporary applications (i.e., without a vegetative component) may require a second application in order to remain effective for an entire rainy season.
- Treatment areas must be accessible to hydraulic mulching equipment.
- Availability of water sources in remote areas for mixing and application.
- As a stand-alone temporary BMP, hydraulic mulches may need to be re-applied to maintain their erosion control effectiveness, typically after 6-12 months depending on the type of mulch used.
- Availability of hydraulic mulching equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Cellulose fiber mulches alone may not perform well on steep slopes or in course soils.

Implementation

- Where feasible, it is preferable to prepare soil surfaces prior to application by roughening embankments and fill areas with a crimping or punching type roller or by track walking.
- The majority of hydraulic mulch applications do not necessarily require surface/soil preparation (See EC-15 Soil Preparation) although in almost every case where re-vegetation is included as part of the practice, soil preparation can be beneficial. One of the advantages of hydraulic mulch over other erosion control methods is that it can be applied in areas where soil preparation is precluded by site conditions, such as steep slopes, rocky soils, or inaccessibility.
- Avoid mulch over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Hydraulic mulching is generally performed utilizing specialized machines that have a large water-holding/mixing tank and some form of mechanical agitation or other recirculation method to keep water, mulch and soil amendments in suspension. The mixed hydraulic slurry can be applied from a tower sprayer on top of the machine or by extending a hose to areas remote from the machine.

- Where possible apply hydraulic mulch from multiple directions to adequately cover the soil. Application from a single direction can result in shadowing, uneven coverage and failure of the BMP.

- Hydraulic mulch can also include a vegetative component, such as seed, rhizomes, or stolons (see EC-4 Hydraulic Seed).

- Typical hydraulic mulch application rates range from 2,000 pounds per acre for standard mulches (SMs) to 3,500 pounds per acre for BFMs. However, the required amount of hydraulic mulch to provide adequate coverage of exposed topsoil may appear to exceed the standard rates when the roughness of the soil surface is changed due to soil preparation methods (see EC-15 Soil Preparation) or by slope gradient.

- Other factors such as existing soil moisture and soil texture can have a profound effect on the amount of hydraulic mulch required (i.e. application rate) applied to achieve an erosion-resistant covering.

- Avoid use of mulch without a tackifier component, especially on slopes.

- Mulches used in the hydraulic mulch slurry can include:

  - Cellulose fiber

  - Thermally-processed wood fibers

  - Cotton

  - Synthetics

  - Compost (see EC-14, Compost Blanket)

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Categories of Hydraulic Mulches

Standard Hydraulic Mulch (SM)

Standard hydraulic mulches are generally applied at a rate of 2,000 pounds per acre and are manufactured containing around 5% tackifier (i.e. soil binder), usually a plant-derived guar or psyllium type. Most standard mulches are green in color derived from food-color based dyes.

Hydraulic Matrices (HM) and Stabilized Fiber Matrices (SFM)

Hydraulic matrices and stabilized fiber matrices are slurries which contain increased levels of tackifiers/soil binders; usually 10% or more by weight. HMs and SFMs have improved performance compared to a standard hydraulic mulch (SM) because of the additional percentage of tackifier and because of their higher application rates, typically 2,500 – 4,000 pounds per acre. Hydraulic matrices can include a mixture of fibers, for example, a 50/50 blend of paper and wood fiber. In the case of an SFM, the tackifier/soil binder is specified as a polyacrylamide (PAM).

Bonded Fiber Matrix (BFM)

Bonded fiber matrices (BFMs) are hydraulically-applied systems of fibers, adhesives (typically guar based) and chemical cross-links. Upon drying, the slurry forms an erosion-resistant blanket that prevents soil erosion and promotes vegetation establishment. The cross-linked adhesive in the BFM should be biodegradable and should not dissolve or disperse upon re-wetting. BFMs are typically applied at rates from 3,000 to 4,000 lbs/acre based on the manufacturer's recommendation. BFMs should not be applied immediately before, during or immediately after rainfall or if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

Mechanically-Bonded Fiber Matrices (MBFM)

Mechanically-bonded fiber matrices (MBFMs) are hydraulically applied systems similar to BFM that use crimped synthetic fibers and PAM and are typically applied to a slope at a higher application rate than a standard BFM.

Hydraulic Compost Matrix (HCM)

Hydraulic compost matrix (HCM) is a field-derived practice whereby finely graded or sifted compost is introduced into the hydraulic mulch slurry. A guar-type tackifier can be added for steeper slope applications as well as any specified seed mixtures. A HCM can help to accelerate seed germination and growth. HCMs are particularly useful as an in-fill for three-dimensional re-vegetation geocomposites, such as turf reinforcement mats (TRM) (see EC-7 Geotextiles and Mats).

Costs

Average installed costs for hydraulic mulch categories are is provided in Table 1, below.

Table 1
HYDRAULIC MULCH BMPs
INSTALLED COSTS

BMP	Installed Cost/Acre
Standard Hydraulic Mulching (SM)	$1,700 - $3,600 per acre
Hydraulic Matrices (HM) and Stabilized Fiber Matrices	
Guar-based	$2,000 - $4,000 per acre
PAM-based	$2,500 - $5,610 per acre
Bonded Fiber Matrix (BFM)	$3,900 - $6,900 per acre
Mechanically Bonded Fiber Matrix (MBFM)	$4,500 - $6,000 per acre
Hydraulic Compost Matrix (HCM)	$3,000 - $3,500 per acre

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected

weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Compare the number of bags or weight of applied mulch to the area treated to determine actual application rates and compliance with specifications.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Controlling Erosion of Construction Sites, Agricultural Information #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

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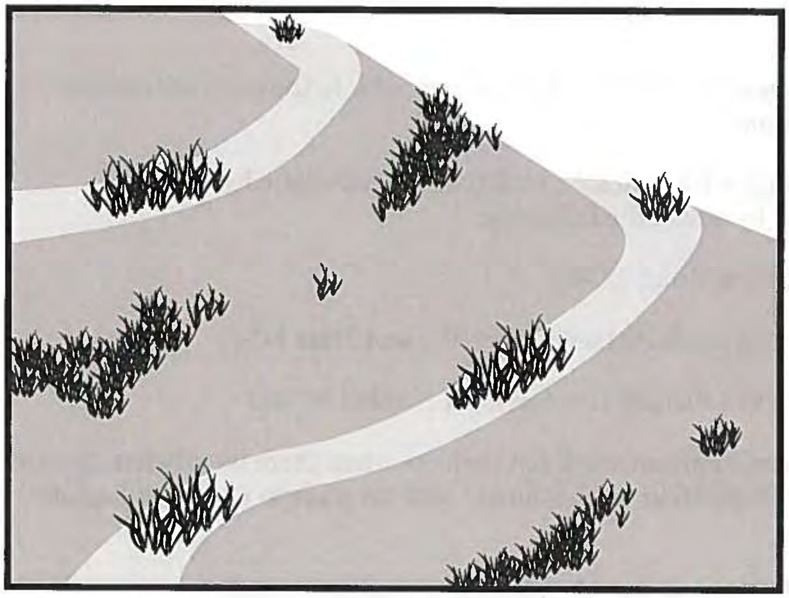
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydroseeding EC-4



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

EC-16 Non-Vegetative Stabilization

Description and Purpose

Hydroseeding typically consists of applying a mixture of a hydraulic mulch, seed, fertilizer, and stabilizing emulsion with a hydraulic mulcher, to temporarily protect exposed soils from erosion by water and wind. Hydraulic seeding, or hydroseeding, is simply the method by which temporary or permanent seed is applied to the soil surface.

Suitable Applications

Hydroseeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, for disturbed areas that will be re-disturbed following an extended period of inactivity, or to apply permanent stabilization measures. Hydroseeding without mulch or other cover (e.g. EC-7, Erosion Control Blanket) is not a stand-alone erosion control BMP and should be combined with additional measures until vegetation establishment.

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.
- Cleared and graded areas exposed to seasonal rains or temporary irrigation.
- Areas not subject to heavy wear by construction equipment or high traffic.

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Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.

- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:

  - Straw mulch (see Straw Mulch EC-6)
  - Rolled erosion control products (see Geotextiles and Mats EC-7)
  - Application of Compost Blanket (see Compost Blanket EC-14)

  Hydraulic seed may be used alone only on small flat surfaces when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control.

- Hydraulic seed without mulch does not provide immediate erosion control.

- Temporary seeding may not be appropriate for steep slopes (i.e., slopes readily prone to rill erosion or without sufficient topsoil).

- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.

- Temporary vegetation may have to be removed before permanent vegetation is applied.

- Temporary vegetation may not be appropriate for short term inactivity (i.e. less than 3-6 months).

Implementation

In order to select appropriate hydraulic seed mixtures, an evaluation of site conditions should be performed with respect to:

- Soil conditions
- Site topography and exposure (sun/wind)
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS) is an excellent source of information on appropriate seed mixes.

The following steps should be followed for implementation:

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying (See EC-15, Soil Preparation) the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.
- Hydraulic seed can be applied using a multiple step or one step process.
  - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).
  - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.
- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at http://www.leginfo.ca.gov/.html/fac_table_of_contents.html. Fertilizer should be pelleted or granular form.
- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Costs

Average cost for installation and maintenance may vary from as low as $1,900 per acre for flat slopes and stable soils, to $4,000 per acre for moderate to steep slopes and/or erosive soils. Cost of seed mixtures vary based on types of required vegetation.

BMP	Installed Cost per Acre
Hydraulic Seed	$1,900-$4,000

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

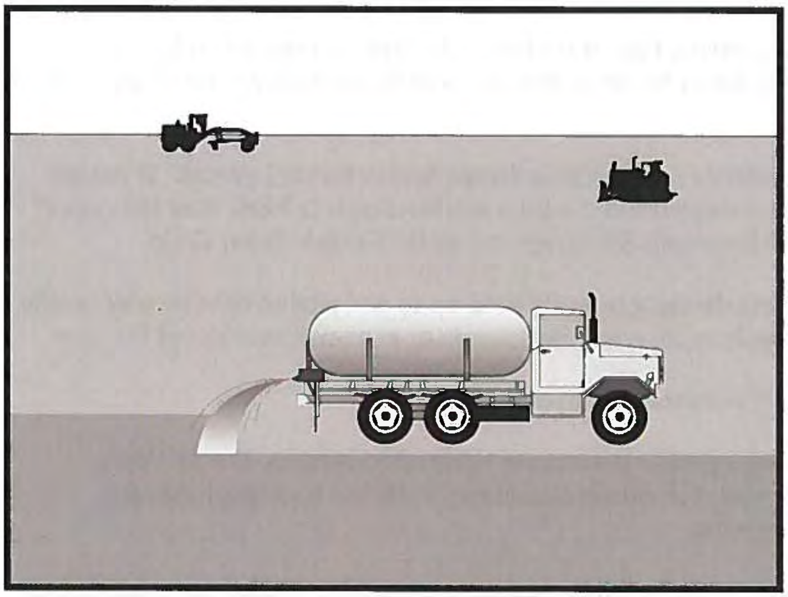
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.



Categories

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Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch
EC-4 Hydroseeding
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching

Description and Purpose

Soil binding consists of application and maintenance of a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water and wind induced erosion of exposed soils on construction sites.

Suitable Applications

Soil binders are typically applied to disturbed areas requiring temporary protection. Because soil binders, when used as a stand-alone practice, can often be incorporated into the soil, they are a good alternative to mulches in areas where grading activities will soon resume. Soil binders are commonly used in the following areas:

- Rough graded soils that will be inactive for a short period of time
- Soil stockpiles
- Temporary haul roads prior to placement of crushed rock
- Compacted soil road base
- Construction staging, materials storage, and layout areas

Limitations

- Soil binders are temporary in nature and may need reapplication.

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- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer. Curing time may be 24 hours or longer. Soil binders may need reapplication after a storm event.
- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.
- Plant-material-based soil binders do not generally hold up to pedestrian or vehicular traffic across treated areas as well as polymeric emulsion blends or cementitious-based binders.
- Soil binders may not sufficiently penetrate compacted soils.
- Some soil binders are soil texture specific in terms of their effectiveness. For example, polyacrylamides (PAMs) work very well on silt and clayey soils but their performance decreases dramatically in sandy soils.
- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.
- Soil binders may not cure if low temperatures occur within 24 hours of application.
- The water quality impacts of some chemical soil binders are relatively unknown and some may have water quality impacts due to their chemical makeup.

Implementation

General Considerations

- Soil binders should conform to local municipality specifications and requirements.
- Site soil types will dictate appropriate soil binders to be used.
- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and should not stain paved or painted surfaces. Soil binders should not pollute stormwater when cured. Obtain a Material Safety Data Sheet (MSDS) from the manufacturer to ensure non-toxicity.
- Stormwater runoff from PAM treated soils should pass through one of the following sediment control BMP prior to discharging to surface waters.
  - When the total drainage area is greater than or equal to 5 acres, PAM treated areas should drain to a sediment basin.
  - Areas less than 5 acres should drain to sediment control BMPs, such as a sediment trap, or a series of check dams. The total number of check dams used should be maximized to achieve the greatest amount of settlement of sediment prior to discharging from the site. Each check dam should be spaced evenly in the drainage channel through which stormwater flows are discharged off site.
- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.

- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Selecting a Soil Binder

Properties of common soil binders used for erosion control are provided on Table 1 at the end of this Fact Sheet. Use Table 1 to select an appropriate soil binder. Refer to WE-1, Wind Erosion Control, for dust control soil binders.

Factors to consider when selecting a soil binder include the following:

- Suitability to situation - Consider where the soil binder will be applied, if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders.
- Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.
- Frequency of application - The frequency of application is related to the functional longevity of the binder, which can be affected by subgrade conditions, surface type, climate, and maintenance schedule.
- Frequent applications could lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean up.

Plant-Material-Based (Short Lived, <6 months) Binders

<u>Guar:</u> Guar is a non-toxic, biodegradable, natural galactomannan-based hydrocolloid treated with dispersant agents for easy field mixing. It should be mixed with water at the rate of 11 to 15 lb per 1,000 gallons. Recommended minimum application rates are as follows:

Application Rates for Guar Soil Stabilizer

Slope (H:V):	Flat	4:1	3:1	2:1	1:1
lb/acre:	40	45	50	60	70

<u>Psyllium:</u> Psyllium is composed of the finely ground muciloid coating of plantago seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together, but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Application rates should be from 80 to 200 lb/acre, with enough water in solution to allow for a uniform slurry flow.

<u>Starch:</u> Starch is non-ionic, cold water soluble (pre-gelatinized) granular cornstarch. The material is mixed with water and applied at the rate of 150 lb/acre. Approximate drying time is 9 to 12 hours.

Plant-Material-Based (Long Lived, 6-12 months) Binders

Pitch and Rosin Emulsion: Generally, a non-ionic pitch and rosin emulsion has a minimum solids content of 48%. The rosin should be a minimum of 26% of the total solids content. The soil stabilizer should be non-corrosive, water dilutable emulsion that upon application cures to a water insoluble binding and cementing agent. For soil erosion control applications, the emulsion is diluted and should be applied as follows:

- For clayey soil: 5 parts water to 1 part emulsion
- For sandy soil: 10 parts water to 1 part emulsion

Application can be by water truck or hydraulic seeder with the emulsion and product mixture applied at the rate specified by the manufacturer.

Polymeric Emulsion Blend Binders

Acrylic Copolymers and Polymers: Polymeric soil stabilizers should consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound should be handled and mixed in a manner that will not cause foaming or should contain an anti-foaming agent. The polymeric emulsion should not exceed its shelf life or expiration date; manufacturers should provide the expiration date. Polymeric soil stabilizer should be readily miscible in water, non-injurious to seed or animal life, non-flammable, should provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and should not re-emulsify when cured. The applied compound typically requires 12 to 24 hours drying time. Liquid copolymer should be diluted at a rate of 10 parts water to 1 part polymer and the mixture applied to soil at a rate of 1,175 gallons/acre.

Liquid Polymers of Methacrylates and Acrylates: This material consists of a tackifier/sealer that is a liquid polymer of methacrylates and acrylates. It is an aqueous 100% acrylic emulsion blend of 40% solids by volume that is free from styrene, acetate, vinyl, ethoxylated surfactants or silicates. For soil stabilization applications, it is diluted with water in accordance with the manufacturer's recommendations, and applied with a hydraulic seeder at the rate of 20 gallons/acre. Drying time is 12 to 18 hours after application.

Copolymers of Sodium Acrylates and Acrylamides: These materials are non-toxic, dry powders that are copolymers of sodium acrylate and acrylamide. They are mixed with water and applied to the soil surface for erosion control at rates that are determined by slope gradient:

Slope Gradient (H:V)	lb/acre
Flat to 5:1	3.0 – 5.0
5:1 to 3:1	5.0 – 10.0
2:1 to 1:1	10.0 – 20.0

Poly-Acrylamide (PAM) and Copolymer of Acrylamide: Linear copolymer polyacrylamide for use as a soil binder is packaged as a dry flowable solid, as a liquid. Refer to the manufacturer's recommendation for dilution and application rates as they vary based on liquid or dry form, site conditions and climate.

- Limitations specific to PAM are as follows:

- Do not use PAM on a slope that flows into a water body without passing through a sediment trap or sediment basin.

- The specific PAM copolymer formulation must be anionic. Cationic PAM should not be used in any application because of known aquatic toxicity problems. Only the highest drinking water grade PAM, certified for compliance with ANSI/NSF Standard 60 for drinking water treatment, should be used for soil applications.

- PAM designated for erosion and sediment control should be "water soluble" or "linear" or "non-cross linked".

- PAM should not be used as a stand-alone BMP to protect against water-based erosion. When combined with mulch, its effectiveness increases dramatically.

Hydro-Colloid Polymers: Hydro-Colloid Polymers are various combinations of dry flowable poly-acrylamides, copolymers and hydro-colloid polymers that are mixed with water and applied to the soil surface at rates of 55 to 60 lb/acre. Drying times are 0 to 4 hours.

Cementitious-Based Binders

Gypsum: This is a formulated gypsum based product that readily mixes with water and mulch to form a thin protective crust on the soil surface. It is composed of high purity gypsum that is ground, calcined and processed into calcium sulfate hemihydrate with a minimum purity of 86%. It is mixed in a hydraulic seeder and applied at rates 4,000 to 12,000 lb/acre. Drying time is 4 to 8 hours.

Applying Soil Binders

After selecting an appropriate soil binder, the untreated soil surface must be prepared before applying the soil binder. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. In general, the following steps should be followed:

- Follow manufacturer's written recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.

- Prior to application, roughen embankment and fill areas.

- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders should not be applied during or immediately before rainfall.

- Avoid over spray onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.

- Soil binders should not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 40°F during the curing period.

- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.

- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure time.

- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd² or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically at least 24 hours.
  - Apply second treatment before first treatment becomes ineffective, using 50% application rate.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd².

Costs

Costs vary according to the soil stabilizer selected for implementation. The following are approximate installed costs:

Soil Binder	Cost per Acre (2000)[1]	Estimated Cost per Acre (2009)[2]
Plant-Material-Based (Short Lived) Binders	\$700-\$900	\$770-\$990
Plant-Material-Based (Long Lived) Binders	\$1,200-\$1,500	\$1,320-\$1,650
Polymeric Emulsion Blend Binders	\$700 -\$1,500	\$770-\$1,650
Cementitious-Based Binders	\$800-\$1,200	\$880-\$1,350

1. Source: Erosion Control Pilot Study Report, Caltrans, June 2000.
2. 2009 costs reflect a 10% escalation over year 2000 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Reapply the selected soil binder as needed to maintain effectiveness.

Table 1 Properties of Soil Binders for Erosion Control

Evaluation Criteria	Binder Type			
	Plant Material Based (Short Lived)	Plant Material Based (Long Lived)	Polymeric Emulsion Blends	Cementitious-Based Binders
Relative Cost	Low	Moderate to High	Low to High	Low to Moderate
Resistance to Leaching	High	High	Low to Moderate	Moderate
Resistance to Abrasion	Moderate	Low	Moderate to High	Moderate to High
Longevity	Short to Medium	Medium	Medium to Long	Medium
Minimum Curing Time before Rain	9 to 18 hours	19 to 24 hours	0 to 24 hours	4 to 8 hours
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Biodegradable	Biodegradable	Photodegradable/ Chemically Degradable	Photodegradable/ Chemically Degradable
Labor Intensive	No	No	No	No
Specialized Application Equipment	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher
Liquid/Powder	Powder	Liquid	Liquid/Powder	Powder
Surface Crusting	Yes, but dissolves on rewetting	Yes	Yes, but dissolves on rewetting	Yes
Clean Up	Water	Water	Water	Water
Erosion Control Application Rate	Varies (1)	Varies (1)	Varies (1)	4,000 to 12,000 lbs/acre

(1) See Implementation for specific rates.

References

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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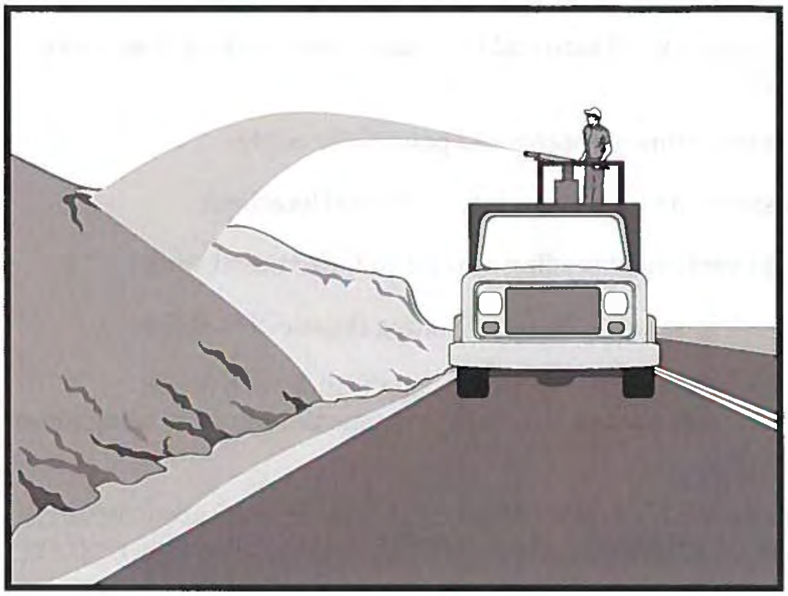

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Potential Alternatives

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EC-4 Hydroseeding

EC-5 Soil Binders

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

Description and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or crimper, or anchoring it with a tackifier or stabilizing emulsion. Straw mulch protects the soil surface from the impact of rain drops, preventing soil particles from becoming dislodged.

Suitable Applications

Straw mulch is suitable for disturbed areas requiring temporary protection until permanent stabilization is established. Straw mulch can be specified for the following applications:

- As a stand-alone BMP on disturbed areas until soils can be prepared for permanent vegetation. The longevity of straw mulch is typically less than six months.
- Applied in combination with temporary seeding strategies
- Applied in combination with permanent seeding strategies to enhance plant establishment and final soil stabilization
- Applied around containerized plantings to control erosion until the plants become established to provide permanent stabilization

Limitations

- Availability of straw and straw blowing equipment may be limited just prior to the rainy season and prior to storms due to high demand.

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- There is a potential for introduction of weed seed and unwanted plant material if weed-free agricultural straw is not specified.
- Straw mulch applied by hand is more time intensive and potentially costly.
- Wind may limit application of straw and blow straw into undesired locations.
- May have to be removed prior to permanent seeding or prior to further earthwork.
- "Punching" of straw does not work in sandy soils, necessitating the use of tackifiers.
- Potential fugitive dust control issues associated with straw applications can occur. Application of a stabilizing emulsion or a water stream at the same time straw is being blown can reduce this problem.
- Use of plastic netting should be avoided in areas where wildlife may be entrapped and may be prohibited for projects in certain areas with sensitive wildlife species, especially reptiles and amphibians.

Implementation

- Straw should be derived from weed-free wheat, rice, or barley. Where required by the plans, specifications, permits, or environmental documents, native grass straw should be used.
- Use tackifier to anchor straw mulch to the soil on slopes.
- Crimping, punch roller-type rollers, or track walking may also be used to incorporate straw mulch into the soil on slopes. Track walking can be used where other methods are impractical.
- Avoid placing straw onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.
- Straw mulch with tackifier should not be applied during or immediately before rainfall.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Application Procedures

- When using a tackifier to anchor the straw mulch, roughen embankment or fill areas by rolling with a crimping or punching-type roller or by track walking before placing the straw mulch. Track walking should only be used where rolling is impractical.
- Apply straw at a rate of between 3,000 and 4,000 lb/acre, either by machine or by hand distribution and provide 100% ground cover. A lighter application is used for flat surfaces and a heavier application is used for slopes.
- Evenly distribute straw mulch on the soil surface.
- Anchoring straw mulch to the soil surface by "punching" it into the soil mechanically (incorporating) can be used in lieu of a tackifier.

- Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions, and longevity.
  - A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier should be selected based on longevity and ability to hold the fibers in place. A tackifier is typically applied at a rate of 125 lb/acre. In windy conditions, the rates are typically 180 lb/acre.
  - On very small areas, a spade or shovel can be used to punch in straw mulch.
  - On slopes with soils that are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife blade roller or a straight bladed coulter, known commercially as a "crimper."

Costs

Average annual cost for installation and maintenance is included in the table below. Application by hand is more time intensive and potentially more costly.

BMP	Unit Cost per Acre
Straw mulch, crimped or punched	$2,458-$5,375
Straw mulch with tackifier	$1,823-$4,802

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- The key consideration in inspection and maintenance is that the straw needs to last long enough to achieve erosion control objectives. Straw mulch as a stand-alone BMP is temporary and is not suited for long-term erosion control.
- Maintain an unbroken, temporary mulched ground cover while disturbed soil areas are inactive. Repair any damaged ground cover and re-mulch exposed areas.
- Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Controlling Erosion of Construction Sites, Agricultural Information Bulletin #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Soil Erosion by Water, Agricultural Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

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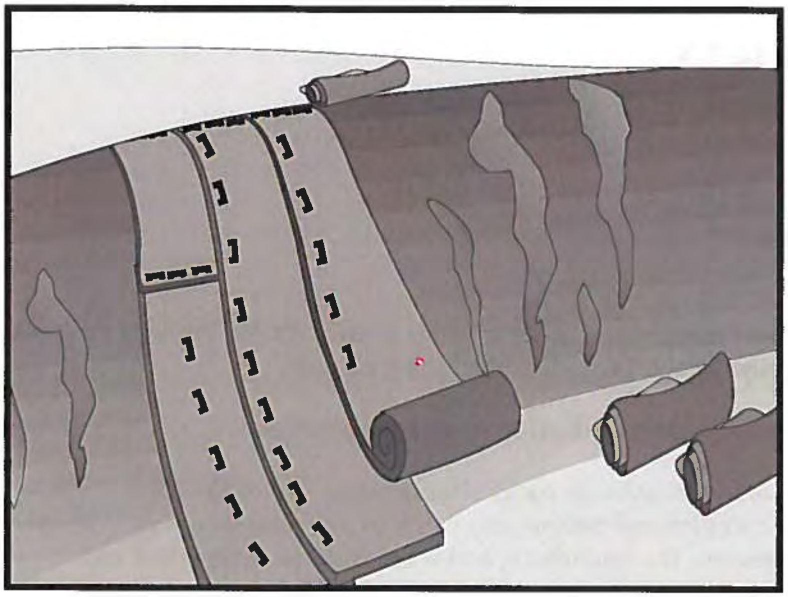
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Geotextiles and Mats EC-7



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

Description and Purpose

Mattings, or Rolled Erosion Control Products (RECPs), can be made of natural or synthetic materials or a combination of the two. RECPs are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, RECPs may be used to stabilize soils until vegetation is established or to reinforce non-woody surface vegetation.

Suitable Applications

RECPs are typically applied on slopes where erosion hazard is high and vegetation will be slow to establish. Mattings are also used on stream banks, swales and other drainage channels where moving water at velocities between 3 ft/s and 6 ft/s are likely to cause scour and wash out new vegetation, and in areas where the soil surface is disturbed and where existing vegetation has been removed. RECPs may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). RECPs should be considered when the soils are fine grained and potentially erosive. RECPs should be considered in the following situations.

- Steep slopes, generally steeper than 3:1 (H:V)
- Slopes where the erosion potential is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop

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- Channels with flows exceeding 3.3 ft/s
- Channels to be vegetated
- Stockpiles
- Slopes adjacent to water bodies

Limitations

- RECP installed costs are generally higher than other erosion control BMPs, limiting their use to areas where other BMPs are ineffective (e.g. channels, steep slopes).
- RECPs may delay seed germination, due to reduction in soil temperature.
- RECPs are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers). If a staple or pin cannot be driven into the soil because the underlying soil is too hard or rocky, then an alternative BMP should be selected.
- If used for temporary erosion control, RECPs should be removed and disposed of prior to application of permanent soil stabilization measures.
- The use of plastic should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until more environmentally friendly measures, such as seeding and mulching, may be installed.
  - Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
  - Plastic sheeting results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- RECPs may have limitations based on soil type, slope gradient, or channel flow rate; consult the manufacturer for proper selection.
- Not suitable for areas that have foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.
- RECPs that incorporate a plastic netting (e.g. straw blanket typically uses a plastic netting to hold the straw in place) may not be suitable near known wildlife habitat. Wildlife can become trapped in the plastic netting.
- RECPs may have limitations in extremely windy climates. However, when RECPs are properly trenched at the top and bottom and stapled in accordance with the manufacturer's recommendations, problems with wind can be minimized.

Implementation

Material Selection

- Natural RECPs have been found to be effective where re-vegetation will be provided by re-seeding. The choice of material should be based on the size of area, side slopes, surface conditions such as hardness, moisture, weed growth, and availability of materials.

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

- The following natural and synthetic RECPs are commonly used:

Geotextiles

- Material can be a woven or a non-woven polypropylene fabric with minimum thickness of 0.06 in., minimum width of 12 ft and should have minimum tensile strength of 150 lbs (warp), 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric should be approximately 0.07 sec^{-1} in conformance with the requirements in ASTM Designation: D4491. The fabric should have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets must be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under geotextile. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Geotextiles may be reused if they are suitable for the use intended.

Plastic Covers

- Generally plastic sheeting should only be used as stockpile covering or for very small graded areas for short periods of time (such as through one imminent storm event). If plastic sheeting must be used, choose a plastic that will withstand photo degradation.

- Plastic sheeting should have a minimum thickness of 6 mils, and must be keyed in at the top of slope (when used as a temporary slope protection) and firmly held in place with sandbags or other weights placed no more than 10 ft apart. Seams are typically taped or weighted down their entire length, and there should be at least a 12 in. to 24 in. overlap of all seams. Edges should be embedded a minimum of 6 in. in soil (when used as a temporary slope protection).

- All sheeting must be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures must be repaired immediately. If washout or breakages occur, the material should be re-installed after repairing the damage to the slope.

Erosion Control Blankets/Mats

- Biodegradable RECPs are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. In order for an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable. See typical installation details at the end of this fact sheet.

- **Jute** is a natural fiber that is made into a yarn that is loosely woven into a biodegradable mesh. The performance of jute as a stand-alone RECP is low. Most other RECPs outperform jute as a temporary erosion control product and therefore jute is not commonly used. It is designed to be used in conjunction with vegetation. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Excelsior** (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 in. or longer. The excelsior blanket should be of consistent thickness. The wood fiber must be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and should be non-toxic and non-injurious to plant and animal life. Excelsior blankets should be furnished in rolled strips, a minimum of 48 in. wide, and should have an average weight of 0.8 lb/yd^2, ±10 percent, at the time of manufacture. Excelsior blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Straw blanket** should be machine produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Coconut fiber blanket** should be a machine produced mat of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 ft wide, a minimum of 80 ft. long and a minimum of 0.5 lb/yd^2. Coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Straw coconut fiber blanket** should be machine produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd². Straw coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

■ Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.

- **Plastic netting** is a lightweight biaxially oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Plastic mesh** is an open weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than ¼ in. It is used with re-vegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be re-vegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Bonded synthetic fibers** consist of a three dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90 percent open area, which facilitates root growth. It's tough root reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high strength continuous filament geomatrix or net stitched to the bottom. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

Site Preparation

- Proper soil preparation is essential to ensure complete contact of the RECP with the soil. Soil Roughening is not recommended in areas where RECPs will be installed.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 2 to 3 in. of topsoil.

Seeding/Planting

Seed the area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all areas disturbed during blanket installation must be re-seeded. Where soil filling is specified for turf reinforcement mats (TRMs), seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

Check Slots

Check slots shall be installed as required by the manufacturer.

Laying and Securing Matting

- Before laying the matting, all check slots should be installed and the seedbed should be friable, made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Mechanical or manual lay down equipment should be capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

Anchoring

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Wire staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Metal stake pins should be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin, and 8 in. in length.
- Wire staples and metal stakes should be driven flush to the soil surface.

Installation on Slopes

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 to 3 in. and staple every 3 ft (or greater, per manufacturer's specifications).
- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples should be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd^2. Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 ½ staples/yd^2. Check manufacturer's specifications to determine if a higher density staple pattern is required.

Installation in Channels

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft intervals along the channels.
- Cut longitudinal channel anchor trenches 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 to 3 in. above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 3 in. overlap.

- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 to 30 ft. intervals in lieu of excavated check slots.
- Staple shingled lap spliced ends a minimum of 12 in. apart on 12 in. intervals.
- Place edges of outside mats in previously excavated longitudinal slots; anchor using prescribed staple pattern, backfill, and compact soil.
- Anchor, fill, and compact upstream end of mat in a 12 in. by 6 in. terminal trench.
- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement mat (TRM))

Installation should be in accordance with the manufacturer's recommendations. Typical installation guidelines are as follows:

- After seeding, spread and lightly rake ½-3/4 inches of fine topsoil into the TRM apertures to completely fill TRM thickness. Use backside of rake or other flat implement.
- Alternatively, if allowed by product specifications, spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.
- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes, or brooms for fine grading and touch up.
- Smooth out soil filling just exposing top netting of mat.

Temporary Soil Stabilization Removal

- Temporary soil stabilization removed from the site of the work must be disposed of if necessary.

Costs

Installed costs can be relatively high compared to other BMPs. Approximate costs for installed materials are shown below:

Rolled Erosion Control Products		Installed Cost per Acre (2000)[1]	Estimated Cost per Acre (2009)[2]
Biodegradable	Jute Mesh	$6,000-$7,000	$6,600-$7,700
	Curled Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Straw	$8,000-$10,500	$8,800-$11,050
	Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Coconut Fiber	$13,000-$14,000	$14,300-$15,400
	Coconut Fiber Mesh	$30,000-$33,000	$33,000-$36,300
	Straw Coconut Fiber	$10,000-$12,000	$11,000-$13,200
Non-Biodegradable	Plastic Netting	$2,000-$2,200	$2,200-$2,220
	Plastic Mesh	$3,000-$3,500	$3,300-$3,850
	Synthetic Fiber with Netting	$34,000-$40,000	$37,400-$44,000
	Bonded Synthetic Fibers	$45,000-$55,000	$49,500-$60,500
	Combination with Biodegradable	$30,000-$36,000	$33,000-$39,600

1. Source: Erosion Control Pilot Study Report, Caltrans, June 2000.
2. 2009 costs reflect a 10% escalation over year 2000 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

Inspection and Maintenance

- RECPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.
- Make sure matting is uniformly in contact with the soil.
- Check that all the lap joints are secure.
- Check that staples are flush with the ground.

References

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

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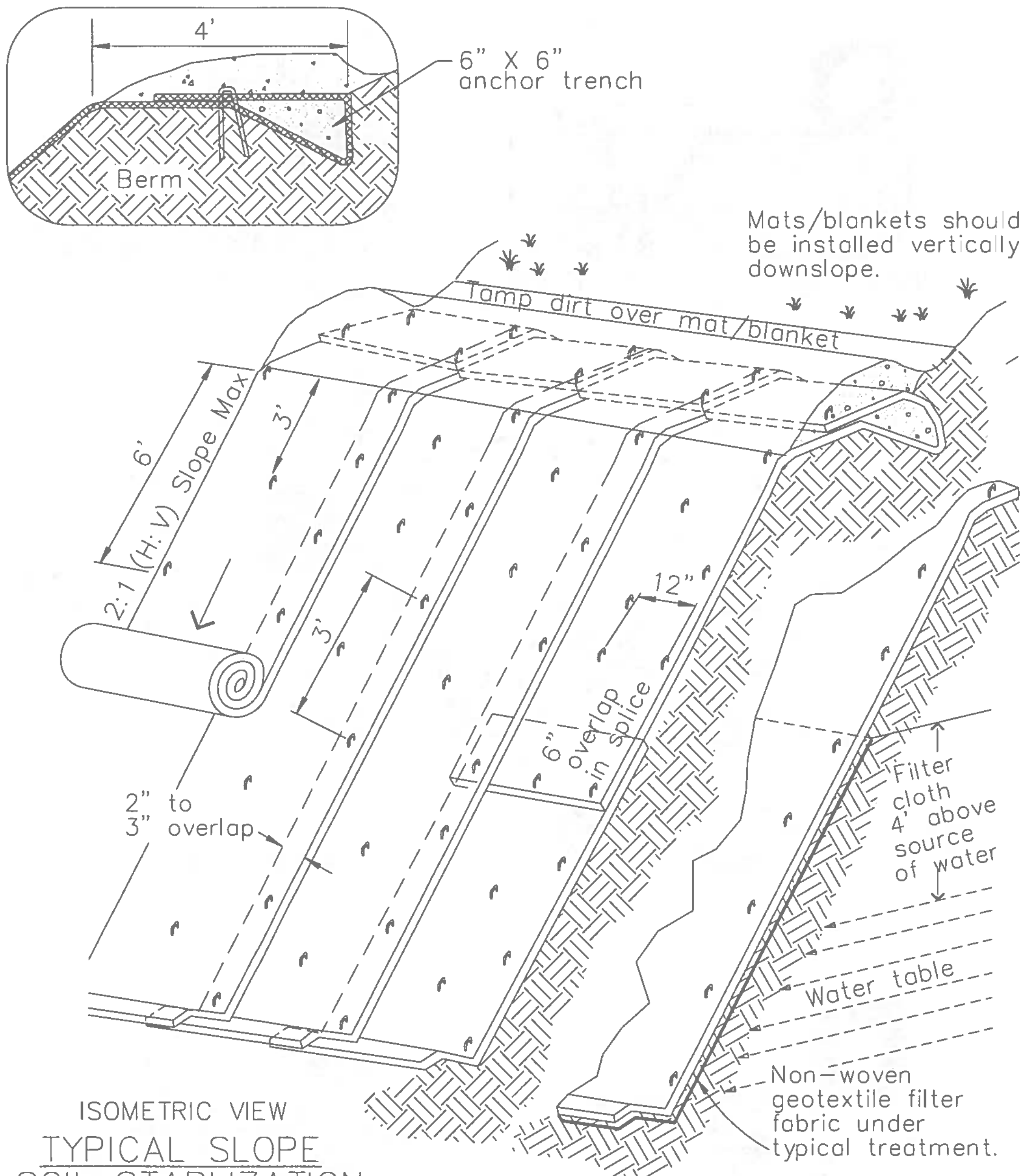


ISOMETRIC VIEW

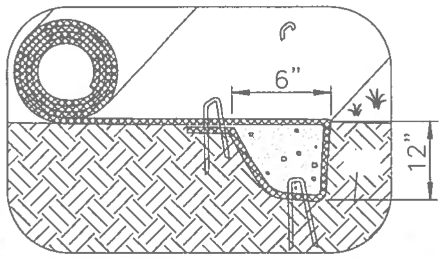
TYPICAL SLOPE
SOIL STABLIZATION
NTS

WET SLOPE LINING
NTS

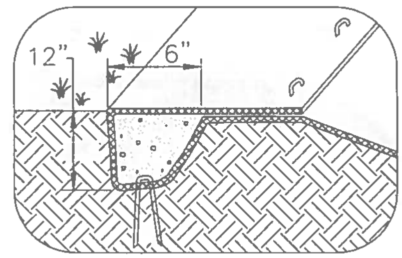
NOTES:

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations

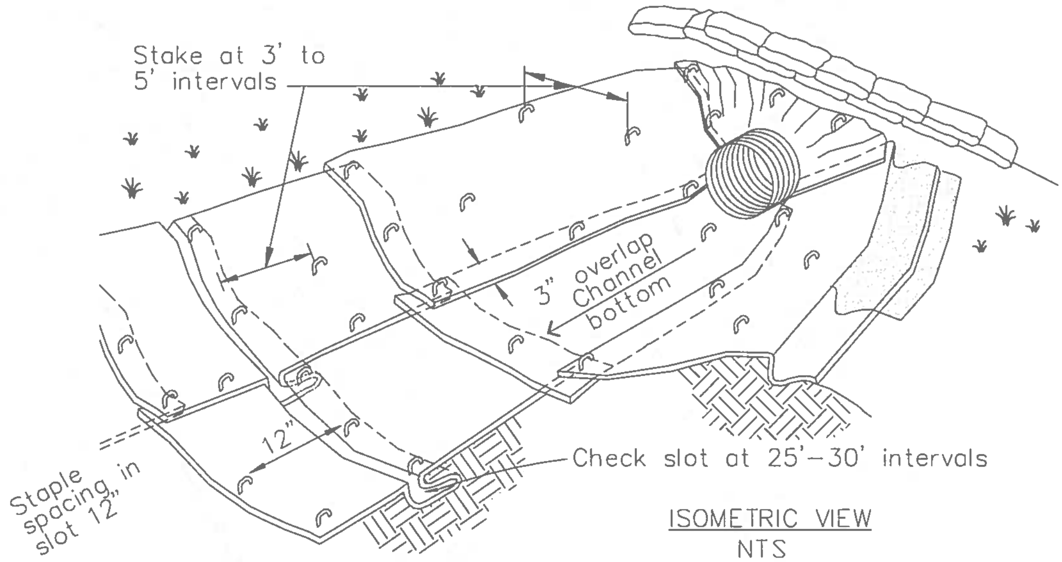
TYPICAL INSTALLATION DETAIL



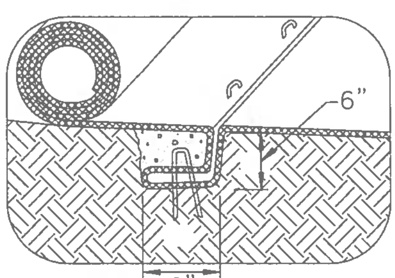
INITIAL CHANNEL ANCHOR TRENCH
NTS



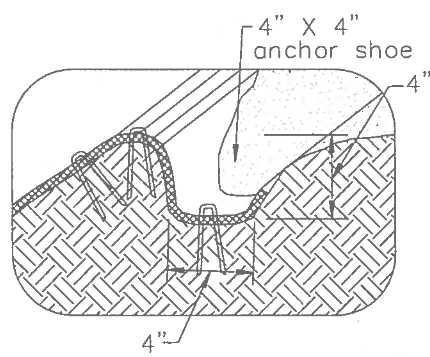
TERMINAL SLOPE AND CHANNEL
ANCHOR TRENCH
NTS



ISOMETRIC VIEW
NTS



INTERMITTENT CHECK SLOT
NTS



LONGITUDINAL ANCHOR TRENCH
NTS

NOTES:

1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

TYPICAL INSTALLATION DETAIL

Wood Mulching EC-8

Categories		
EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

Description and Purpose

Wood mulching consists of applying a mixture of shredded wood mulch, bark or compost to disturbed soils. The primary function of wood mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.

Suitable Applications

Wood mulching is suitable for disturbed soil areas requiring temporary protection until permanent stabilization is established.

Limitations

- Not suitable for use on slopes steeper than 3:1 (H:V). Best suited to flat areas or gentle slopes or 5:1 (H:V) or flatter.
- Wood mulch and compost may introduce unwanted species.
- Not suitable for areas exposed to concentrated flows.
- May need to be removed prior to further earthwork.

Implementation

Mulch Selection

There are many types of mulches. Selection of the appropriate type of mulch should be based on the type of application, site conditions, and compatibility with planned or future uses.

Application Procedures

Prior to application, after existing vegetation has been

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removed, roughen embankment and fill areas by rolling with a device such as a punching type roller or by track walking. The construction application procedures for mulches vary significantly depending upon the type of mulching method specified. Two methods are highlighted here:

- Green Material: This type of mulch is produced by the recycling of vegetation trimmings such as grass, shredded shrubs, and trees. Methods of application are generally by hand although pneumatic methods are available.
  - Green material can be used as a temporary ground cover with or without seeding.
  - The green material should be evenly distributed on site to a depth of not more than 2 in.
- Shredded Wood: Suitable for ground cover in ornamental or revegetated plantings.
  - Shredded wood/bark is conditionally suitable. See note under limitations.
  - Distribute by hand or use pneumatic methods.
  - Evenly distribute the mulch across the soil surface to a depth of 2 to 3 in.
- Avoid mulch placement onto roads, sidewalks, drainage channels, existing vegetation, etc.

Costs

Average annual cost for installation and maintenance (3-4 months useful life) is around $4,000 per acre, but cost can increase if the source is not close to the project site.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- Regardless of the mulching technique selected, the key consideration in inspection and maintenance is that the mulch needs to last long enough to achieve erosion control objectives. If the mulch is applied as a stand alone erosion control method over disturbed areas (without seed), it should last the length of time the site will remain barren or until final re-grading and revegetation.
- Where vegetation is not the ultimate cover, such as ornamental and landscape applications of bark or wood chips, inspection and maintenance should focus on longevity and integrity of the mulch.
- Reapply mulch when bare earth becomes visible.

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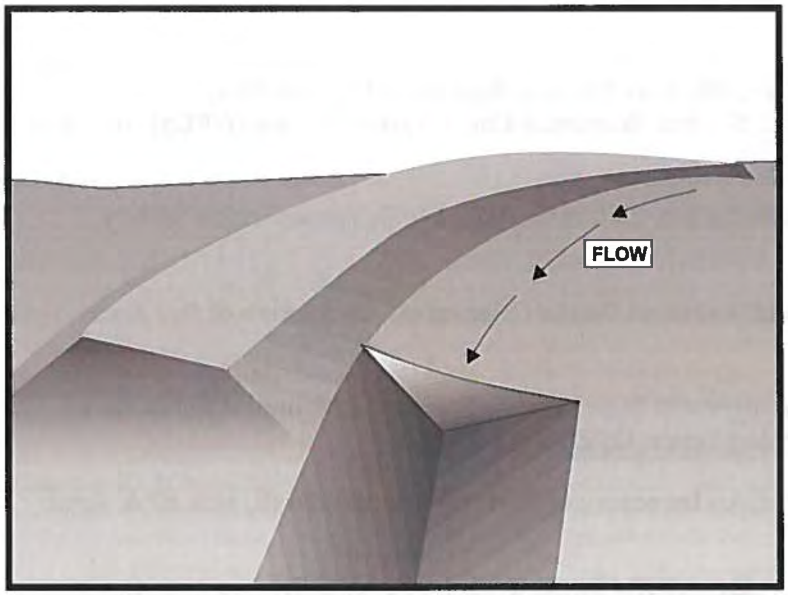
Earth Dikes and Drainage Swales EC-9



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
  - To convey surface runoff down sloping land
  - To intercept and divert runoff to avoid sheet flow over sloped surfaces
  - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
  - To intercept runoff from paved surfaces
  - Below steep grades where runoff begins to concentrate
  - Along roadways and facility improvements subject to flood drainage

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- At the top of slopes to divert runon from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in drainage swales.

Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

General

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

Earth Dikes

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin

(SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

Channel Grade	Riprap Stabilization
0.5-1.0%	4 in. Rock
1.1-2.0%	6 in. Rock
2.1-4.0%	8 in. Rock
4.1-5.0%	8 in. -12 in. Riprap

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
- Filter cloth may be used to cover dikes in use for long periods.
- Construction activity on the earth dike should be kept to a minimum.

Drainage Swales

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.
- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.

- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.
- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

Costs

- Cost ranges from $15 to $55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: $2.50 - $6.50/linear ft; Large dikes: $2.50/yd^3.
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

References

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursetynsky, P.E., McGraw Hill Book Company, 1986.

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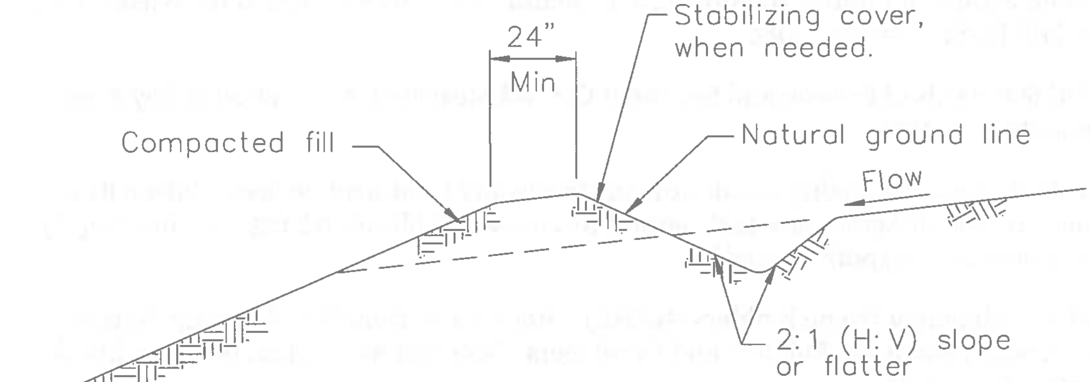
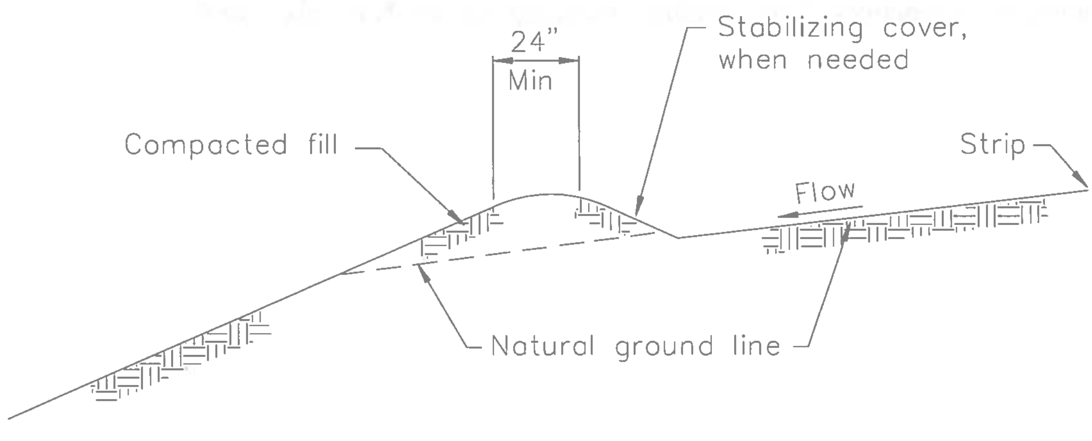


TYPICAL DRAINAGE SWALE

NOT TO SCALE

NOTES:

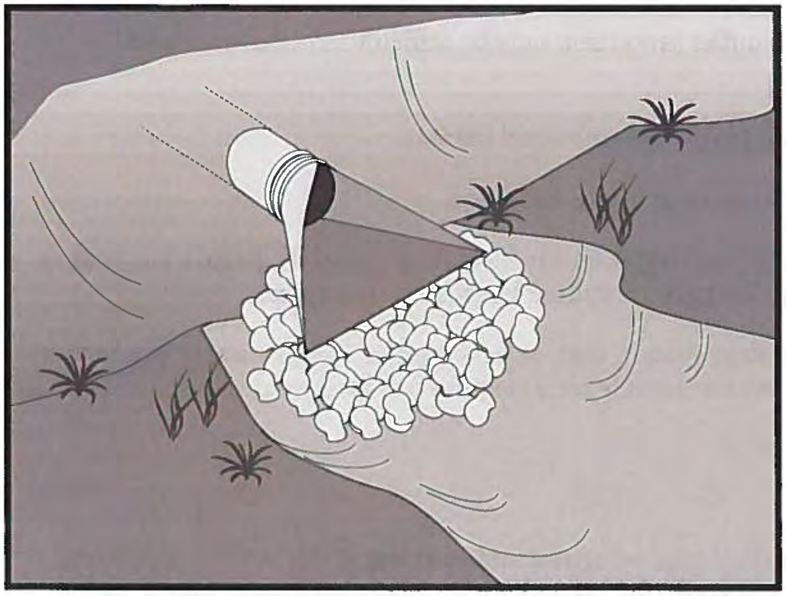
1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.



TYPICAL EARTH DIKE

NOT TO SCALE

Velocity Dissipation Devices EC-10



Categories

EC	Erosion Control	☑
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WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runon during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

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- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in velocity dissipation devices.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.

- Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.

- Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.

- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.

- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.

- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.

- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

References

County of Sacramento Improvement Standards, Sacramento County, May 1989.

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursztynsky, P.E., McGraw Hill Book Company, 1986.

Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

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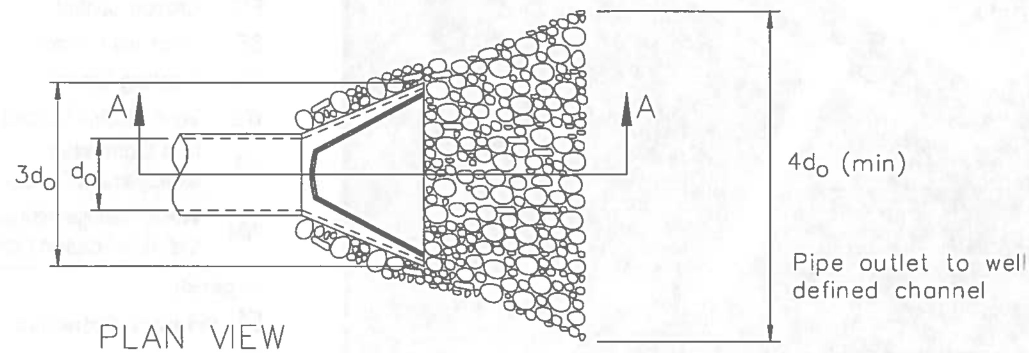
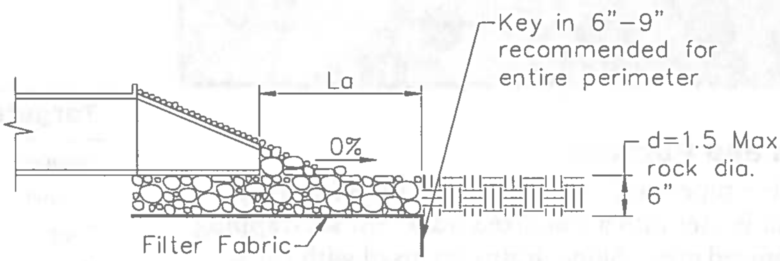


PLAN VIEW

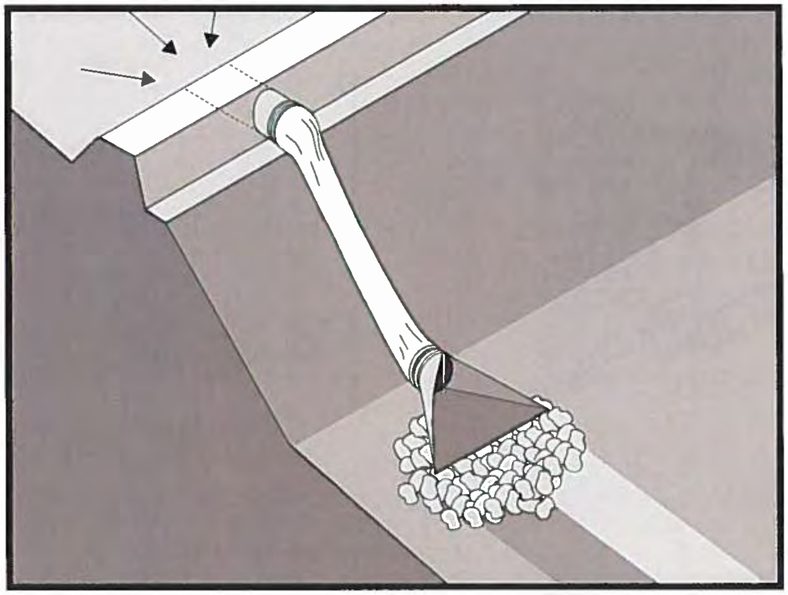


SECTION A–A

Pipe Diameter inches	Discharge ft³/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

Slope Drains EC-11



Categories

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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-9 Earth Dike, Drainage Swales

Description and Purpose

A slope drain is a pipe used to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device, or stabilized area. Slope drains are used with earth dikes and drainage ditches to intercept and direct surface flow away from slope areas to protect cut or fill slopes.

Suitable Applications

- Where concentrated flow of surface runoff must be conveyed down a slope in order to prevent erosion.
- Drainage for top of slope diversion dikes or swales.
- Drainage for top of cut and fill slopes where water can accumulate.
- Emergency spillway for a sediment basin.

Limitations

Installation is critical for effective use of the pipe slope drain to minimize potential gully erosion.

- Maximum drainage area per slope drain is 10 acres. (For large areas use a paved chute, rock lined channel, or additional pipes.)
- Severe erosion may result when slope drains fail by overtopping, piping, or pipe separation.
  - During large storms, pipe slope drains may become clogged or over charged, forcing water around the pipe

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and causing extreme slope erosion.

- If the sectional downdrain is not sized correctly, the runoff can spill over the drain sides causing gully erosion and potential failure of the structure.

- Dissipation of high flow velocities at the pipe outlet is required to avoid downstream erosion.

- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in energy dissipaters associated with slope drain outlets.

Implementation

General

The slope drain is applicable for any construction site where concentrated surface runoff can accumulate and must be conveyed down the slope in order to prevent erosion. The slope drain is effective because it prevents the stormwater from flowing directly down the slope by confining all the runoff into an enclosed pipe or channel. Due to the time lag between grading slopes and installation of permanent stormwater collection systems and slope stabilization measures, temporary provisions to intercept runoff are sometimes necessary. Particularly in steep terrain, slope drains can protect unstabilized areas from erosion.

Installation

The slope drain may be a rigid pipe, such as corrugated metal, a flexible conduit, or a lined terrace drain with the inlet placed on the top of a slope and the outlet at the bottom of the slope. This BMP typically is used in combination with a diversion control, such as an earth dike or drainage swale at the top of the slope.

The following criteria must be considered when siting slope drains.

- Permanent structures included in the project plans can often serve as construction BMPs if implemented early. However, the permanent structure must meet or exceed the criteria for the temporary structure.

- Inlet structures must be securely entrenched and compacted to avoid severe gully erosion.

- Slope drains must be securely anchored to the slope and must be adequately sized to carry the capacity of the design storm and associated forces.

- Outlets must be stabilized with riprap, concrete or other type of energy dissipator, or directed into a stable sediment trap or basin. See EC-10, Velocity Dissipation Devices.

- Debris racks are recommended at the inlet. Debris racks located several feet upstream of the inlet can usually be larger than racks at the inlet, and thus provide enhanced debris protection and less plugging.

- Safety racks are also recommended at the inlet and outlet of pipes where children or animals could become entrapped.

- Secure inlet and surround with dikes to prevent gully erosion and anchor pipe to slope.

- When using slope drains, limit drainage area to 10 acres per pipe. For larger areas, use a rock lined channel or a series of pipes.
- Size to convey at least the peak flow of a 10-year storm. The design storm is conservative due to the potential impact of system failures.
- Maximum slope generally limited to 2:1 (H:V) as energy dissipation below steeper slopes is difficult.
- Direct surface runoff to slope drains with interceptor dikes. See BMP EC-9, Earth Dikes and Drainage Swales. Top of interceptor dikes should be 12 in. higher than the top of the slope drain.
- Slope drains can be placed on or buried underneath the slope surface.
- Recommended materials include both metal and plastic pipe, either corrugated or smooth wall. Concrete pipe can also be used.
- When installing slope drains:
  - Install slope drains perpendicular to slope contours.
  - Compact soil around and under entrance, outlet, and along length of pipe.
  - Securely anchor and stabilize pipe and appurtenances into soil.
  - Check to ensure that pipe connections are watertight.
  - Protect area around inlet with filter cloth. Protect outlet with riprap or other energy dissipation device. For high energy discharges, reinforce riprap with concrete or use reinforced concrete device.
  - Protect outlet of slope drains using a flared end section when outlet discharges to a flexible energy dissipation device.
  - A flared end section installed at the inlet will improve flow into the slope drain and prevent erosion at the pipe entrance. Use a flared end section with a 6 in. minimum toe plate to help prevent undercutting. The flared section should slope towards the pipe inlet.

Design and Layout

The capacity for temporary drains should be sufficient to convey at least the peak runoff from a 10-year rainfall event. The pipe size may be computed using the Rational Method or a method established by the local municipality. Higher flows must be safely stored or routed to prevent any offsite concentration of flow and any erosion of the slope. The design storm is purposely conservative due to the potential impacts associated with system failures.

As a guide, temporary pipe slope drains should not be sized smaller than shown in the following table:

Minimum Pipe Diameter (Inches)	Maximum Drainage Area (Acres)
12	1.0
18	3.0
21	5.0
24	7.0
30	10.0

Larger drainage areas can be treated if the area can be subdivided into areas of 10 acres or less and each area is treated as a separate drainage. Drainage areas exceeding 10 acres must be designed by a Registered Civil Engineer and approved by the agency that issued the grading permit.

Materials:

Soil type, rainfall patterns, construction schedule, local requirements, and available supply are some of the factors to be considered when selecting materials. The following types of slope drains are commonly used:

- **Rigid Pipe:** This type of slope drain is also known as a pipe drop. The pipe usually consists of corrugated metal pipe or rigid plastic pipe. The pipe is placed on undisturbed or compacted soil and secured onto the slope surface or buried in a trench. Concrete thrust blocks must be used when warranted by the calculated thrust forces. Collars should be properly installed and secured with metal strappings or watertight collars.

- **Flexible Pipe**: The flexible pipe slope drain consists of a flexible tube of heavy duty plastic, rubber, or composite material. The tube material is securely anchored onto the slope surface. The tube should be securely fastened to the metal inlet and outlet conduit sections with metal strappings or watertight collars.

- **Section Downdrains**: The section downdrain consists of pre-fabricated, section conduit of half round or third round material. The sectional downdrain performs similar to a flume or chute. The pipe must be placed on undisturbed or compacted soil and secured into the slope.

- **Concrete-lined Terrace Drain:** This is a concrete channel for draining water from a terrace on a slope to the next level. These drains are typically specified as permanent structures and if installed early, can serve as slope drains during construction, which should be designed according to local drainage design criteria.

Costs

- Cost varies based on pipe selection and selected outlet protection.

Corrugated Steel Pipes, Per Foot	
Size	Supplied and Installed Cost (No Trenching Included)
12"	$19.60 per LF
15"	$22.00
18"	$26.00
24"	$32.00
30"	$50.00
PVC Pipes, Per Foot	
Size	Supplied and Installed Cost (No Trenching Included)
12"	$24.50
14"	$49.00
16"	$51.00
18"	$54.00
20"	$66.00
24"	$93.00
30"	$130.00

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.
- Inspect outlet for erosion and downstream scour. If eroded, repair damage and install additional energy dissipation measures. If downstream scour is occurring, it may be necessary to reduce flows being discharged into the channel unless other preventative measures are implemented.
- Insert inlet for clogging or undercutting. Remove debris from inlet to maintain flows. Repair undercutting at inlet and if needed, install flared section or rip rap around the inlet to prevent further undercutting.
- Inspect pipes for leakage. Repair leaks and restore damaged slopes.
- Inspect slope drainage for accumulations of debris and sediment.

- Remove built up sediment from entrances and outlets as required. Flush drains if necessary; capture and settle out sediment from discharge.
- Make sure water is not ponding onto inappropriate areas (e.g., active traffic lanes, material storage areas, etc.).
- Pipe anchors must be checked to ensure that the pipe remains anchored to the slope. Install additional anchors if pipe movement is detected.

References

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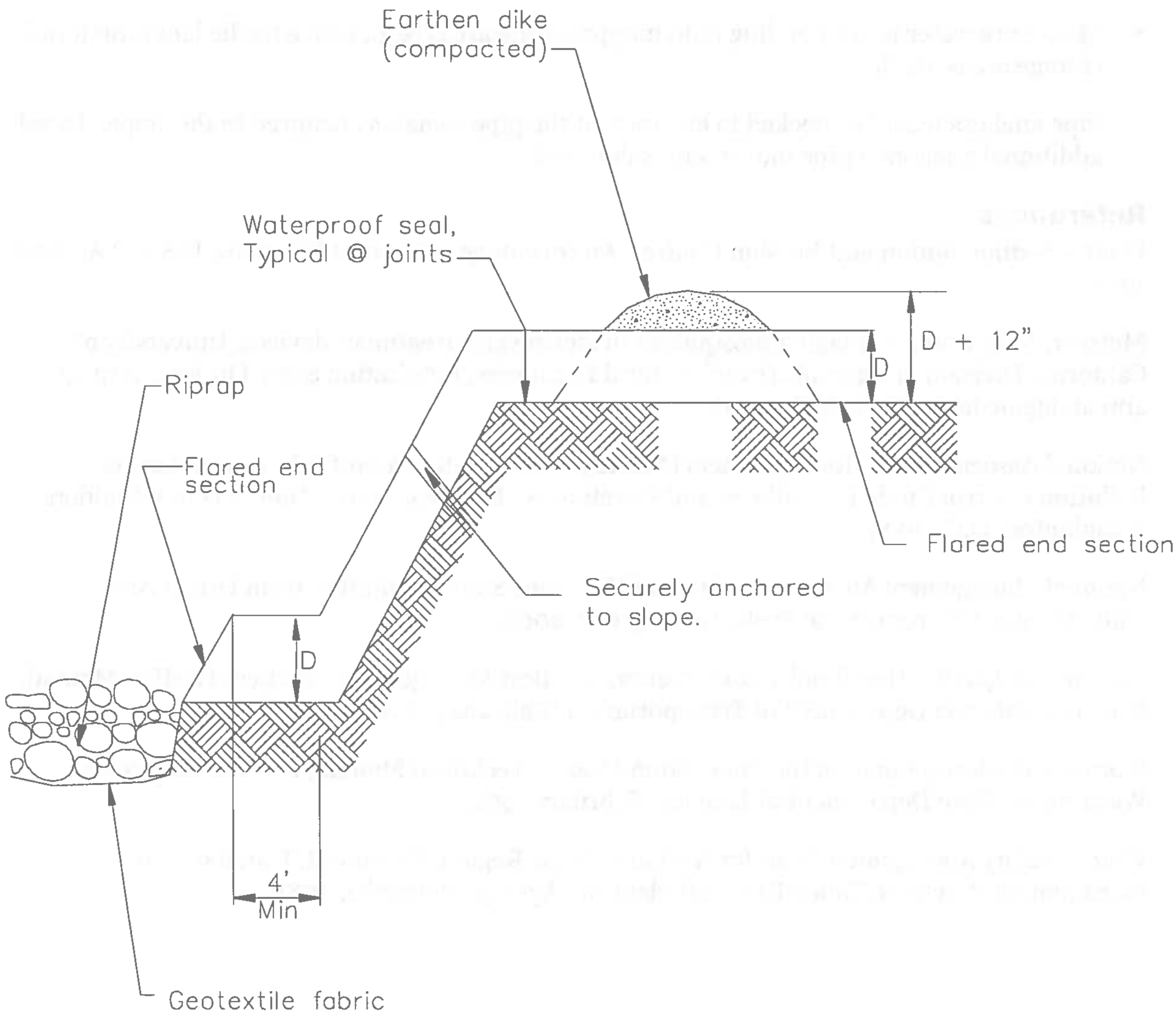

TYPICAL SLOPE DRAIN
NOT TO SCALE

Streambank Stabilization EC-12

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

Combination of erosion and sediment controls.

Description and Purpose

Stream channels, streambanks, and associated riparian areas are dynamic and sensitive ecosystems that respond to changes in land use activity. Streambank and channel disturbance resulting from construction activities can increase the stream's sediment load, which can cause channel erosion or sedimentation and have adverse affects on the biotic system. BMPs can reduce the discharge of sediment and other pollutants to minimize the impact of construction activities on watercourses. Streams on the 303(d) list and listed for sediment may require numerous measures to prevent any increases in sediment load to the stream.

Suitable Applications

These procedures typically apply to all construction projects that disturb or occur within stream channels and their associated riparian areas.

Limitations

Specific permit requirements or mitigation measures such as Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game supercede the guidance in this BMP.

- If numerical based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required. Streams listed as 303(d) impaired for sediment, silt, or turbidity, are required to

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conduct sampling to verify that there is no net increase in sediment load due to construction activities.

Implementation

Planning

- Proper planning, design, and construction techniques can minimize impacts normally associated with in stream construction activities. Poor planning can adversely affect soil, fish, wildlife resources, land uses, or land users. Planning should take into account: scheduling; avoidance of in-stream construction; minimizing disturbance area and construction time period; using pre-disturbed areas; selecting crossing location; and selecting equipment.

Scheduling

- Construction activities should be scheduled according to the relative sensitivity of the environmental concerns and in accordance with EC-1, Scheduling. Scheduling considerations will be different when working near perennial streams vs. ephemeral streams and are as follows.

- When in-stream construction is conducted in a perennial stream, work should optimally be performed during the rainy season. This is because in the summer, any sediment-containing water that is discharged into the watercourse will cause a large change in both water clarity and water chemistry. During the rainy season, there is typically more and faster flowing water in the stream so discharges are diluted faster. However, should in-stream work be scheduled for summer, establishing an isolation area, or diverting the stream, will significantly decrease the amount of sediment stirred up by construction work. Construction work near perennial streams should optimally be performed during the dry season (see below).

- When working in or near ephemeral streams, work should be performed during the dry season. By their very nature, ephemeral streams are usually dry in the summer, and therefore, in-stream construction activities will not cause significant water quality problems. However, when tying up the site at the end of the project, wash any fines (see Washing Fines) that accumulated in the channel back into the bed material, to decrease pollution from the first rainstorm of the season.

- When working near ephemeral or perennial streams, erosion and sediment controls (see silt fences, straw bale barriers, etc.) should be implemented to keep sediment out of stream channel.

Minimize Disturbance

- Minimize disturbance through: selection of the narrowest crossing location; limiting the number of equipment trips across a stream during construction; and, minimizing the number and size of work areas (equipment staging areas and spoil storage areas). Place work areas at least 50 ft from stream channel. Field reconnaissance should be conducted during the planning stage to identify work areas.

Use of Pre-Disturbed Areas

- Locate project sites and work areas in areas disturbed by prior construction or other activity when possible.

Selection of Project Site

- Avoid steep and unstable banks, highly erodible or saturated soils, or highly fractured rock.
- Select project site that minimizes disturbance to aquatic species or habitat.

Equipment Selection

- Select equipment that reduces the amount of pressure exerted on the ground surface, and therefore, reduces erosion potential and/or use overhead or aerial access for transporting equipment across drainage channels. Use equipment that exerts ground pressures of less than 5 or 6 lb/in², where possible. Low ground pressure equipment includes: wide or high flotation tires (34 to 72 in. wide); dual tires; bogie axle systems; tracked machines; lightweight equipment; and, central tire inflation systems.

Streambank Stabilization

Preservation of Existing Vegetation

- Preserve existing vegetation in accordance with EC-2, Preservation of Existing Vegetation. In a streambank environment, preservation of existing vegetation provides the following benefits.

Water Quality Protection

- Vegetated buffers on slopes trap sediment and promote groundwater recharge. The buffer width needed to maintain water quality ranges from 15 to 100 ft. On gradual slopes, most of the filtering occurs within the first 30 ft. Steeper slopes require a greater width of vegetative buffer to provide water quality benefits.

Streambank Stabilization

- The root system of riparian vegetation stabilizes streambanks by increasing tensile strength in the soil. The presence of vegetation modifies the moisture condition of slopes (infiltration, evapo transpiration, interception) and increases bank stability.

Riparian Habitat

- Buffers of diverse riparian vegetation provide food and shelter for riparian and aquatic organisms. Minimizing impacts to fisheries habitat is a major concern when working near streams and rivers. Riparian vegetation provides shade, shelter, organic matter (leaf detritus and large woody debris), and other nutrients that are necessary for fish and other aquatic organisms. Buffer widths for habitat concerns are typically wider than those recommended for water quality concerns (100 to 1500 ft).
- When working near watercourses, it is important to understand the work site's placement in the watershed. Riparian vegetation in headwater streams has a greater impact on overall water quality than vegetation in downstream reaches. Preserving existing vegetation upstream is necessary to maintain water quality, minimize bank failure, and maximize riparian habitat, downstream of the work site.

Limitations

- Local county and municipal ordinances regarding width, extent and type of vegetative buffer required may exceed the specifications provided here; these ordinances should be investigated prior to construction.

Streambank Stabilization Specific Installation

- As a general rule, the width of a buffer strip between a road and the stream is recommended to be 50 ft plus four times the percent slope of the land, measured between the road and the top of stream bank.

Hydraulic Mulch

- Apply hydraulic mulch on disturbed streambanks above mean high water level in accordance with EC-3, Hydraulic Mulch to provide temporary soil stabilization.

Limitations

- Do not place hydraulic mulch or tackifiers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication (eutrophication is an algal bloom caused by excessively high nutrient levels in the water).

Hydroseeding

- Hydroseed disturbed streambanks in accordance with EC-4, Hydroseeding.

Limitations

- Do not place tackifiers or fertilizers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication.

Soil Binders

- Apply soil binders to disturbed streambanks in accordance with EC-5, Soil Binders.

Limitations

- Do not place soil binders below the mean high water level. Soil binder must be environmentally benign and non-toxic to aquatic organisms.

Straw Mulch

- Apply straw mulch to disturbed streambanks in accordance with EC-6, Straw Mulch.

Limitations

- Do not place straw mulch below the mean high water level, as this material could wash into the channel and impact water quality or possibly cause eutrophication.

Geotextiles and Mats

- Install geotextiles and mats as described in EC-7, Geotextiles and Mats, to stabilize disturbed channels and streambanks. Not all applications should be in the channel, for example, certain geotextile netting may snag fish gills and are not appropriate in fish bearing streams. Geotextile fabrics that are not biodegradable are not appropriate for in stream use. Additionally, geotextile fabric or blankets placed in channels must be adequate to sustain anticipated hydraulic forces.

Earth Dikes, Drainage Swales, and Lined Ditches

- Convey, intercept, or divert runoff from disturbed streambanks using EC-9, Earth Dikes and Drainage Swales.

Limitations

- Do not place earth dikes in watercourses, as these structures are only suited for intercepting sheet flow, and should not be used to intercept concentrated flow.
- Appropriately sized velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Velocity Dissipation Devices

- Place velocity dissipation devices at outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels in accordance with EC-10, Velocity Dissipation Devices.

Slope Drains

- Use slope drains to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area in accordance with EC-11, Slope Drains.

Limitations

- Appropriately sized outlet protection and velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Streambank Sediment Control

Silt Fences

- Install silt fences in accordance with SE-1, Silt Fence, to control sediment. Silt fences should only be installed where sediment laden water can pond, thus allowing the sediment to settle out.

Fiber Rolls

- Install fiber rolls in accordance with SE-5, Fiber Rolls, along contour of slopes above the high water level to intercept runoff, reduce flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. In a stream environment, fiber rolls should be used in conjunction with other sediment control methods such as SE-1, Silt Fence or SE-9 Straw Bale Barrier. Install silt fence, straw bale barrier, or other erosion control method along toe of slope above the high water level.

Gravel Bag Berm

- A gravel bag berm or barrier can be utilized to intercept and slow the flow of sediment laden sheet flow runoff in accordance with SE-6, Gravel Bag Berm. In a stream environment gravel bag barriers can allow sediment to settle from runoff before water leaves the construction site and can be used to isolate the work area from the live stream.

Limitations

- Gravel bag barriers are not recommended as a perimeter sediment control practice around streams.

Straw Bale Barrier

- Install straw bale barriers in accordance with SE-9, Straw Bale Barrier, to control sediment. Straw bale barriers should only be installed where sediment laden water can pond, thus allowing the sediment to settle out. Install a silt fence in accordance with SE-1, Silt Fence, on down slope side of straw bale barrier closest to stream channel to provide added sediment control.

Rock Filter

Description and Purpose

Rock filters are temporary erosion control barriers composed of rock that is anchored in place. Rock filters detain the sediment laden runoff, retain the sediment, and release the water as sheet flow at a reduced velocity. Typical rock filter installations are illustrated at the end of this BMP.

Applications

- Near the toe of slopes that may be subject to flow and rill erosion.

Limitations

- Inappropriate for contributing drainage areas greater than 5 acres.
- Requires sufficient space for ponded water.
- Ineffective for diverting runoff because filters allow water to slowly seep through.
- Rock filter berms are difficult to remove when construction is complete.
- Unsuitable in developed areas or locations where aesthetics is a concern.

Specifications

- Rock: open graded rock, 0.75 to 5 in. for concentrated flow applications.
- Woven wire sheathing: 1 in. diameter, hexagonal mesh, galvanized 20gauge (used with rock filters in areas of concentrated flow).
- In construction traffic areas, maximum rock berm heights should be 12 in. Berms should be constructed every 300 ft on slopes less than 5%, every 200 ft on slopes between 5% and 10%, and every 100 ft on slopes greater than 10%.

Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Reshape berms as needed and replace lost or dislodged rock, and filter fabric.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

K-rail

Description and Purpose

This is temporary sediment control that uses K-rails to form the sediment deposition area, or to isolate the near bank construction area. Install K-rails at toe of slope in accordance with procedures described in NS-5, Clear Water Diversion.

Barriers are placed end to end in a pre-designed configuration and gravel filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

- This technique is useful at the toe of embankments, cuts or fills slopes.

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Implementation

- Refer to NS-5, Clear Water Diversion, for implementation requirements.

Instream Construction Sediment Control

There are three different options currently available for reducing turbidity while working in a stream or river. The stream can be isolated from the area in which work is occurring by means of a water barrier, the stream can be diverted around the work site through a pipe or temporary channel, or one can employ construction practices that minimize sediment suspension.

Whatever technique is implemented, an important thing to remember is that dilution can sometimes be the solution. A probable "worst time" to release high TSS into a stream system might be when the stream is very low; summer low flow, for example. During these times, the flow may be low while the biological activity in the stream is very high. Conversely, the addition of high TSS or sediment during a big storm discharge might have a relatively low impact, because the stream is already turbid, and the stream energy is capable of transporting both suspended solids, and large quantities of bedload through the system. The optimum time to "pull" in-stream structures may be during the rising limb of a storm hydrograph.

Techniques to minimize Total Suspended Solids (TSS)

- **Padding** - Padding laid in the stream below the work site may trap some solids that are deposited in the stream during construction. After work is done, the padding is removed from the stream, and placed on the bank to assist in re-vegetation.

- **Clean, washed gravel** - Using clean, washed gravel decreases solid suspension, as there are fewer small particles deposited in the stream.

- **Excavation using a large bucket** - Each time a bucket of soil is placed in the stream, a portion is suspended. Approximately the same amount is suspended whether a small amount of soil is placed in the stream, or a large amount. Therefore, using a large excavator bucket instead of a small one, will reduce the total amount of soil that washes downstream.

- **Use of dozer for backfilling** - Using a dozer for backfilling instead of a backhoe follows the same principles – the fewer times soil is deposited in the stream, the less soil will be suspended.

- **Partial dewatering with a pump** - Partially dewatering a stream with a pump reduces the amount of water, and thus the amount of water that can suspend sediment.

Washing Fines

Definition and Purpose

- Washing fines is an "in-channel" sediment control method, which uses water, either from a water truck or hydrant, to wash stream fines that were brought to the surface of the channel bed during restoration, back into the interstitial spaces of the gravel and cobbles.

- The purpose of this technique is to reduce or eliminate the discharge of sediment from the channel bottom during the first seasonal flow. Sediment should not be allowed into stream channels; however, occasionally in-channel restoration work will involve moving or otherwise disturbing fines (sand and silt sized particles) that are already in the stream, usually below bankfull discharge elevation. Subsequent re-watering of the channel can result in a plume of turbidity and sedimentation.

- This technique washes the fines back into the channel bed. Bedload materials, including gravel cobbles, boulders and those fines, are naturally mobilized during higher storm flows. This technique is intended to delay the discharge until the fines would naturally be mobilized.

Appropriate Applications

- This technique should be used when construction work is required in channels. It is especially useful in intermittent or ephemeral streams in which work is performed "in the dry", and which subsequently become re-watered.

Limitations

- The stream must have sufficient gravel and cobble substrate composition.

- The use of this technique requires consideration of time of year and timing of expected stream flows.

- The optimum time for the use of this technique is in the fall, prior to winter flows.

- Consultation with, and approval from the Department of Fish and Game and the Regional Water Quality Control Board may be required.

Implementation

- Apply sufficient water to wash fines, but not cause further erosion or runoff.

- Apply water slowly and evenly to prevent runoff and erosion.

- Consult with Department of Fish and Game and the Regional Water Quality Control Board for specific water quality requirements of applied water (e.g. chlorine).

Inspection and Maintenance

- None necessary

Costs

Cost may vary according to the combination of practices implemented.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, An Inventory of Current Practices (Draft), UESPA, 1990.

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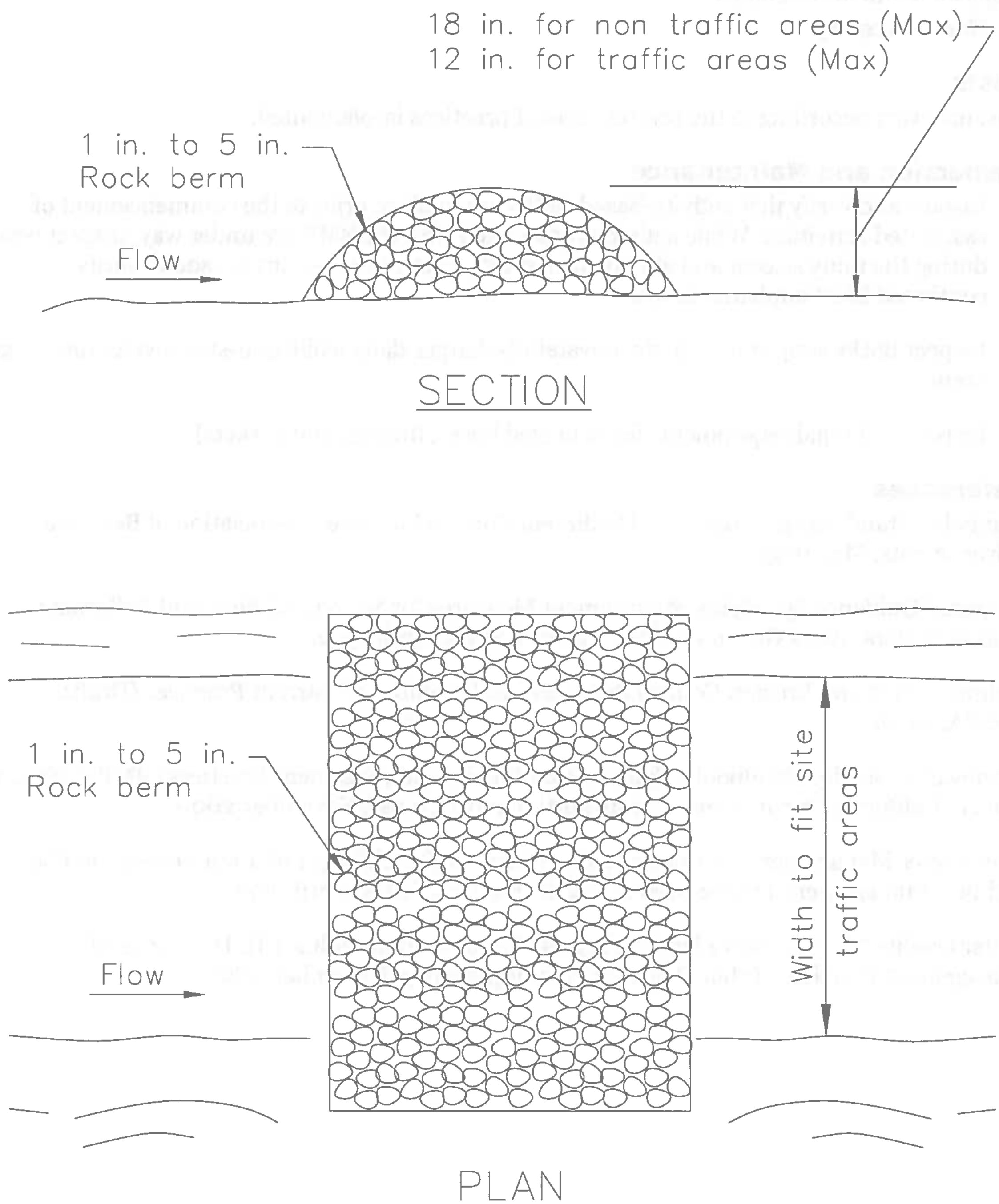

TYPICAL ROCK FILTER

NOT TO SCALE

BMP Factsheet removed in 2009.
Formerly PAM. See SE-11, Active Treatment Systems.

Categories

EC	Erosion Control
SE	Sediment Control
TC	Tracking Control
WE	Wind Erosion Control
NS	Non-Stormwater Management Control
WM	Waste Management and Materials Pollution Control

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment
Nutrients
Trash
Metals
Bacteria
Oil and Grease
Organics

Potential Alternatives

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Categories

EC	Erosion Control	☑
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Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Description and Purpose

A compost blanket is applied to slopes and earth disturbed areas to prevent erosion, and in some cases, increase infiltration and/or establish vegetation. The compost blanket can be applied by hand, conveyor system, compost spreader, or pneumatic delivery (blower) system. The blanket thickness is determined from the slope steepness and anticipated precipitation. A compost blanket protects the soil surface from raindrop erosion, particularly rills and gullies that may form under other methods of erosion control.

A compost blanket, if properly installed, can be very successful at vegetation establishment, weed suppression and erosion control. The compost blanket comes into direct contact with the underlying soil, reducing rill formation. Furthermore, compost provides organic matter and nutrients important for vegetation growth. The compost blanket provides soil structure that allows water to infiltrate the soil surface and retain moisture, which also promotes seed germination and vegetation growth, in addition to reducing runoff.

Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste. Many types of compost are products of municipal recycle or "Greenwaste" programs. Compost is organic and biodegradable and can be left onsite. There are many types of compost with a variety of properties with specific functions, and accordingly, compost selection is an important design consideration in the application of this type of erosion control.

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Suitable Applications

A compost blanket is appropriate for slopes and earth disturbed areas requiring protection until permanent stabilization is established. A compost blanket can also used in combination with temporary and/or permanent seeding strategies to enhance plant establishment. Examples include:

- Rough-graded areas that will remain inactive for longer than 14 days
- Soil stockpiles
- Slopes with exposed soil between existing vegetation such as trees or shrubs
- Slopes planted with live, container-grown vegetation
- Disturbed areas where plants are slow to develop

A compost blanket is typically used on slopes of 2:1 (H:V) or gentler. However, a compost blanket can be effective when applied to slopes as steep as 1:1 (H:V) with appropriate design considerations including slope length, blanket thickness, adding components such as a tackifier, or using compost blankets in conjunction with other techniques, such as compost socks and berms or fiber rolls.

Compost can be pre-seeded prior to application to the soil (recommended by the EPA for construction site stormwater runoff control) or seeded after the blanket has been installed. The compost medium can also remove pollutants in stormwater including heavy metals; oil and grease; and hydrocarbons (USEPA, 1998).

Limitations

- Compost can potentially leach nutrients (dissolved phosphorus and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies (Adams et. al, 2008).
- Compost may also contain other undesirable constituents that are detrimental to water quality. Carefully consider the qualifications and experience of any compost producer/supplier.
- A compost blanket applied by hand is more time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of application.
- When blowers are used, the treatment areas should be within 300 ft of a road or surface capable of supporting trucks.
- Wind may limit application of compost and result in application to undesired locations.
- Compost blankets should not be applied in areas of concentrated flows.
- Steeper slopes may require additional blanket thickness and other stability measures such as using tackifiers or slope interruption devices (compost socks and berms, or fiber rolls). The same applies for sites with high precipitation totals or during the rainy season.

Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Compost Materials

- California Compost Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3) define and require a quality of compost for application. Compost should comply with all physical and chemical requirements. Specific requirements are provided in Table 1 below, taken from Caltrans Standard Special Provision 10-1 (SSP 10-1), Erosion Control (Compost Blanket).
- The compost producer should be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility should certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.
- The compost producer should be a participant in United States Composting Council's Seal of Testing Assurance program.
- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air.
- Organic content of the compost is also important and should range from 30 to 65% depending on site conditions.
- Compost should be high-quality mature compost. Immature compost can potentially leach nutrients.
- Compost should not be derived from mixed municipal solid waste and should be free of visible contaminants.
- Compost should not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Metal concentrations in compost should not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.
- Compost should not possess objectionable odors.
- Compost should be weed free.

Table 1. Physical/Chemical Requirements of Compost
Reference - Caltrans SSP-10 Erosion Control Blanket (Compost)

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Installation

- Prior to compost application, prepare the slope by removing loose rocks, roots, stumps, and other debris greater than 2" in diameter. Prepare the slope area surface by scarifying or track walking/roughening if necessary.
- Select method to apply the compost blanket. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations.
- A compost blanket thickness of 1" to 4" should be applied to slopes of 2:1 (H:V) or gentler, based on site-specific conditions. Increase blanket thickness with increased slope steepness and/or during installation during the rainy season (for example, 2" to 3" should be used for a

3:1 slope, while 1" to 2" can be used for a 4:1 slope). Erosion control using a compost blanket is not recommended for slopes greater than 1:1 (H:V).

- For steeper slopes, tackifiers should be utilized and/or other stabilization techniques employed. For example, compost socks or berms can be installed at intervals over the compost blanket (in a similar manner as Fiber Rolls, SE-5).
- Compost socks or berms (or equivalent linear sediment control BMP) should be placed at the top and/or bottom of the slope for additional erosion control performance.
- For optimum vegetation establishment, a blanket thickness of 1" to 2" is recommended. If vegetation establishment is not the primary function of the compost blanket, a thicker blanket may be recommended based on slope or rainfall conditions.
- Evenly distribute compost on the soil surface to the desired blanket thickness (1/2" to 4" as calculated prior based on site conditions and objectives). Even distribution is an important factor in preventing future rill and gully erosion.
- The compost blanket should extend 3 to 6 feet over the top of the shoulder of the slope. A compost sock or compost berm can be used at the top of the slope as an auxiliary technique to prevent runoff from flowing underneath the compost blanket.
- Use additional anchoring and erosion control BMPs in conjunction of the compost blanket as needed.

Costs

The cost associated with a compost blanket is similar to that of a straw mat and generally less expensive than a geotextile blanket (USEPA, 2009). Caltrans has provided a recent estimate for $5,000 to $8,000 per acre for application of an unseeded 1 inch compost blanket (Caltrans Compost Specifications, 2009). Recently obtained vendor costs indicate that proprietary blends of compost that are seeded and contain a nutrient rich "tackifier" can cost approximately $0.35 per square foot, or approximately $15,000 per acre for a 2 inch blanket. Application by hand is more time intensive and likely more costly.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident, another layer of compost should be reapplied as soon as possible. It may be necessary to install an additional type of stormwater BMP at the top of slope or as a slope interrupter to control flow, such as a fiber roll (SE-5) or compost sock (SE-11).
- Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- Limit or prohibit foot traffic to minimize damage to BMP or impede vegetation establishment.

References

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Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-7 Geotextiles and Mats

Description and Purpose

Soil Preparation/Roughening involves assessment and preparation of surface soils for BMP installation. This can include soil testing (for seed base, soil characteristics, or nutrients), as well as roughening surface soils by mechanical methods (including sheepsfoot rolling, track walking, scarifying, stair stepping, and imprinting) to prepare soil for additional BMPs, or to break up sheet flow. Soil Preparation can also involve tilling topsoil to prepare a seed bed and/or incorporation of soil amendments, to enhance vegetative establishment.

Suitable Applications

Soil preparation: Soil preparation is essential to proper vegetative establishment. In particular, soil preparation (i.e. tilling, raking, and amendment) is suitable for use in combination with any soil stabilization method, including RECPs or sod. Soil preparation should not be confused with roughening.

Roughening: Soil roughening is generally referred to as track walking (sometimes called imprinting) a slope, where treads from heavy equipment run parallel to the contours of the slope and act as mini terraces. Soil preparation is most effective when used in combination with erosion controls. Soil Roughening is suitable for use as a complementary process for controlling erosion on a site. Roughening is not intended to be used as a stand-alone BMP, and should be used with perimeter controls, additional erosion control measures, grade breaks, and vegetative establishment for maximum effectiveness. Roughening is intended to only affect surface soils and should not compromise slope stability or overall compaction. Suitable applications for soil roughening include:

- Along any disturbed slopes, including temporary stockpiles, sediment basins, or compacted soil diversion berms and swales.

- Roughening should be used in combination with hydraulically applied stabilization methods, compost blanket, or straw mulch; but should not be used in combination with RECPs or sod because roughening is intended to leave terraces on the slope.

Limitations

- Preparation and roughening must take place prior to installing other erosion controls (such as hydraulically applied stabilizers) or sediment controls (such as fiber rolls) on the faces of slopes.

- In such cases where slope preparation is minimal, erosion control/revegetation BMPs that do not require extensive soil preparation - such as hydraulic mulching and seeding applications - should be employed.

- Consideration should be given to the type of erosion control BMP that follows surface preparation, as some BMPs are not designed to be installed over various types of tillage/roughening, i.e., RECPs (erosion control blankets) should not be used with soil roughening due to a "bridging" effect, which suspends the blanket above the seed bed.

- Surface roughness has an effect on the amount of mulch material that needs to be applied, which shows up as a general increase in mulch material due to an increase in surface area (Topographic Index -see EC-3 Hydraulic Mulching).

Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

General

A roughened surface can significantly reduce erosion. Based on tests done at the San Diego State Erosion Research Laboratory, various roughening techniques on slopes can result in a 12 - 76% reduction in the erosion rate versus smooth slopes.

Materials

Minimal materials are required unless amendments and/or seed are added to the soil. The majority of soil roughening/preparation can be done with equipment that is on hand at a normal construction site, such as bull dozers and compaction equipment.

Installation Guidelines

Soil Preparation

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Based upon soil testing conducted, apply additional soil amendments (e.g. fertilizers, additional seed) to the soil to help with germination. Follow EC-4, Hydroseeding, when selecting and applying seed and fertilizers.

Cut Slope Roughening:

- Stair-step grade or groove the cut slopes that are steeper than 3:1.
- Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" in toward the vertical wall.
- Do not make individual vertical cuts more than 2 feet (0.6 m) high in soft materials or more than 3 feet (0.9 m) high in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope, on the contour.

Fill Slope Roughening:

- Place on fill slopes with a gradient steeper than 3:1 in lifts not to exceed 8 inches (0.2 m), and make sure each lift is properly compacted.
- Ensure that the face of the slope consists of loose, uncompacted fill 4-6 inches (0.1-0.2 m) deep.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Do not blade or scrape the final slope face.

Roughening for Slopes to be Mowed:

- Slopes which require mowing activities should not be steeper than 3:1.
- Roughen these areas to shallow grooves by track walking, scarifying, sheepsfoot rolling, or imprinting.
- Make grooves close together (less than 10 inches), and not less than 1 inch deep, and perpendicular to the direction of runoff (i.e., parallel to the slope contours).
- Excessive roughness is undesirable where mowing is planned.

Roughening With Tracked Machinery:

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.
- Seed and mulch roughened areas as soon as possible to obtain optimum seed germination and growth.

Costs

Costs are based on the additional labor of tracking or preparation of the slope plus the cost of any required soil amendment materials.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check the seeded slopes for signs of erosion such as rills and gullies. Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.
- Inspect BMPs weekly during normal operations, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Non-Vegetative Stabilization EC-16

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

Non-vegetative stabilization methods are used for temporary or permanent stabilization of areas prone to erosion and should be used only where vegetative options are not feasible; examples include:

- Areas of vehicular or pedestrian traffic such as roads or paths;
- Arid environments where vegetation would not provide timely ground coverage, or would require excessive irrigation;
- Rocky substrate, infertile or droughty soils where vegetation would be difficult to establish; and
- Areas where vegetation will not grow adequately within the construction time frame.

There are several non-vegetative stabilization methods and selection should be based on site-specific conditions.

Decomposed Granite (DG) is a permanent erosion protection method that consists of a layer of stabilized decomposed granite placed over an erodible surface.

Degradable Mulches of various types (see EC-3, EC-6, EC-8) can be used for temporary non-vegetative stabilization; examples include straw mulch, compost, wood chips or hydraulic mulch.

Geotextiles and Mats can be used for temporary non-vegetative stabilization (see EC-7). These BMPs are typically manufactured from degradable or synthetic materials and are designed and specified based on their functional longevity, i.e., how long they will persist and provide erosion protection. All geotextiles and mats should be replaced when they exceed their functional longevity or when permanent stabilization methods are instituted.

Gravel Mulch is a non-degradable erosion control product that is composed of washed and screened coarse to very coarse gravel, 16 mm to 64 mm (0.6" - 2.5"), similar to an AASHTO No. 3 coarse aggregate.

Rock Slope Protection consists of utilizing large rock or rip-rap (4"- 24") to stabilize slopes with a high erosion potential and those subject to scour along waterways.

Soil Binders can be used for temporary non-vegetative stabilization (see EC-5). The key to their use is functional longevity. In most cases, the soil binder will need to be routinely monitored and re-applied to maintain an erosion-resistant coverage.

Suitable Applications

Non-vegetated stabilization methods are suitable for use on disturbed soil areas and on material stockpiles that need to be temporarily or permanently protected from erosion by water and wind. Non-vegetated stabilization should only be utilized when vegetation cannot be established in the required timeframe, due to soil or climactic conditions, or where vegetation may be a potential fire hazard.

Decomposed Granite (DG) and Gravel Mulch are suitable for use in areas where vegetation establishment is difficult, on flat surfaces, trails and pathways, and when used in conjunction with a stabilizer or tackifier, on shallow slopes (i.e., 10:1 [H:V]). DG and gravel can also be used on shallow rocky slopes where vegetation cannot be established for permanent erosion control.

Degradable Mulches can be used to cover and protect soil surfaces from erosion both in temporary and permanent applications. In many cases, the use of mulches by themselves requires routine inspection and re-application. See EC-3 Hydraulic Mulch, EC-6 Straw Mulch, EC-8 Wood Mulch, or EC-14 Compost Blankets for more information.

Geotextiles and Mats can be used as a temporary stand-alone soil stabilization method. Depending on material selection, geotextiles and mats can be a short-term (3 mos – 1 year) or long-term (1-2 years) temporary stabilization method. For more information on geotextiles and mats see EC-7 Geotextiles and Mats.

Rock Slope Protection can be used when the slopes are subject to scour or have a high erosion potential, such as slopes adjacent to flowing waterways or slopes subject to overflow from detention facilities (spillways).

Soil Binders can be used for temporary stabilization of stockpiles and disturbed areas not subject to heavy traffic. See EC-5 Soil Binders for more information.

Limitations

General

- Refer to EC-3, EC-6, EC-8, and EC-14 for limitations on use of mulches. Refer to EC-7 for limitations on use of geotextiles and mats. Refer to EC-5 for limitations on use of Soil Binders.

Decomposed Granite

- Not available in some geographic regions.
- If not tackified, material may be susceptible to erosion even on slight slopes (e.g., 30:1 [H:V]).
- Installed costs may be more expensive than vegetative stabilization methods.

Gravel Mulch

- Availability is limited in some geographic regions.
- If not properly screened and washed, can contain fine material that can erode and/or create dust problems.
- If inadequately sized, material may be susceptible to erosion on sloped areas.
- Pore spaces fill with dirt and debris over time; may provide a growing medium for weeds.

Rock Slope Protection

- Installation is labor intensive.
- Installed costs can be significantly higher than vegetative stabilization methods.
- Rounded stones may not be used on slopes greater than 2:1 [H:V].

Implementation

General

Non-vegetated stabilization should be used in accordance with the following general guidance:

- Should be used in conjunction with other BMPs, including drainage, erosion controls and sediment controls.
- Refer to EC-3, EC-6, EC-8, and EC-14 for implementation details for mulches. Refer to EC-7 for implementation details for geotextiles and mats. Refer to EC-5 for implementation details for soil binders.
- Non-vegetated stabilization measures should be implemented as soon as the disturbance in the areas they are intended to protect has ceased.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Decomposed Granite Stabilization

- If used for a road or path should be installed on a prepared base.

- Should be mixed with a stabilizer if used for roads or pathways, or on slope applications.
- Though porous it is recommended to prevent standing water on or next to a decomposed granite road or pathway.

Gravel Mulch

- Should be sized based on slope, rainfall, and upgradient run-on conditions. Stone size should be increased as potential for erosion increases (steeper slopes, high intensity rainfall).
- If permanent, a weed control fabric should be placed prior to installation.
- Should be installed at a minimum 2" depth.
- Should completely cover all exposed surfaces.

Rock Slope Protection

- Rock slope protection installation should follow Caltrans Standard Specification 72-2: Rock Slope Protection. Refer to the specification for rock conformity requirements and installation methods.
- When using rock slope protection, rock size and installation method should be specified by an Engineer.
- A geotextile fabric should be placed prior to installation.

Costs

- Costs are highly variable depending not only on technique chosen, but also on materials chosen within specific techniques. In addition, availability of certain materials will vary by region/location, which will also affect the cost. Costs of mulches, geotextiles and mats, and soil binders are presented in their respective fact sheets. Costs for decomposed granite, gravel mulch stabilization and rock slope protection may be higher depending on location and availability of materials. Caltrans has provided an estimate for gravel mulch of \$10 - \$15/yd^2 in flat areas and \$11 - \$23/yd^2 on side slopes.

Inspection and Maintenance

General

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- For permanent installation, require inspection periodically and after major storm events to look for signs of erosion or damage to the stabilization.
- All damage should be repaired immediately.
- Refer to EC-3, EC-6, EC-8, and EC-14 for inspection and maintenance requirements for mulches. Refer to EC-7 for inspection and maintenance requirements for geotextiles and mats. Refer to EC-5 for inspection and maintenance requirements for soil binders.

Decomposed Granite and Gravel Mulch Stabilization

- Rake out and add decomposed granite or gravel as needed to areas subject to rill erosion. Inspect upgradient drainage controls and repair/modify as necessary.
- Should remain stable under loose surface material. Any significant problem areas should be repaired to restore uniformity to the installation.

References

Arid Zone Forestry: A Guide for Field Technicians. Food and Agriculture Organization of the United Nations, 1989.

Design of Roadside Channels with Flexible Linings, Hydraulic Engineering Circular Number 15, Third Edition, Federal Highway Administration, 2007.

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Erosion and Sediment Control Handbook: A Guide for Protection of State Waters through the use of Best Management Practices during Land Disturbing Activities, Tennessee Department of Environment and Conservation, 2002.

Gravel Mulch, Landscape Architecture Non-Standard Specification 10-2, California Department of Transportation (Caltrans), http://www.dot.ca.gov/hq/LandArch/roadside/detail-gm.htm

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National Menu of Best Management Practices, US Environmental Protection Agency, 2006.

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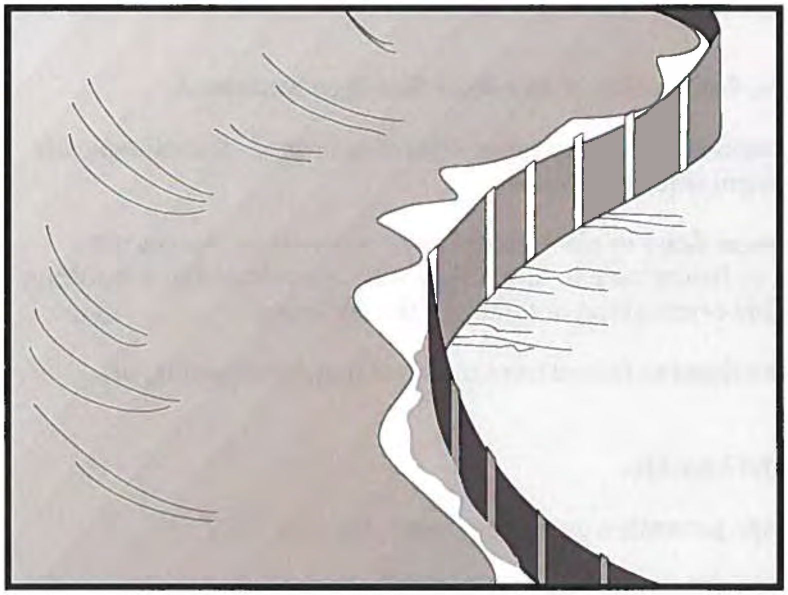
Silt Fence SE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

SE-14 Biofilter Bags

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

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Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard. Runoff typically ponds temporarily on the upstream side of silt fence.
- Do not use silt fence to divert water flows or place across any contour line. Fences not constructed on a level contour, or fences used to divert flow will concentrate flows resulting in additional erosion and possibly overtopping or failure of the silt fence.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.

- Silt fences should remain in place until the disturbed area is permanently stabilized, after which, the silt fence should be removed and properly disposed.
- Silt fence should be used in combination with erosion source controls up slope in order to provide the most effective sediment control.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Woven geotextile material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the slope of area draining to the silt fence is 4:1 (H:V) or less.
- Used for shorter durations, typically 5 months or less
- Area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Use is generally limited to 8 months or less.
- Area draining to fence produces moderate sediment loads.
- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fence fabric has higher tensile strength.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
  - Posts are metal (steel or aluminum)

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts or bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement for health and safety purposes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.

- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.

- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with native material and compacted.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where, due to specific site conditions, a 3 ft setback is not available, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and more difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of $^1/_3$ and a maximum of ½ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the gerotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
    - Ease of installation (most often done with a 2 person crew). In addition, installation using static slicing has been found to be more efficient on slopes, in rocky soils, and in saturated soils.
    - Minimal soil disturbance.
    - Greater level of compaction along fence, leading to higher performance (i.e. greater sediment retention).
    - Uniform installation.
    - Less susceptible to undercutting/undermining.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.
- In tests, the slicing method required 0.33 man hours per 100 linear feet, while the trenched based systems required as much as 1.01 man hours per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.

- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

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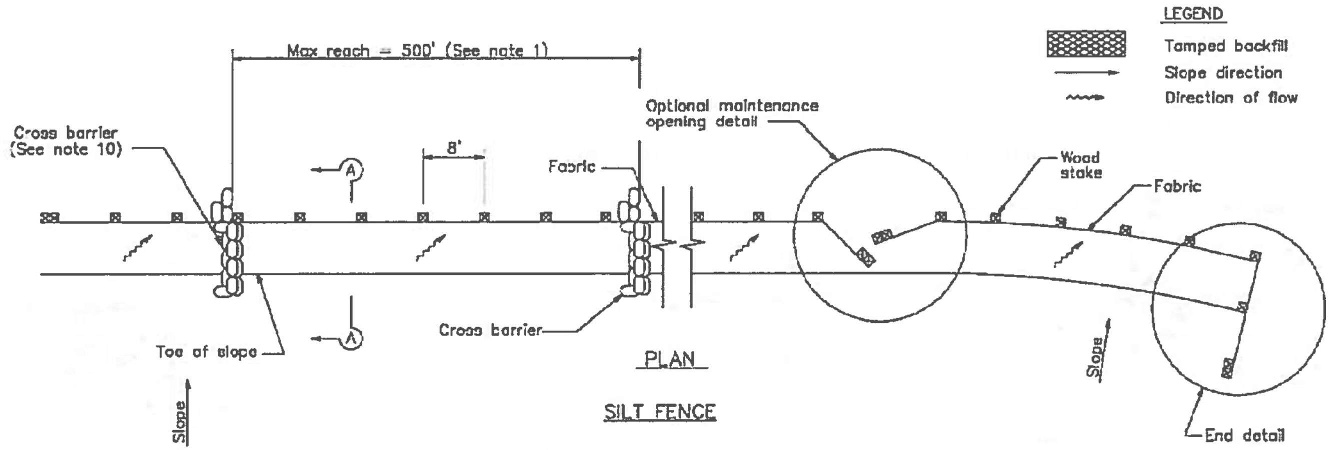
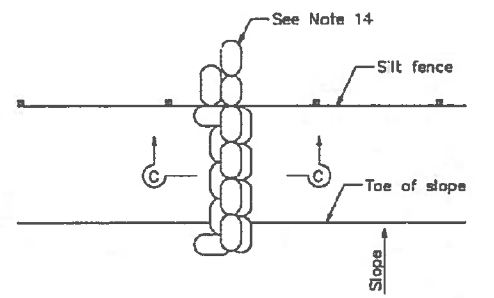
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

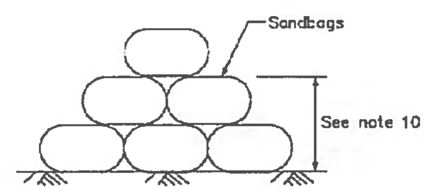


PLAN

SILT FENCE



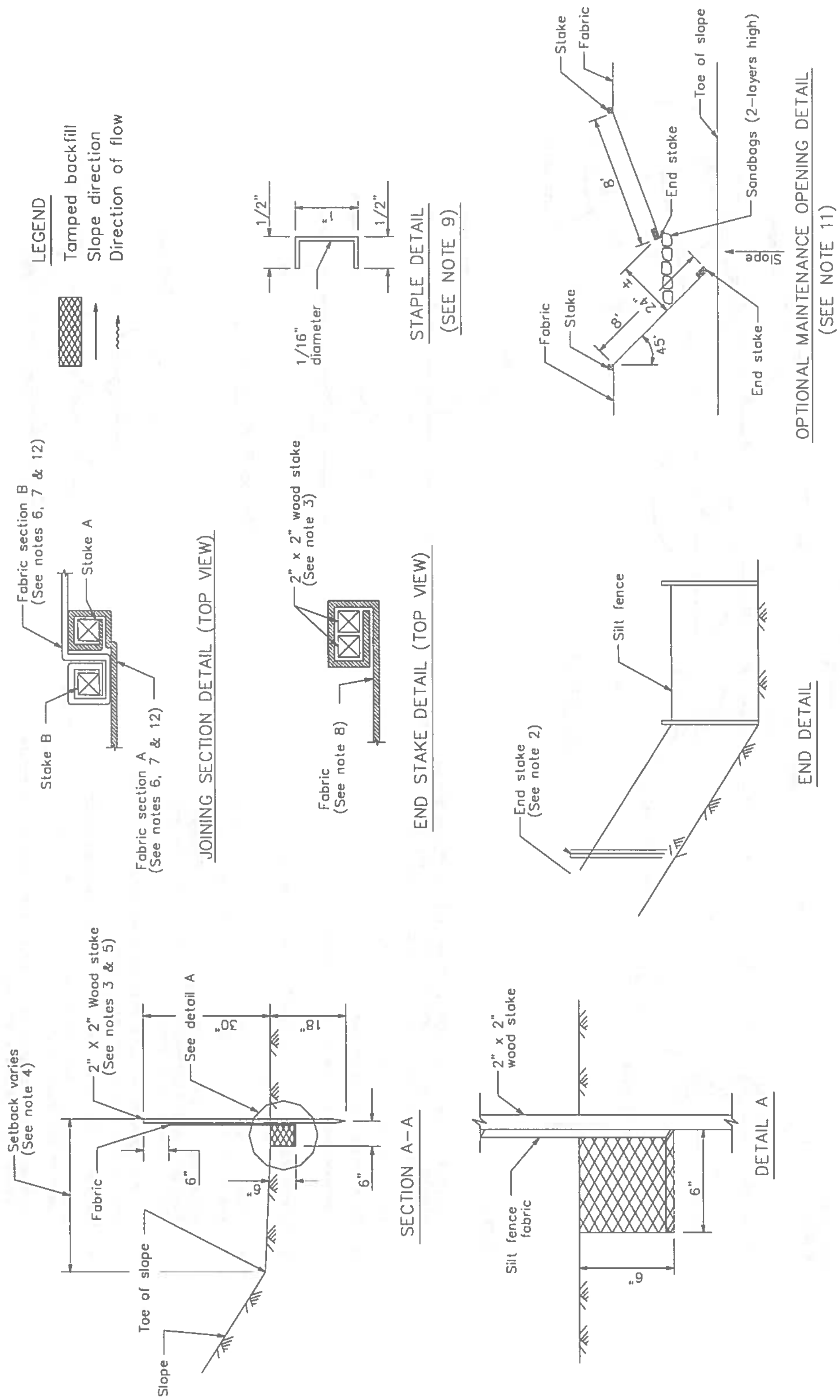
CROSS BARRIER DETAIL



SECTION C–C

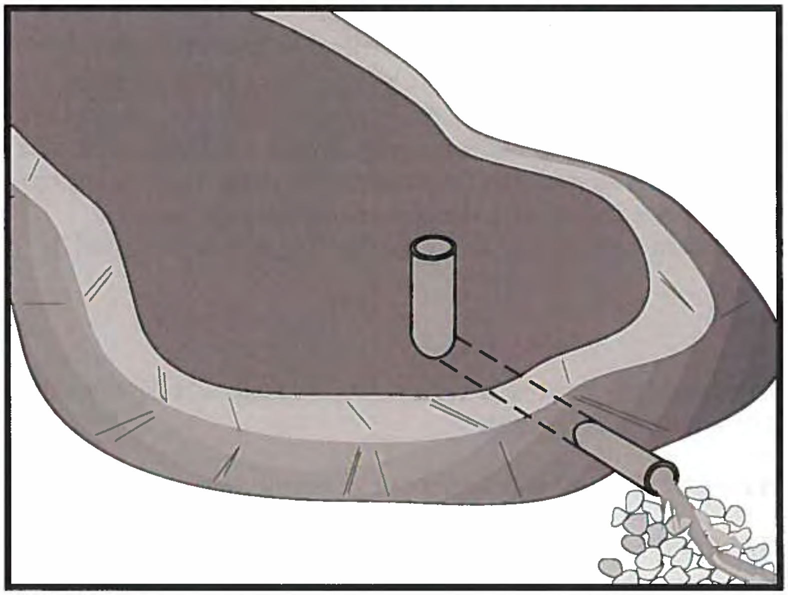
NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'–0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'–0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow–through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3–4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.



LEGEND
Tamped backfill
Slope direction
Direction of flow
Fabric section B (See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A (See notes 6, 7 & 12)
JOINING SECTION DETAIL (TOP VIEW)
2" x 2" wood stake (See note 3)
Fabric (See note 8)
END STAKE DETAIL (TOP VIEW)
1/2"
1"
1/16" diameter
STAPLE DETAIL
(SEE NOTE 9)
Stake
Fabric
8'
End stake
Toe of slope
Sandbags (2-layers high)
Slope
4'
45°
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Setback varies (See note 4)
2" X 2" Wood stake (See notes 3 & 5)
See detail A
30"
18"
6"
Toe of slope
Slope
SECTION A-A
End stake (See note 2)
Silt fence
END DETAIL
2" x 2" wood stake
Silt fence fabric
DETAIL A

Sediment Basin SE-2



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-3 Sediment Trap (for smaller areas)

Description and Purpose

A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is discharged.

Sediment basin design guidance presented in this fact sheet is intended to provide options, methods, and techniques to optimize temporary sediment basin performance and basin sediment removal. Basin design guidance provided in this fact sheet is not intended to guarantee basin effluent compliance with numeric discharge limits (numeric action levels or numeric effluent limits for turbidity). Compliance with discharge limits requires a thoughtful approach to comprehensive BMP planning, implementation, and maintenance. Therefore, optimally designed and maintained sediment basins should be used in conjunction with a comprehensive system of BMPs that includes:

- Diverting runoff from undisturbed areas away from the basin
- Erosion control practices to minimize disturbed areas on-site
  and to provide temporary stabilization and interim sediment controls (e.g., stockpile perimeter control, check dams, perimeter controls around individual lots) to reduce the basin's influent sediment concentration.

At some sites, sediment basin design enhancements may be required to adequately remove sediment. Traditional (aka "physical") enhancements such as alternative outlet configurations or flow deflection baffles increase detention time and other techniques such as outlet skimmers preferentially drain flows with lower sediment concentrations. These "physical" enhancement techniques are described in this fact sheet. To further enhance sediment removal particularly at sites with fine soils or turbidity sensitive receiving waters, some projects may need to consider implementing Active Treatment Systems (ATS) whereby coagulants and flocculants are used to enhance settling and removal of suspended sediments. Guidance on implementing ATS is provided in SE-11.

Suitable Applications

Sediment basins may be suitable for use on larger projects with sufficient space for constructing the basin. Sediment basins should be considered for use:

- Where sediment-laden water may enter the drainage system or watercourses
- On construction projects with disturbed areas during the rainy season
- At the outlet of disturbed watersheds between 5 acres and 75 acres and evaluated on a site by site basis
- Where post construction detention basins are required
- In association with dikes, temporary channels, and pipes used to convey runoff from disturbed areas

Limitations

Sediment basins must be installed only within the property limits and where failure of the structure will not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. In addition, sediment basins are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the basin is required, the type of fence and its location should be shown in the SWPPP and in the construction specifications.

- As a general guideline, sediment basins are suitable for drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres. However, the tributary area should be evaluated on a site by site basis.
- Sediment basins may become an "attractive nuisance" and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this fact sheet are only effective in removing sediment down to about the silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical (or other appropriate method) treatment is used in addition to the sediment basin.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from California Department of Water Resources Division of Safety of Dams (http://www.water.ca.gov/damsafety/).

- Water that stands in sediment basins longer than 96 hours may become a source of mosquitoes (and midges), particularly along perimeter edges, in shallow zones, in scour or below-grade pools, around inlet pipes, along low-flow channels, and among protected habitats created by emergent or floating vegetation (e.g. cattails, water hyacinth), algal mats, riprap, etc.

- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

Implementation

General

A sediment basin is a controlled stormwater release structure formed by excavation or by construction of an embankment of compacted soil across a drainage way, or other suitable location. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure expected to be used during active construction in most cases and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sediment basins are suitable for nearly all types of construction projects. Whenever possible, construct the sediment basins before clearing and grading work begins. Basins should be located at the stormwater outlet from the site but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to convey runoff to the basin inlet.

Many development projects in California are required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins if properly designed and maintained can trap a significant amount of the sediment that flows into them. However, traditional basins do not remove all inflowing sediment. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

Planning

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. Locations best suited for a sediment basin are generally in lower elevation areas of the site (or basin tributary area) where site drainage would not require significant diversion or other means to direct water to the basin but outside jurisdictional waterways. However, as necessary, drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). . The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

Construct before clearing and grading work begins when feasible.

- Do not locate the basin in a jurisdictional stream.

- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft must obtain approval from the Division of Dam Safety. Local dam safety requirements may be more stringent.
- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.
- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

Design

When designing a sediment basin, designers should evaluate the site constraints that could affect the efficiency of the BMP. Some of these constraints include: the relationship between basin capacity, anticipated sediment load, and freeboard, available footprint for the basin, maintenance frequency and access, and hydraulic capacity and efficiency of the temporary outlet infrastructure. Sediment basins should be designed to maximize sediment removal and to consider sediment load retained by the basin as it affects basin performance.

Three Basin Design Options (Part A) are presented below along with a Typical Sediment/Detention Basin Design Methodology (Part B). Regardless of the design option that is selected, designers also need to evaluate the sediment basin capacity with respect to sediment accumulation (See "*Step 3. Evaluate the Capacity of the Sediment Basin*"), and should incorporate approaches identified in "*Step 4. Other Design Considerations*" to enhance basin performance.

A) Basin Design Options:

Option 1:

Design sediment basin(s) using the standard equation:

$$A_s = \frac{1.2Q}{V_s} \qquad \text{(Eq. 1)}$$

Where:

A_s = Minimum surface area for trapping soil particles of a certain size

V_s = Settling velocity of the design particle size chosen (V_s = 0.00028 ft/s for a design particle size of 0.01 mm at 68°F)

1.2 = Factor of safety recommended by USEPA to account for the reduction in basin efficiency caused due to turbulence and other non ideal conditions.

$$Q = CIA \qquad \text{(Eq.2)}$$

Where

Q = Discharge rate measured in cubic feet per second

C = Runoff coefficient (unitless)

I = Peak rainfall intensity for the 10-year, 6-hour rain event (in/hr)

A = Area draining into the sediment basin in acres

The design particle size should be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01 mm [or 0.0004 in.]) particle, and the Vs used should be 100 percent of the calculated settling velocity.

This sizing basin method is dependent on the outlet structure design or the total basin length with an appropriate outlet. If the designer chooses to utilize the outlet structure to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a minimum of twice the basin width; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). If the designer chooses to utilize the basin length (with appropriate basin outlet) to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a specifically designed to capture 100% of the design particle size; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity).

The basin should be located on the site where it can be maintained on a year-round basis and should be maintained on a schedule to retain the 2 ft of capacity.

Option 2:

Design pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 1.

Option 3:

The use of an equivalent surface area design or equation provided that the design efficiency is as protective or more protective of water quality than Option 1.

B) Typical Sediment/Detention Basin Design Methodology:

Design of a sediment basin requires the designer to have an understanding of the site constraints, knowledge of the local soil (e.g., particle size distribution of potentially contributing soils), drainage area of the basin, and local hydrology. Designers should not assume that a sediment basin for location A is applicable to location B. Therefore, designers can use this factsheet as guidance but will need to apply professional judgment and knowledge of the site to design an effective and efficient sediment basin. The following provides a general overview of typical design methodologies:

Step 1. Hydrologic Design

- Evaluate the site constraints and assess the drainage area for the sediment basin. Designers should consider on- and off-site flows as well as changes in the drainage area associated with site construction/disturbance. To minimize additional construction during the course of the project, the designer should consider identifying the maximum drainage area when calculating the basin dimensions.

- If a local hydrology manual is not available it is recommended to follow standard rational method procedures to estimate discharge. The references section of this factsheet provides a reference to standard hydrology textbooks that can provide standard methodologies. If local rainfall depths are not available, values can be obtained from standard precipitation frequency maps from NOAA (downloaded from http://www.wrcc.dri.edu/pcpnfreq.html).

Step 2. Hydraulic Design

- Calculate the surface area required for the sediment basin using Equation 1. In which discharge is estimated for a 10-yr 6-hr event using rational method procedure listed in local hydrology manual and Vs is estimated using Stokes Law presented in Equation 3.

$$V_s = 2.81d^2 \qquad \text{(Eq.3)}$$

Where

V_s = Settling velocity in feet per second at 68°F

d = diameter of sediment particle in millimeters (smallest soil grain size determined by wet sieve analysis or fine silt (0.01 mm [or 0.0004 in.])

- In general the basin outlet design requires an iterative trial and error approach that considered the maximum water surface elevation, the elevation versus volume (stage-storage) relationship, the elevation verses discharge (stage-discharge) relationship, and the estimated inflow hydrograph. To adequately design the basins to settle sediment, the outlet configuration and associated outflow rates can be estimated by numerous methodologies. The following provides some guidance for design the basin outlet:
  - An outlet should have more than one orifice.
  - An outlet design typically utilizes multiple horizontal rows of orifices (approximately 3 or more) with at least 2 orifices per row (see Figures 1 and 2 at the end of this fact sheet).
  - Orifices can vary in shape.
  - Select the appropriate orifice diameter and number of perforations per row with the objective of minimizing the number of rows while maximizing the detention time.

- The diameter of each orifice is typically a maximum of 3-4 inches and a minimum of 0.25-0.5 inches.

- If a rectangular orifice is used, it is recommended to have minimum height of 0.5 inches and a maximum height of 6 inches.

- Rows are typically spaced at three times the diameter center to center vertically with a minimum distance of approximately 4 inches on center and a maximum distance of 1 foot on center.

- To estimate the outflow rate, each row is calculated separately based on the flow through a single orifice then multiplied by the number of orifices in the row. This step is repeated for each of the rows. Once all of the orifices are estimated, the total outflow rate versus elevation (stage-discharge curve) is developed to evaluate the detention time within the basin.

- Flow through a single orifice can be estimated using an Equation 4:

$$Q = BC' A(2gH)^{0.5} \qquad \text{(Eq.4)}$$

Where
Q = Discharge in ft^3/s
C′ = Orifice coefficient (unitless)
A = Area of the orifice (ft^2)
g = acceleration due to gravity (ft^3/s)
H = Head above the orifice (ft)
B = Anticipated Blockage or clogging factor (unitless), It is dependent on anticipated sediment and debris load, trash rack configuration etc, so the value is dependent on design engineers professional judgment and/or local requirements (B is never greater than 1 and a value of 0.5 is generally used)

  - Care must be taken in the selection of orifice coefficient ("C′"); 0.60 is most often recommended and used. However, based on actual tests, Young and Graziano (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:

    - C′ = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or

    - C′ = 0.80 when the material is thicker than the orifice diameter

- If different sizes of orifices are used along the riser then they have to be sized such that not more than 50 percent of the design storm event drains in one-third of the drawdown time (to provide adequate settling time for events smaller than the design storm event) and the entire volume drains within 96 hours or as regulated by the local vector control agency. If a basin fails to drain within 96 hours, the basin must be pumped dry.

- Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.

- Floating Outlet Skimmer: The floating skimmer (see Figure 3 at the end of this fact sheet is an alternative outlet configuration (patented) that drains water from upper portion of the water column. This configuration has been used for temporary and permanent basins and can improve basin performance by eliminating bottom orifices which have the potential of discharging solids. Some design considerations for this alternative outlet device includes the addition of a sand filter or perforated under drain at the low point in the basin and near the floating skimmer. These secondary drains allow the basin to fully drain. More detailed guidelines for sizing the skimmer can be downloaded from http://www.fairclothskimmer.com/.

- Hold and Release Valve: An ideal sediment/detention basin would hold all flows to the design storm level for sufficient time to settle solids, and then slowly release the storm water. Implementing a reliable valve system for releasing detention basins is critical to eliminate the potential for flooding in such a system. Some variations of hold and release valves include manual valves, bladder devices or electrically operated valves. When a precipitation event is forecast, the valve would be close for the duration of the storm and appropriate settling time. When the settling duration is met (approximately 24 or 48 hours), the valve would be opened and allow the stormwater to be discharged at a rate that does not resuspend settled solids and in a non-erosive manner. If this type of system is used the valve should be designed to empty the entire basin within 96 hours or as stipulated by local vector control regulations.

Step 3. Evaluate the Capacity of the Sediment Basin

- Typically, sediment basins do not perform as designed when they are not properly maintained or the sediment yield to the basin is larger than expected. As part of a good sediment basin design, designers should consider maintenance cycles, estimated soil loss and/or sediment yield, and basin sediment storage volume. The two equations below can be used to quantify the amount of soil entering the basin.

- The Revised Universal Soil Loss Equation (RUSLE, Eq.5) can be used to estimate annual soil loss and the Modified Universal Soil Equation (MUSLE, Eq.6) can be used to estimate sediment yield from a single storm event.

  $$A = R \times K \times LS \times C \times P \qquad \text{(Eq.5)}$$

  $$Y = 95\left(Q \times q_p\right)^{0.56} \times K \times LS \times C \times P \qquad \text{(Eq.6)}$$

  Where:

  A = annual soil loss, tons/acre-year

  R = rainfall erosion index, in 100 ft.tons/acre.in/hr

  K = soil erodibility factor, tons/acre per unit of R

  LS = slope length and steepness factor (unitless)

C = vegetative cover factor (unitless)

P = erosion control practice factor (unitless)

Y = single storm sediment yield in tons

Q = runoff volume in acre-feet

q_p = peak flow in cfs

- Detailed descriptions and methodologies for estimating the soil loss can be obtained from standard hydrology text books (See References section).
- Determination of the appropriate equation should consider construction duration and local environmental factors (soils, hydrology, etc.). For example, if a basin is planned for a project duration of 1 year and the designer specifies one maintenance cycle, RUSLE could be used to estimate the soil loss and thereby the designer could indicate that the sediment storage volume would be half of the soil loss value estimated. As an example for use of MUSLE, a project may have a short construction duration thereby requiring fewer maintenance cycles and a reduced sediment storage volume. MUSLE would be used to estimate the anticipated soil loss based on a specific storm event to evaluate the sediment storage volume and appropriate maintenance frequency.
- The soil loss estimates are an essential step in the design and it is essential that the designer provide construction contractors with enough information to understand maintenance frequency and/or depths within the basin that would trigger maintenance. Providing maintenance methods, frequency and specification should be included in design bid documents such as the SWPPP Site Map.
- Once the designer has quantified the amount of soil entering the basin, the depth required for sediment storage can be determined by dividing the estimated sediment loss by the surface area of the basin.

Step 4. Other Design Considerations

- Consider designing the volume of the settling zone for the total storm volume associated with the 2-year event or other appropriate design storms specified by the local agency. This volume can be used as a guide for sizing the basin without iterative routing calculations. The depth of the settling zone can be estimated by dividing the estimated 2-yr storm volume by the surface area of the basin.
- The basin volume consists of two zones:
  - A sediment storage zone at least 1 ft deep.
  - A settling zone at least 2 ft deep.
  - The basin depth must be no less than 3 ft (not including freeboard).
- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The outlet should be designed to drain the basin within 24 to 96 hours (also referred

to as "drawdown time"). The 24-hour limit is specified to provide adequate settling time; the 96-hour limit is specified to mitigate vector control concerns.

- Confirmation of the basin performance can be evaluated by routing the design storm (10-yr 6-hr, or as directed by local regulations) through the basin based on the basin volume (stage-storage curve) and the outlet design (stage-discharge curve based on the orifice configuration or equivalent outlet design).

- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.
  - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap (or equivalent protection) on fill slopes.
  - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.

- Rock, vegetation or appropriate erosion control should be used to protect the basin inlet, outlet, and slopes against erosion.

- The total depth of the sediment basin should include the depth required for sediment storage, depth required for settling zone and freeboard of at least 1 foot or as regulated by local flood control agency for a flood event specified by the local agency.

- The basin alignment should be designed such that the length of the basin is more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet. If the site topography does not allow for this configuration baffles should be installed so that the ratio is satisfied. If a basin has more than one inflow point, any inflow point that conveys more than 30 percent of the total peak inflow rate has to meet the required length to width ratio.

- An alternative basin sizing method proposed by Fifield (2004) can be consulted to estimate an alternative length to width ratio and basin configuration. These methods can be considered as part of Option 3 which allows for alternative designs that are protective or more protective of water quality.

- Baffles (see Figure 4 at the end of this fact sheet) can be considered at project sites where the existing topography or site constraints limit the length to width ratio. Baffles should be constructed of earthen berms or other structural material within the basin to divert flow in the basin, thus increasing the effective flow length from the basin inlet to the outlet riser. Baffles also reduce the change of short circuiting and allows for settling throughout the basin.

- Baffles are typically constructed from the invert of the basin to the crest of the emergency spillway (i.e., design event flows are meant to flow around the baffles and flows greater than the design event would flow over the baffles to the emergency spillway).

- Use of other materials for construction of basin baffles (such as silt fence) may not be appropriate based on the material specifications and will require frequent maintenance (maintain after every storm event). Maintenance may not be feasible when required due to flooded conditions resulting from frequent (i.e., back to back) storm events. Use of alternative baffle materials should not deviate from the intended purpose of the material, as described by the manufacturer.

- Sediment basins are best used in conjunction with erosion controls.

- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.

- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.

- The outflow from the sediment basin should be provided with velocity dissipation devices (see BMP EC-10) to prevent erosion and scouring of the embankment and channel.

- The principal outlet should consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure should be designed to accommodate the inflow design storm.

- A rock pile or rock-filled gabions can serve as alternatives to the debris screen, although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.

- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.

- Attach riser pipe (watertight connection) to a horizontal pipe (barrel). Provide anti-seep collars on the barrel.

- Cleanout level should be clearly marked on the riser pipe.

Installation

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).

- Areas under embankments must be cleared and stripped of vegetation.

- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

Costs

The cost of a sediment basin is highly variable and is dependent of the site configuration. To decrease basin construction costs, designers should consider using existing site features such as berms or depressed area to site the sediment basin. Designers should also consider potential savings associated with designing the basin to minimize the number of maintenance cycles and siting the basin in a location where a permanent BMP (e.g., extended detention basin) is required for the project site.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level and as required by local requirements. It is recommended that at a minimum, basins be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Check inlet and outlet area for erosion and stabilize if required.
- Check fencing for damage and repair as needed.
- Sediment that accumulates in the basin must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance should be managed properly. The sediment should be appropriately evaluated and used or disposed of accordingly. Options include: incorporating sediment into earthwork on the site (only if there is no risk that sediment is contaminated); or off-site export/disposal at an appropriate location (e.g., sediment characterization and disposal to an appropriate landfill).
- Remove standing water from basin within 96 hours after accumulation.
- If the basin does not drain adequately (e.g., due to storms that are more frequent or larger than the design storm or other unforeseen site conditions), dewatering should be conducted in accordance with appropriate dewatering BMPs (see NS-2) and in accordance with local permits as applicable.
- To minimize vector production:
    - Remove accumulation of live and dead floating vegetation in basins during every inspection.
    - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

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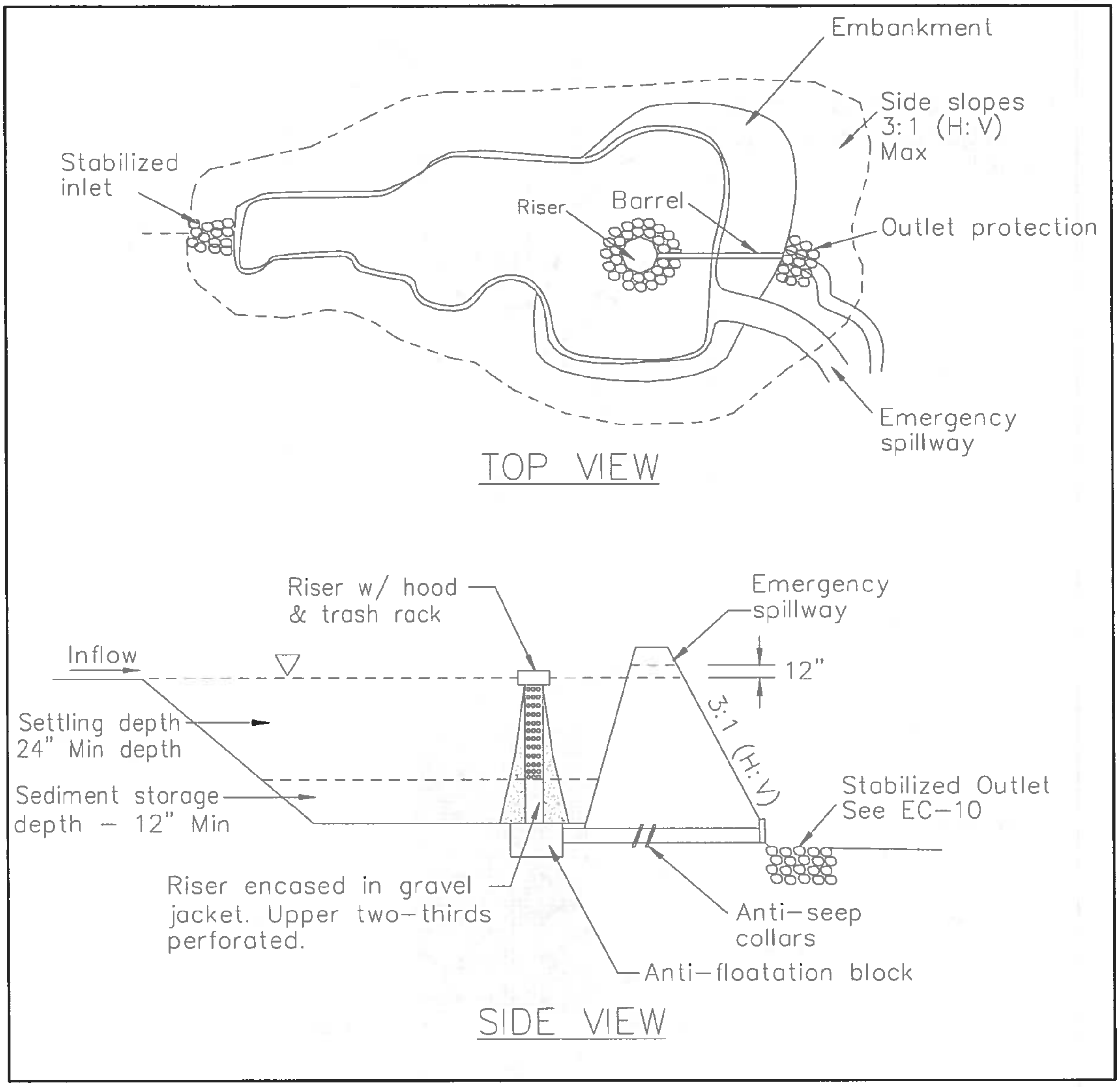


FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN
MULTIPLE ORIFICE DESIGN
NOT TO SCALE

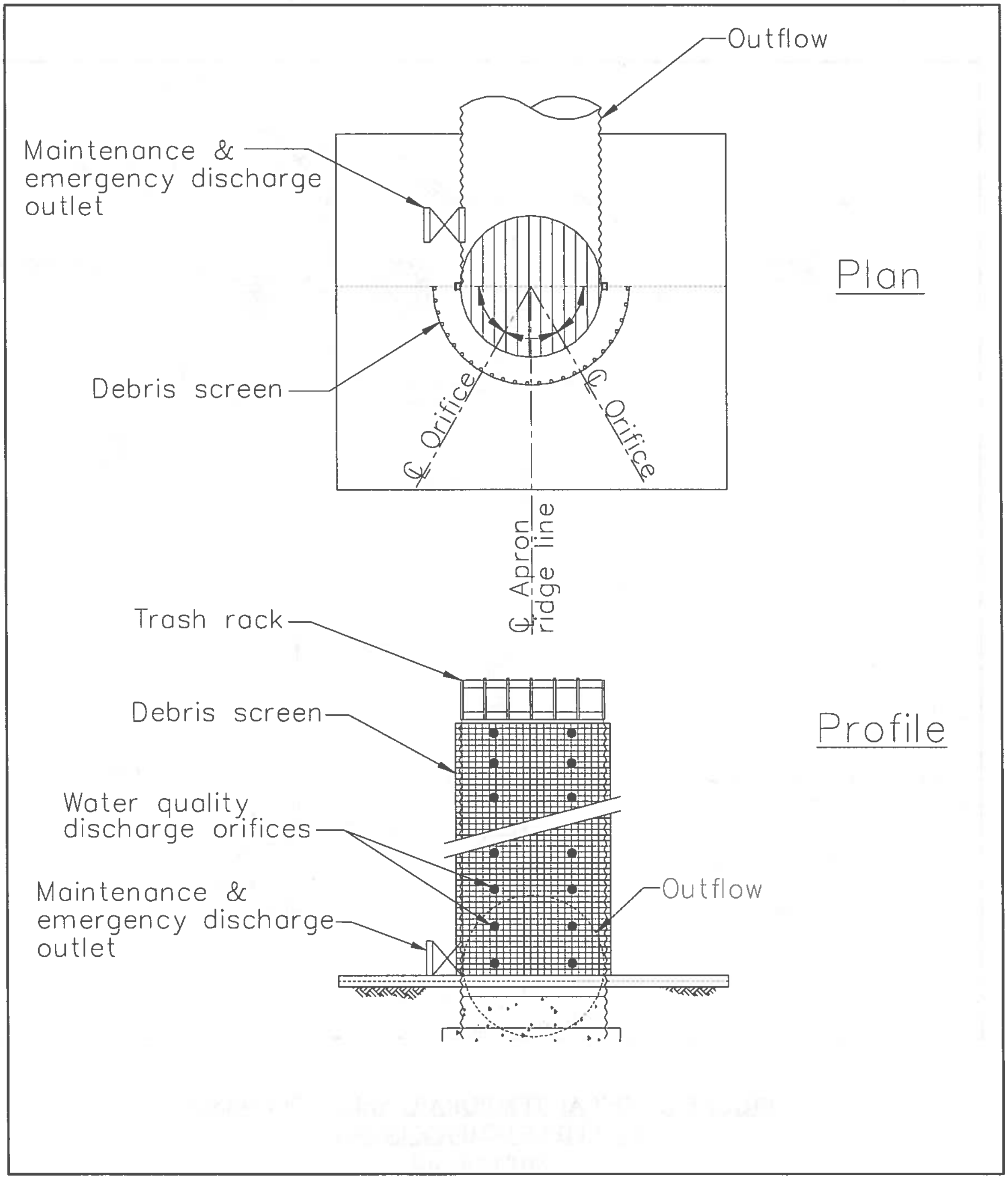


FIGURE 2: MULTIPLE ORIFICE OUTLET RISER

NOT TO SCALE

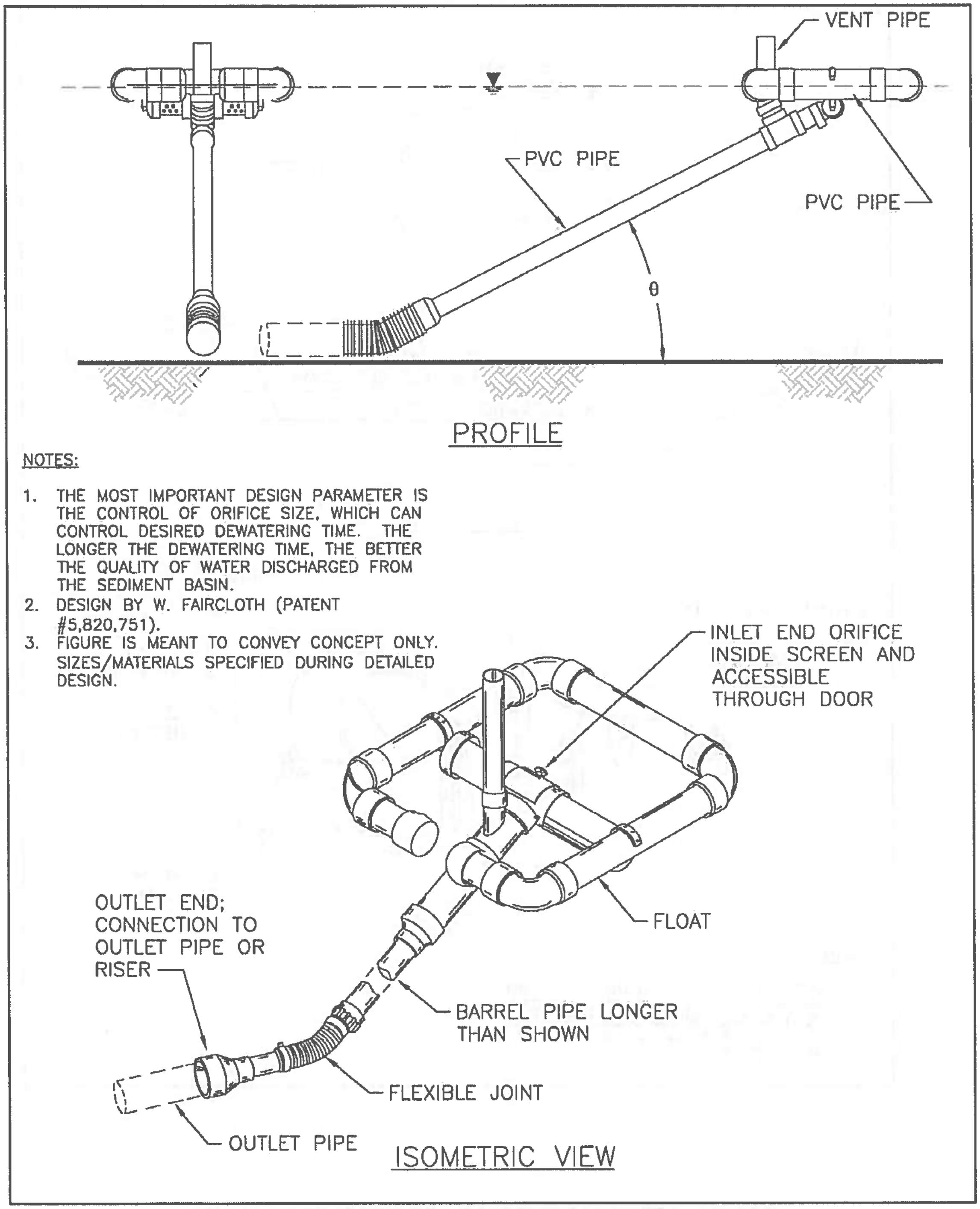


FIGURE 3: TYPICAL SKIMMER

NOT TO SCALE

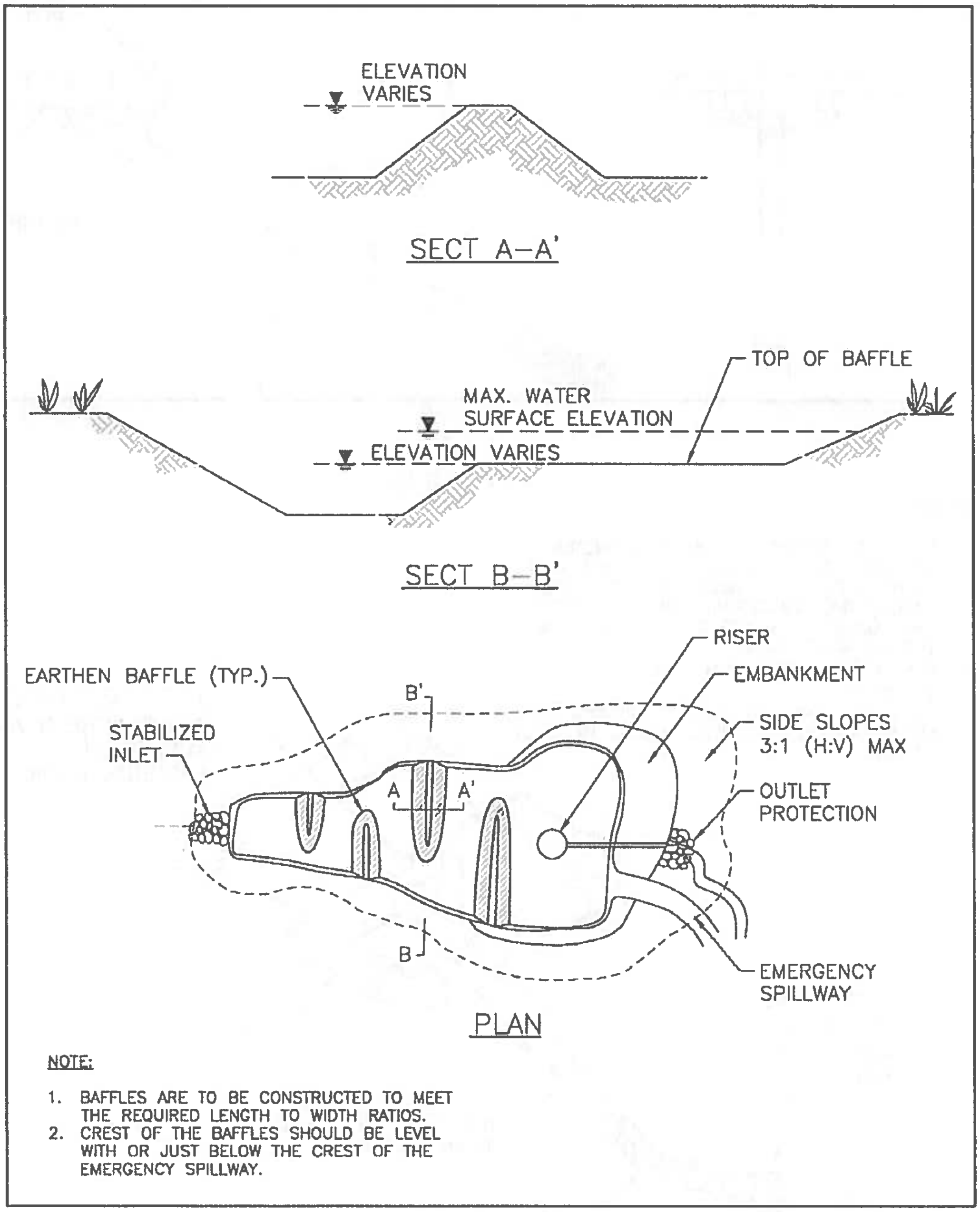
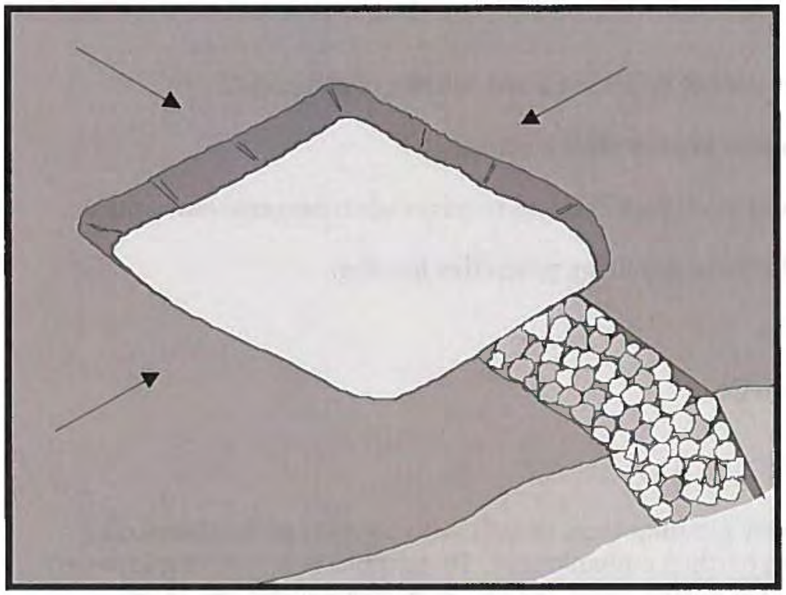


FIGURE 4: TYPICAL TEMPORARY SEDIMENT BASIN WITH BAFFLES

NOT TO SCALE

Sediment Trap



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-2 Sediment Basin (for larger areas)

Description and Purpose

A sediment trap is a containment area where sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out or before the runoff is discharged. Sediment traps are formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Suitable Applications

Sediment traps should be considered for use:

- At the perimeter of the site at locations where sediment-laden runoff is discharged offsite.
- At multiple locations within the project site where sediment control is needed.
- Around or upslope from storm drain inlet protection measures.
- Sediment traps may be used on construction projects where the drainage area is less than 5 acres. Traps would be placed where sediment-laden stormwater may enter a storm drain or watercourse. SE-2, Sediment Basins, must be used for drainage areas greater than 5 acres.
- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

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Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 5 acres.
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Conducive to vector production.
- Should not be located in live streams.

Implementation

Design

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation or by construction of an earthen embankment. Its purpose is to collect and store sediment from sites cleared or graded during construction. It is intended for use on small drainage areas with no unusual drainage features and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately six months to one year and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to SE-2, Sediment Basins, or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed of, such as in fill areas onsite, or removal to an approved offsite dump. Sediment traps used as perimeter controls should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. However, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks:

- Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
- Restrict basin side slopes to 3:1 or flatter.

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see SE-2, Sediment Basin). As a rule of thumb, the larger the basin volume the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a 2-year storm is a common design criteria for a sediment trap. The sizing criteria below assume that this runoff volume is 0.042 acre-ft/acre (0.5 in. of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California:

- Locate sediment traps as near as practical to areas producing the sediment.
- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.
- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd^3/acre and 33 yd^3/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- The outlet pipe or open spillway must be designed to convey anticipated peak flows.
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing should be provided to prevent unauthorized entry.

Installation

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a small embankment. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainage ways. The following steps must be followed during installation:

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.
- All cut-and-fill slopes should be 3:1 or flatter.
- When a riser is used, all pipe joints must be watertight.
- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.
- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.

- When crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

Costs

Average annual cost per installation and maintenance (18 month useful life) is \$0.73 per ft^3 (\$1,300 per drainage acre). Maintenance costs are approximately 20% of installation costs.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect outlet area for erosion and stabilize if required.
- Inspect trap banks for seepage and structural soundness, repair as needed.
- Inspect outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Inspect fencing for damage and repair as needed.
- Inspect the sediment trap for area of standing water during every visit. Corrective measures should be taken if the BMP does not dewater completely in 72 hours or less to prevent vector production.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the trap capacity. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location.
- Remove vegetation from the sediment trap when first detected to prevent pools of standing water and subsequent vector production.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.

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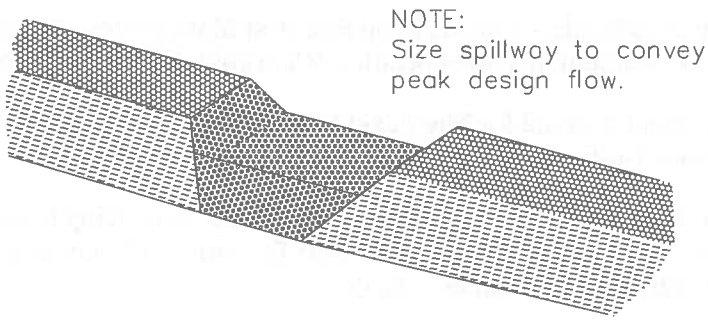
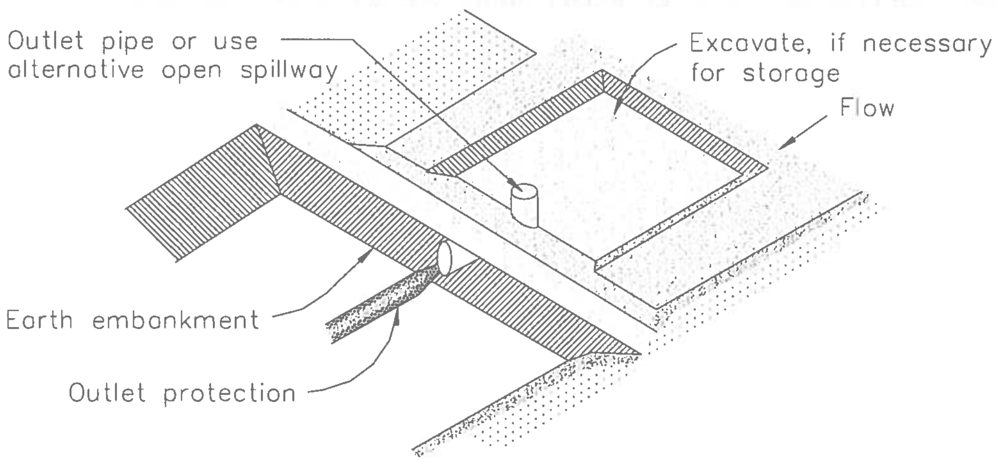
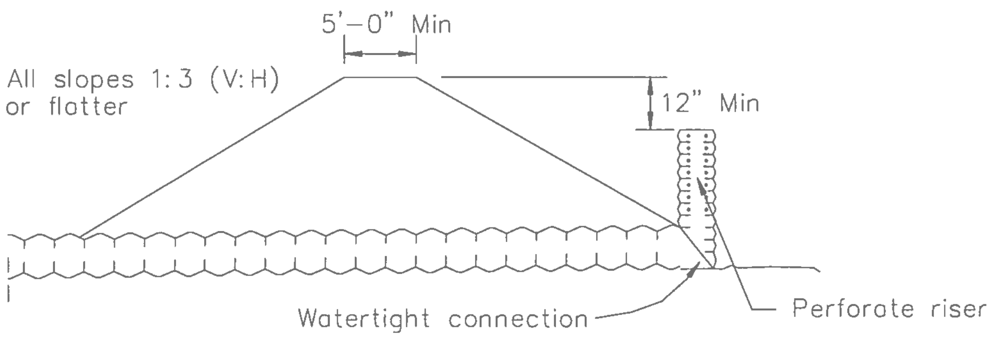


TYPICAL OPEN SPILLWAY



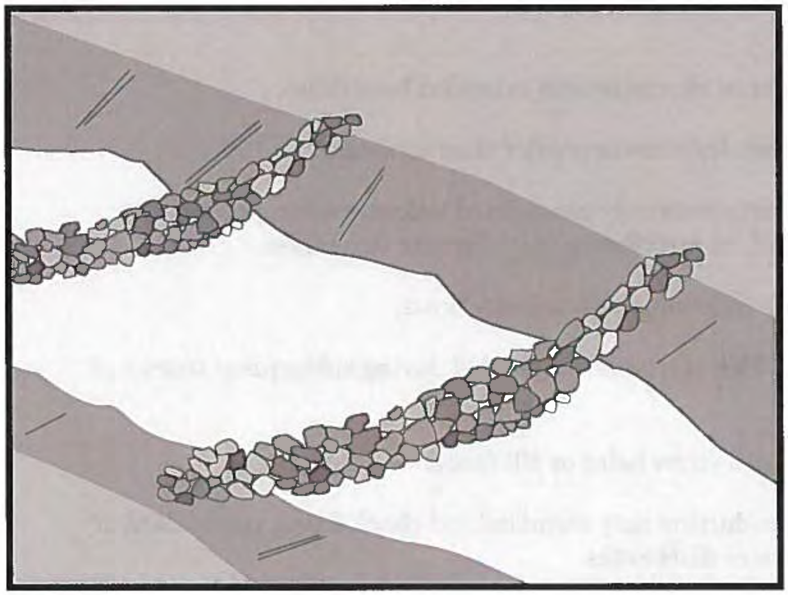


EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP

NOT TO SCALE

Check Dams SE-4



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

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Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or other proprietary products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing scour and channel erosion by reducing flow velocity and increasing residence time within the channel, allowing sediment to settle.

Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.
- To act as a grade control structure.

Limitations

- Not to be used in live streams or in channels with extended base flows.
- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion potential or sediment-laden flow is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.
- Do not construct check dams with straw bales or silt fence.
- Water suitable for mosquito production may stand behind check dams, particularly if subjected to daily non-stormwater discharges.

Implementation

General

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Using check dams to reduce channel slope reduces the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Thus, check dams are dual-purpose and serve an important role as erosion controls as well as as sediment controls. Note that use of 1-2 isolated check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

Design and Layout

Check dams work by decreasing the effective slope in ditches and swales. An important consequence of the reduced slope is a reduction in capacity of the ditch or swale. This reduction in capacity should be considered when using this BMP, as reduced capacity can result in overtopping of the ditch or swale and resultant consequences. In some cases, such as a "permanent" ditch or swale being constructed early and used as a "temporary" conveyance for construction flows, the ditch or swale may have sufficient capacity such that the temporary reduction in capacity due to check dams is acceptable. When check dams reduce capacities beyond acceptable limits, either:

- Don't use check dams. Consider alternative BMPs, or.
- Increase the size of the ditch or swale to restore capacity.

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam (see "Spacing Between Check Dams" detail at the end of this fact sheet). The center section of the dam should be lower than the edge sections (at least 6 inches), acting as a spillway, so that the check dam will direct flows to the center of the ditch or swale (see "Typical Rock Check Dam" detail at the end of this fact sheet). Bypass or side-cutting can occur if a sufficient spillway is not provided in the center of the dam.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products can also be used as check dams (e.g. HDPE check dams, temporary silt dikes (SE-12)), and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam should completely span the ditch or swale to prevent washout. The rock used should be large enough to stay in place given the expected design flow through the channel. It is recommended that abutments be extended 18 in. into the channel bank. Rock can be graded such that smaller diameter rock (e.g. 2-4 in) is located on the upstream side of larger rock (holding the smaller rock in place); increasing residence time.

Log check dams are usually constructed of 4 to 6 in. diameter logs, installed vertically. The logs should be embedded into the soil at least 18 in. Logs can be bolted or wired to vertical support logs that have been driven or buried into the soil.

See fiber rolls, SE-5, for installation of fiber roll check dams.

Gravel bag and sand bag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet (see "Gravel Bag Check Dam" detail at the end of this fact sheet).

Manufactured products, such as temporary silt dikes (SE-12), should be installed in accordance with the manufacturer's instructions. Installation typically requires anchoring or trenching of products, as well as regular maintenance to remove accumulated sediment and debris.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swales is greater than 4%).

The following guidance should be followed for the design and layout of check dams:

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- For multiple check dam installation, backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap should be cleaned following each storm event.

- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.

- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.

Materials

- Rock used for check dams should typically be 8-12 in rock and be sufficiently sized to stay in place given expected design flows in the channel. Smaller diameter rock (e.g. 2 to 4 in) can be placed on the upstream side of larger rock to increase residence time.

- Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms.

- Sandbags used for check dams should conform to SE-8, Sandbag Barrier.

- Fiber rolls used for check dams should conform to SE-5, Fiber Rolls.

- Temporary silt dikes used for check dams should conform to SE-12, Temporary Silt Dikes.

Installation

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.

- Tightly abut bags and stack according to detail shown in the figure at the end of this section (pyramid approach). Gravel bags and sandbags should not be stacked any higher than 3 ft.

- Upper rows or gravel and sand bags shall overlap joints in lower rows.

- Fiber rolls should be trenched in, backfilled, and firmly staked in place.

- Install along a level contour.

- HDPE check dams, temporary silt dikes, and other manufactured products should be used and installed per manufacturer specifications.

Costs

Cost consists of labor costs if materials are readily available (such as gravel on-site). If material must be imported, costs will increase. For other material and installation costs, see SE-5, SE-6, SE-8, SE-12, and SE-14.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Replace missing rock, bags, rolls, etc. Replace bags or rolls that have degraded or have become damaged.

- If the check dam is used as a sediment capture device, sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Inspect areas behind check dams for pools of standing water, especially if subjected to daily non-stormwater discharges.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

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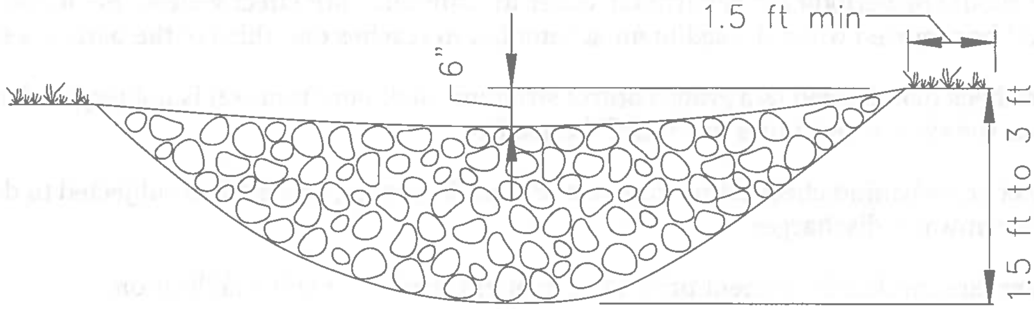
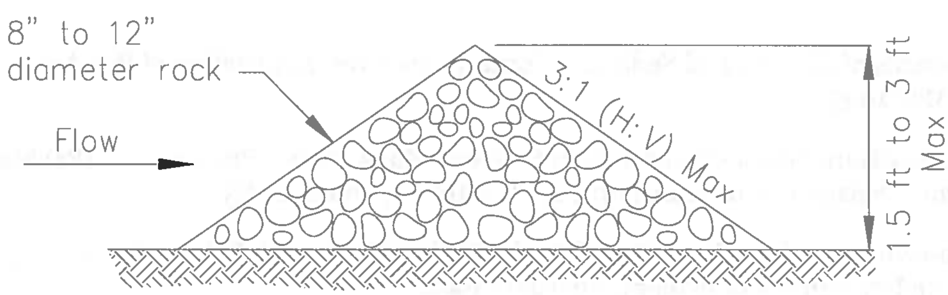
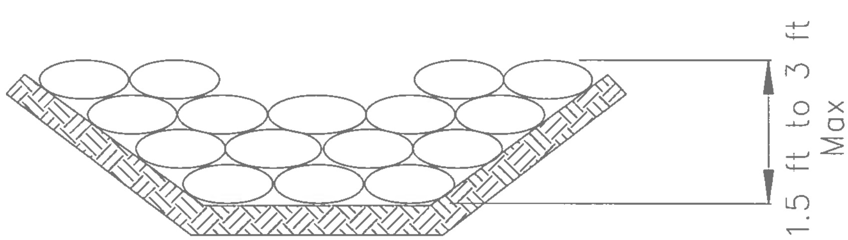


ELEVATION

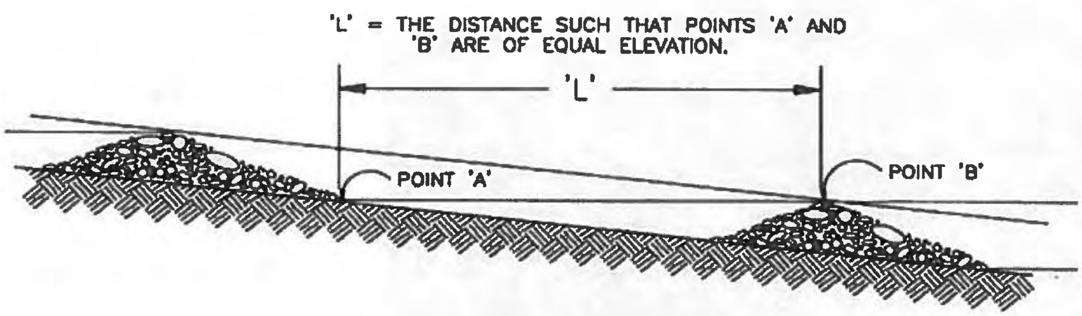


TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE

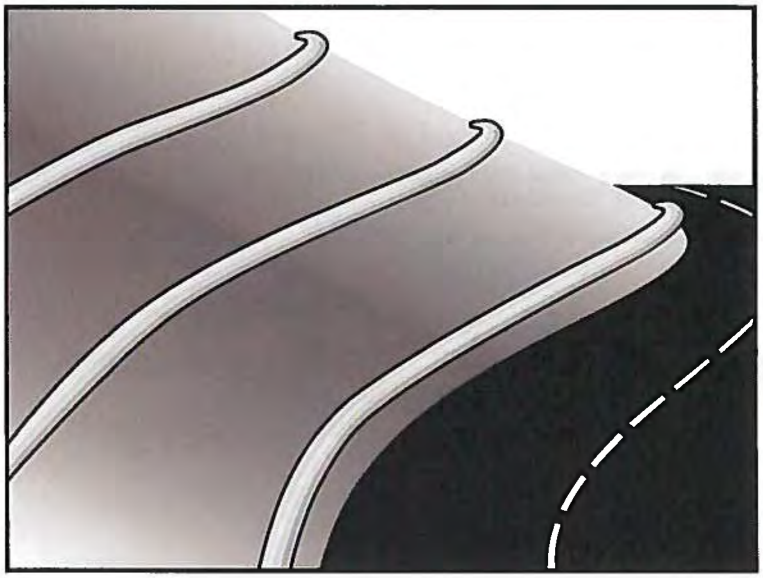


GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE



SPACING BETWEEN CHECK DAMS

Fiber Rolls



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
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WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

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- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

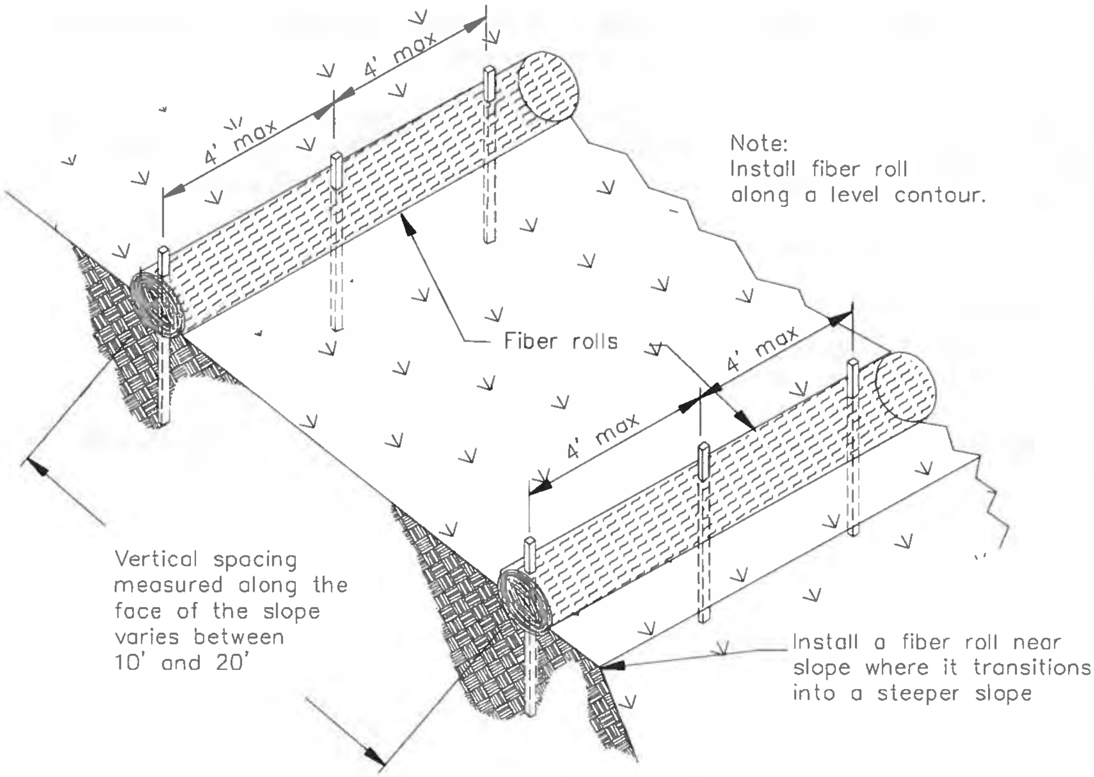
- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.

- Repair any rills or gullies promptly.

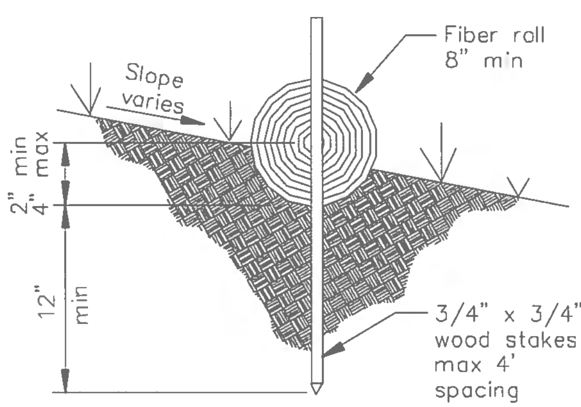
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

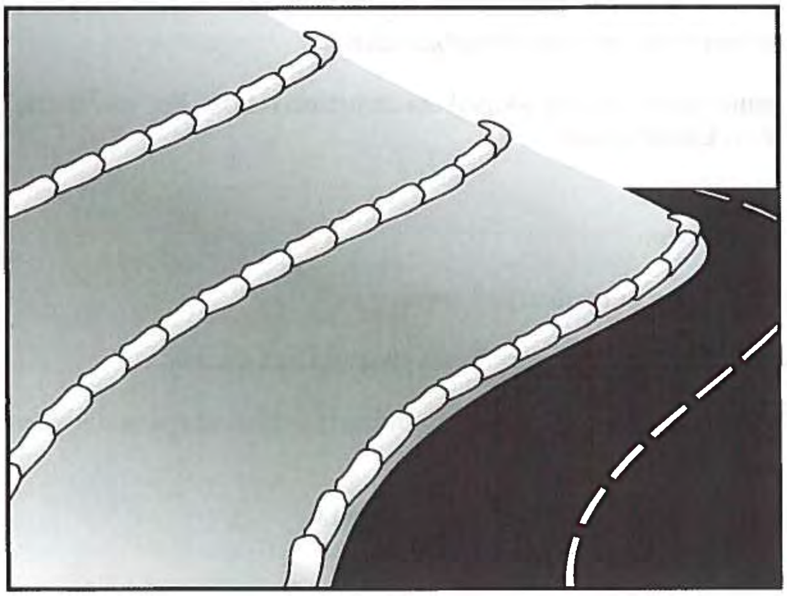


TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Gravel Bag Berm SE-6



Categories		
EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

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Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd², Mullen burst strength exceeding 300 lb/in² in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.
- ***Fill Material:*** Fill material should be 0.5 to 1 in. crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs

Material costs for gravel bags are average and are dependent upon material availability. $2.50-3.00 per filled gravel bag is standard based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.
- Reshape or replace gravel bags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

References

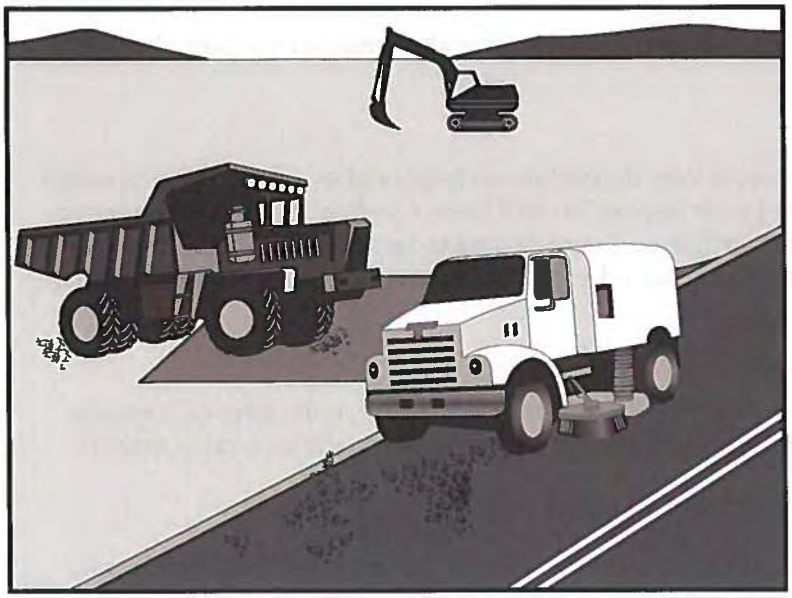
Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Street Sweeping and Vacuuming SE-7



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

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- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

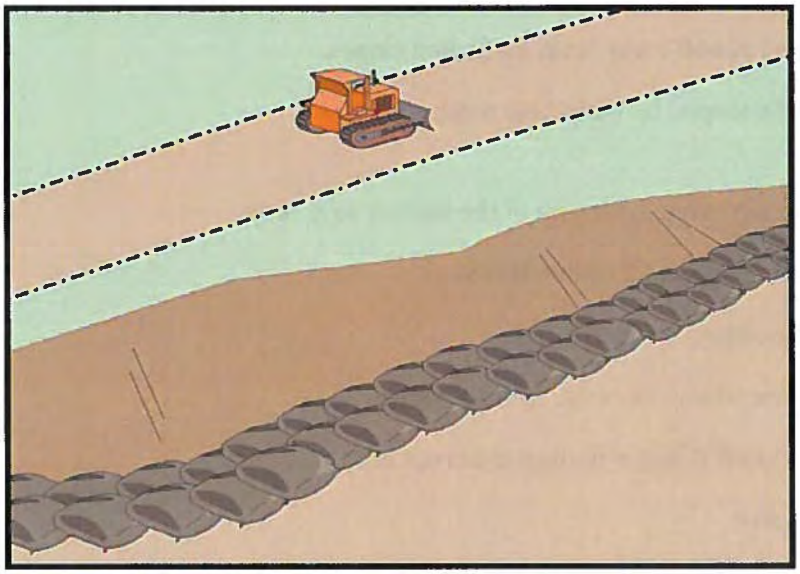
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Sandbag Barrier SE-8



Categories		
EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence
SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-14 Biofilter Bags

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Description and Purpose
A sandbag barrier is a series of sand-filled bags placed on a level contour to intercept or to divert sheet flows. Sandbag barriers placed on a level contour pond sheet flow runoff, allowing sediment to settle out.

Suitable Applications
Sandbag barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes.
  - As sediment traps at culvert/pipe outlets.
  - Below other small cleared areas.
  - Along the perimeter of a site.
  - Down slope of exposed soil areas.
  - Around temporary stockpiles and spoil areas.
  - Parallel to a roadway to keep sediment off paved areas.
  - Along streams and channels.
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

- At the top of slopes to divert runoff away from disturbed slopes.
- As check dams across mildly sloped construction roads.

Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Sandbags are not intended to be used as filtration devices.
- Easily damaged by construction equipment.
- Degraded sandbags may rupture when removed, spilling sand.
- Sand is easily transported by runoff if bag is damaged or ruptured.
- Installation can be labor intensive.
- Durability of sandbags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months. When used to detain concentrated flows, maintenance requirements increase.
- Burlap should not be used for sandbags.

Implementation

General

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. Sand-filled bags have limited porosity, which is further limited as the fine sand tends to quickly plug with sediment, limiting or completely blocking the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms or SE-14, Biofilter Bags. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to gravel bag berms, but less porous. Generally, sandbag barriers should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate sandbag barriers on a level contour.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Sandbags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.
  - Slope inclination 2:1 (H:V) or greater: Sandbags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, sand bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the sand bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- Stack sandbags at least three bags high.
- Butt ends of bags tightly.
- Overlap butt joints of row beneath with each successive row.
- Use a pyramid approach when stacking bags.
- In non-traffic areas
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Side slope = 2:1 (H:V) or flatter
- In construction traffic areas
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- See typical sandbag barrier installation details at the end of this fact sheet.

Materials

- ***Sandbag Material:*** Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap is not an acceptable substitute, as sand can more easily mobilize out of burlap.
- ***Sandbag Size:*** Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** All sandbag fill material should be non-cohesive, Class 3 (Caltrans Standard Specification, Section 25) permeable material free from clay and deleterious material, such as recycled concrete or asphalt..

Costs

Empty sandbags cost $0.25 - $0.75. Average cost of fill material is $8 per yd^3. Additional labor is required to fill the bags. Pre-filled sandbags are more expensive at $1.50 - $2.00 per bag. These costs are based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.

- Reshape or replace sandbags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

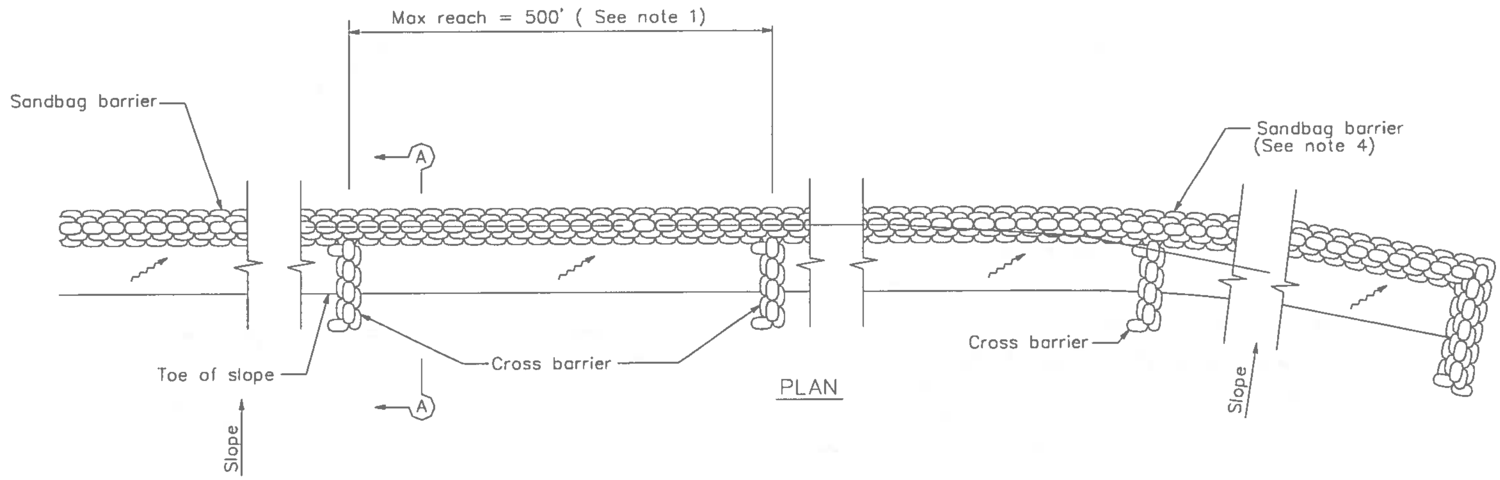
- Remove sandbags when no longer needed and recycle sand fill whenever possible and properly dispose of bag material. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

References

Standard Specifications for Construction of Local Streets and Roads, California Department of Transportation (Caltrans), July 2002.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

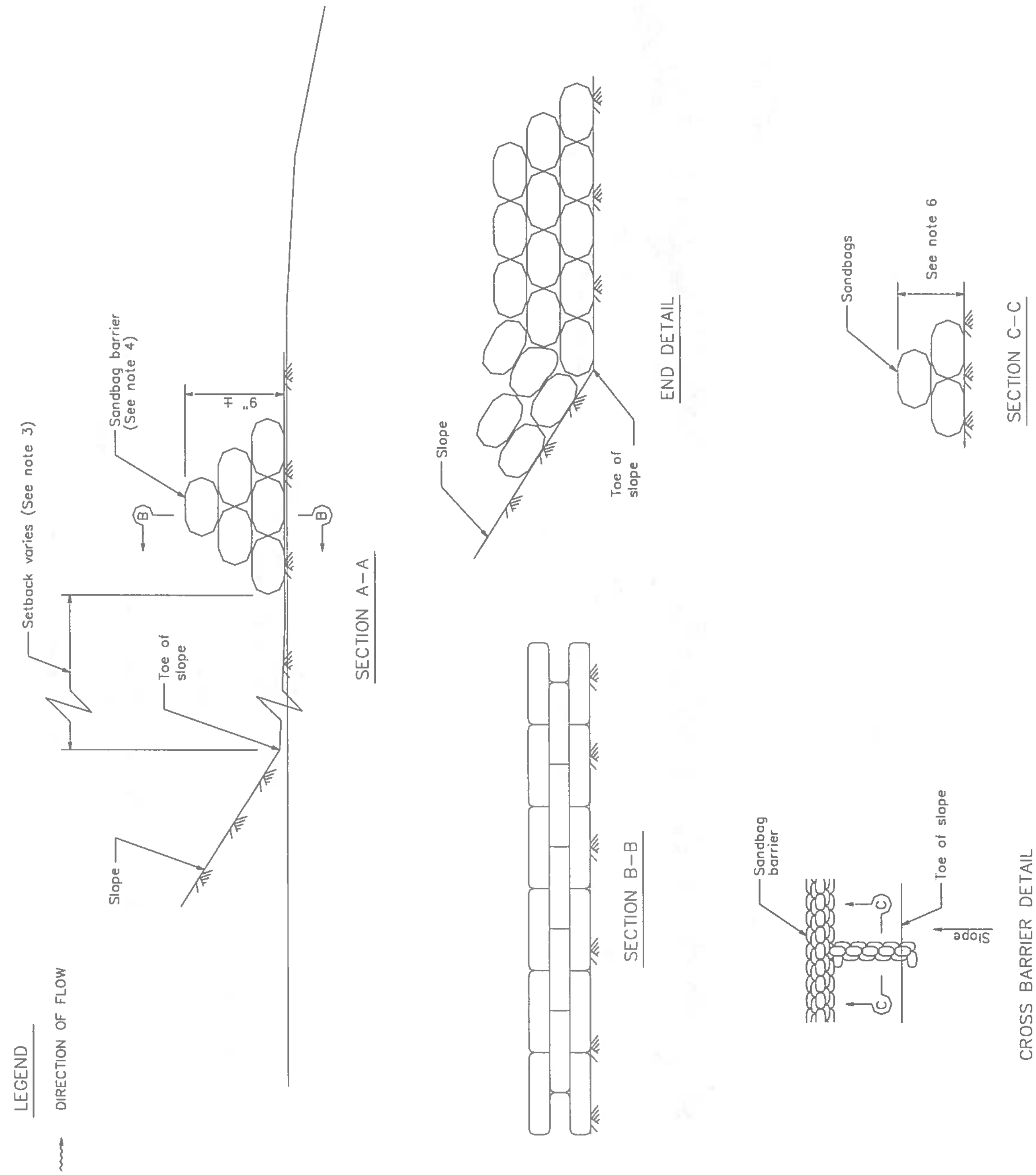
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



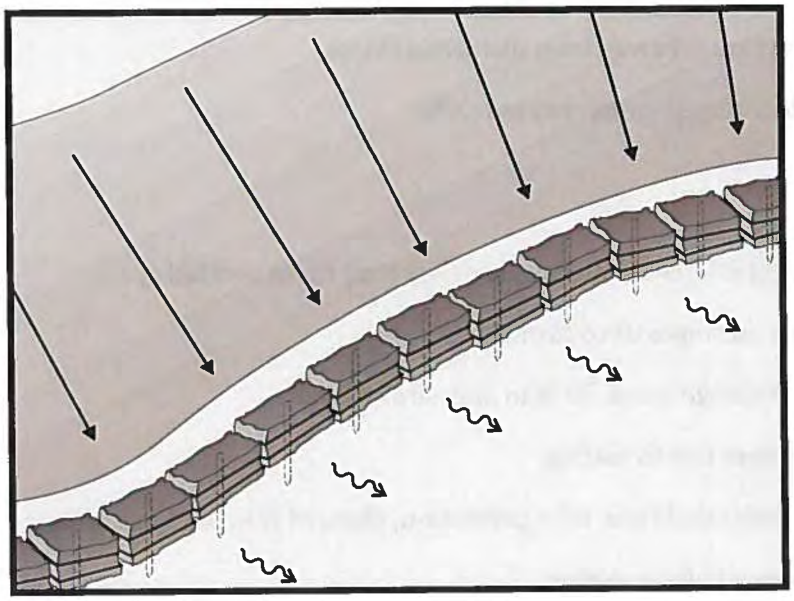
SANDBAG BARRIER

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of 1/2 and a max of 2/3 the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.



LEGEND
DIRECTION OF FLOW
Slope
Toe of slope
Setback varies (See note 3)
Sandbag barrier (See note 4)
9" ±
B
B
SECTION A-A
SECTION B-B
Slope
Toe of slope
END DETAIL
Sandbag barrier
C
C
Toe of slope
Slope
CROSS BARRIER DETAIL
Sandbags
See note 6
SECTION C-C



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

Description and Purpose

A straw bale barrier is a series of straw bales placed on a level contour to intercept sheet flows. Straw bale barriers pond sheet- flow runoff, allowing sediment to settle out.

Suitable Applications

Straw bale barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

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- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

Limitations

Straw bale barriers:

- Are not to be used for extended periods of time because they tend to rot and fall apart
- Are suitable only for sheet flow on slopes of 10 % or flatter
- Are not appropriate for large drainage areas, limit to one acre or less
- May require constant maintenance due to rotting
- Are not recommended for concentrated flow, inlet protection, channel flow, and live streams
- Cannot be made of bale bindings of jute or cotton
- Require labor-intensive installation and maintenance
- Cannot be used on paved surfaces
- Should not to be used for drain inlet protection
- Should not be used on lined ditches
- May introduce undesirable non-native plants to the area

Implementation

General

A straw bale barrier consists of a row of straw bales placed on a level contour. When appropriately placed, a straw bale barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. Straw bale barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils.

Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainage ways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow. Use of straw bale barriers in accordance with this BMP should produce acceptable results.

Design and Layout

- Locate straw bale barriers on a level contour.
  - Slopes up to 10:1 (H:V): Straw bales should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the toe of slope.
  - Slopes greater than 10:1 (H:V): Not recommended.

- Turn the ends of the straw bale barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sand bags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 1 acre, or 0.25 acre per 100 ft of barrier.
- Maximum flow path to the barrier should be limited to 100 ft.
- Straw bale barriers should consist of two parallel rows.
  - Butt ends of bales tightly
  - Stagger butt joints between front and back row
  - Each row of bales must be trenched in and firmly staked
- Straw bale barriers are limited in height to one bale laid on its side.
- Anchor bales with either two wood stakes or four bars driven through the bale and into the soil. Drive the first stake towards the butt joint with the adjacent bale to force the bales together.
- See attached figure for installation details.

Materials

- ***Straw Bale Size:*** Each straw bale should be a minimum of 14 in. wide, 18 in. in height, 36 in. in length and should have a minimum mass of 50 lbs. The straw bale should be composed entirely of vegetative matter, except for the binding material.
- ***Bale Bindings:*** Bales should be bound by steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding should not be used. Baling wire should be a minimum diameter of 14 gauge. Nylon or polypropylene string should be approximately 12 gauge in diameter with a breaking strength of 80 lbs force.
- ***Stakes:*** Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Steel bar reinforcement should be equal to a #4 designation or greater. End protection should be provided for any exposed bar reinforcement.

Costs

Straw bales cost $5 - $7 each. Adequate labor should be budgeted for installation and maintenance.

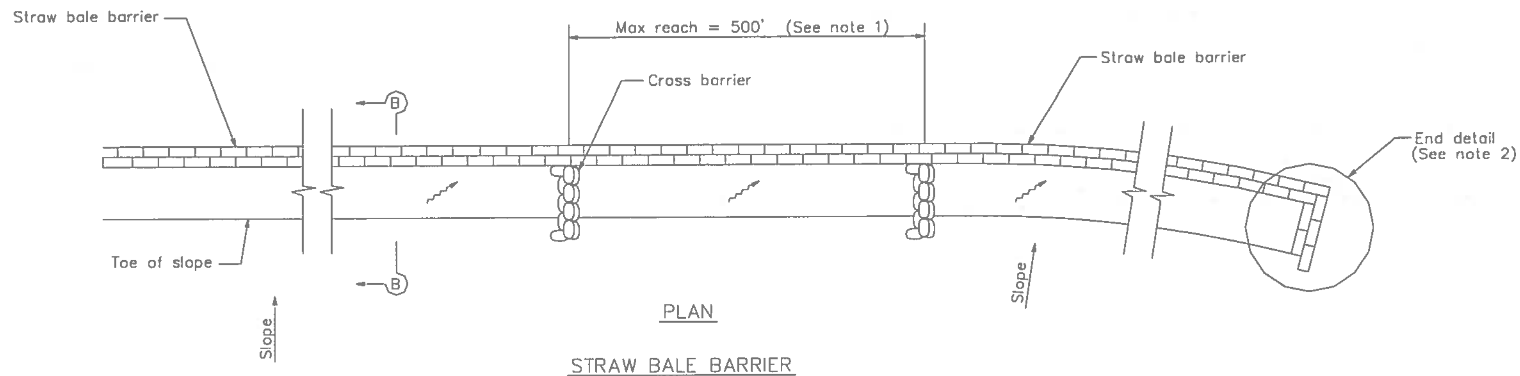
Inspection and Maintenance

Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Straw bales degrade, especially when exposed to moisture. Rotting bales will need to be replaced on a regular basis.
- Replace or repair damaged bales as needed.
- Repair washouts or other damages as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove straw bales when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



PLAN

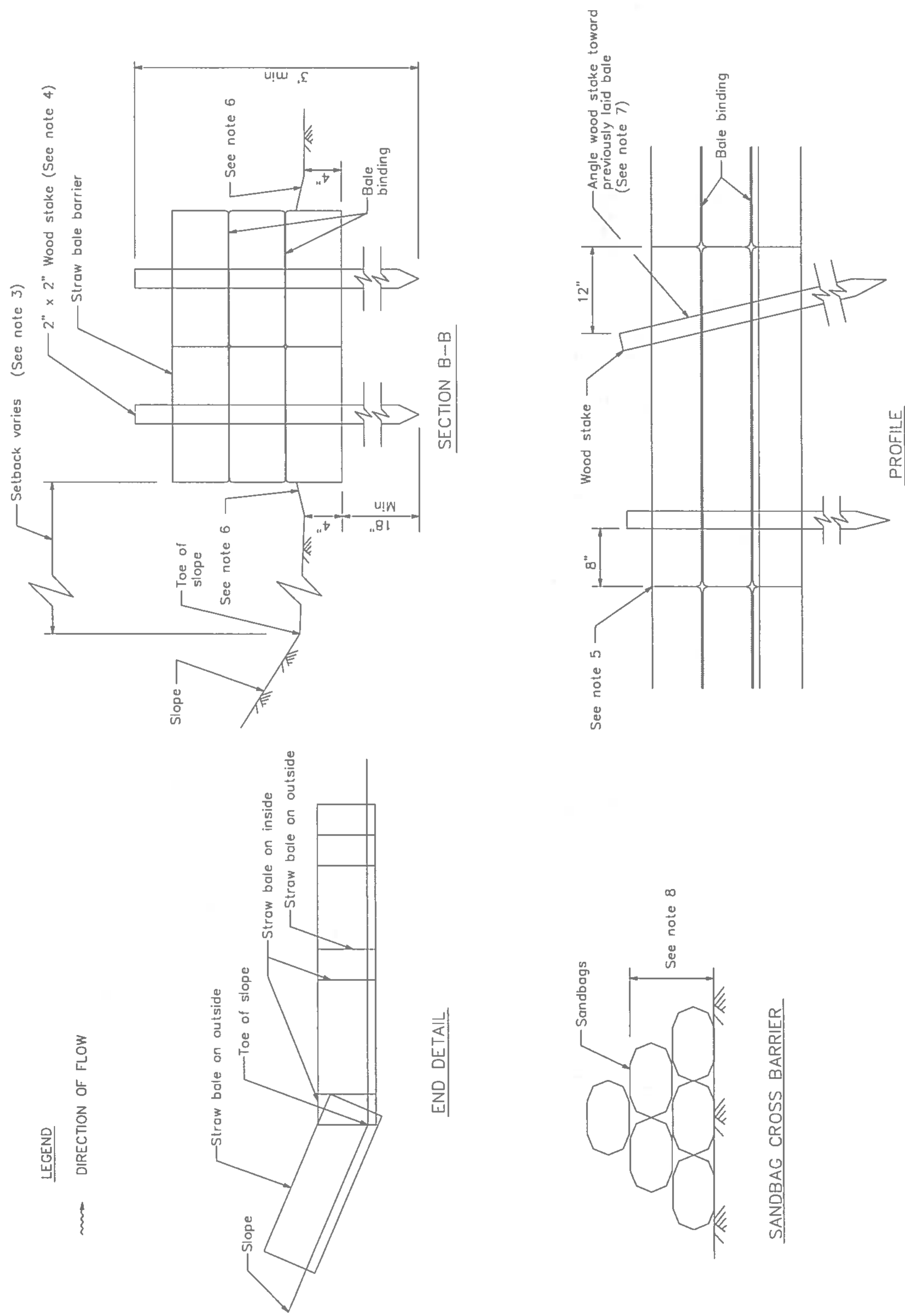
STRAW BALE BARRIER

NOTES

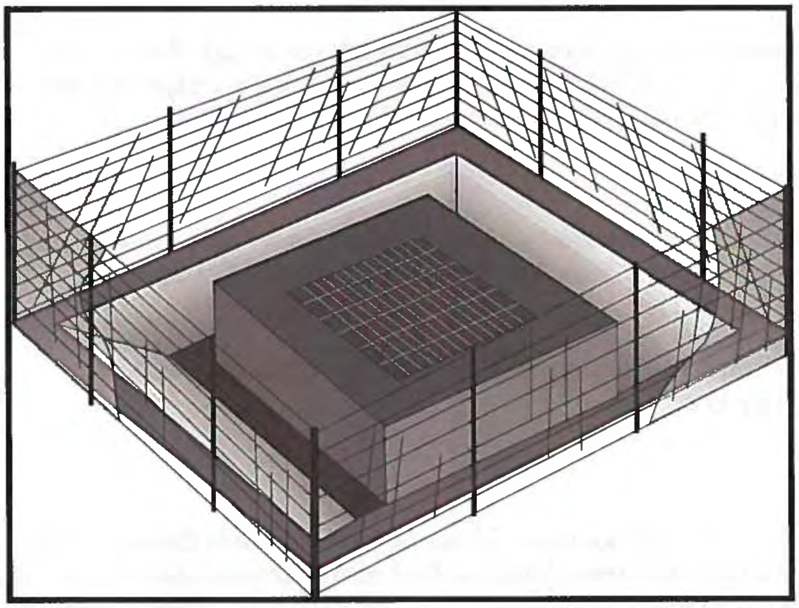
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The end of barrier shall be turned up slope.
3. Dimension may vary to fit field condition.
4. Stake dimensions are nominal.
5. Place straw bales tightly together.
6. Tamp embedment spoils against sides of installed bales.
7. Drive angled wood stake before vertical stake to ensure tight abutment to adjacent bale.
8. Sandbag cross barriers should be a min of 1/2 and a max of 2/3 the height of the linear barrier.
9. Sandbag rows and layers should be offset to eliminate gaps.

LEGEND

〰 DIRECTION OF FLOW


Setback varies (See note 3)
2" x 2" Wood stake (See note 4)
Straw bale barrier
See note 6
3' min
4"
Bale binding
18" Min
4"
Toe of slope
See note 6
Slope
SECTION B-B
Angle wood stake toward previously laid bale (See note 7)
Bale binding
12"
Wood stake
8"
See note 5
PROFILE
LEGEND
DIRECTION OF FLOW
Straw bale on outside
Toe of slope
Straw bale on inside
Straw bale on outside
Slope
END DETAIL
Sandbags
See note 8
SANDBAG CROSS BARRIER

Storm Drain Inlet Protection SE-10



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area in, around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction. Temporary geotextile storm drain inserts attach underneath storm drain grates to capture and filter storm water.

Suitable Applications

Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.

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- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.

- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.

- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.

  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.

  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.

- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Six types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
  - Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
  - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
  - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
  - Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
  - Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Silt Fence*** **-** Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.

  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

5. Backfill the trench with gravel or compacted earth all the way around.

- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap*** - Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

- ***DI Protection Type 3 - Gravel bag*** - Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

1. Construct on gently sloping street.
2. Leave room upstream of barrier for water to pond and sediment to settle.
3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.
4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter*** - Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.
2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

- ***DI Protection Type 5 – Temporary Geotextile Insert (proprietary)*** – Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

- ***DI Protection Type 6 - Biofilter bags*** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.

    1. Construct in a gently sloping area.
    2. Biofilter bags should be placed around inlets to intercept runoff flows.
    3. All bag joints should overlap by 6 in.
    4. Leave room upstream for water to pond and for sediment to settle out.
    5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one year useful life) is $200 per inlet.

- Temporary geotextile inserts are proprietary and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from $50-75 plus installation, but costs can exceed $100. This cost does not include maintenance.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Silt Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.

- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.

- Remove storm drain inlet protection once the drainage area is stabilized.

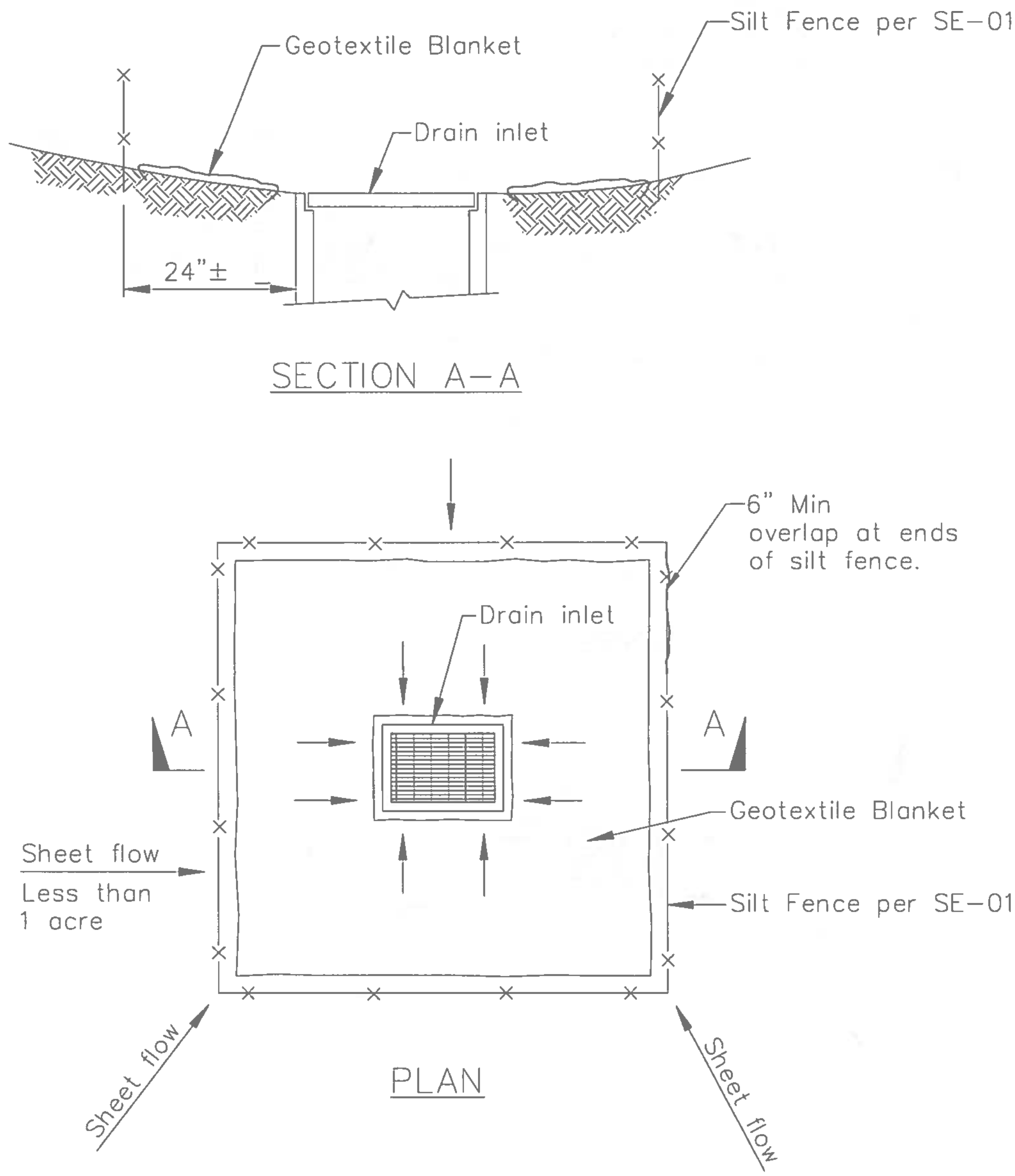
- Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

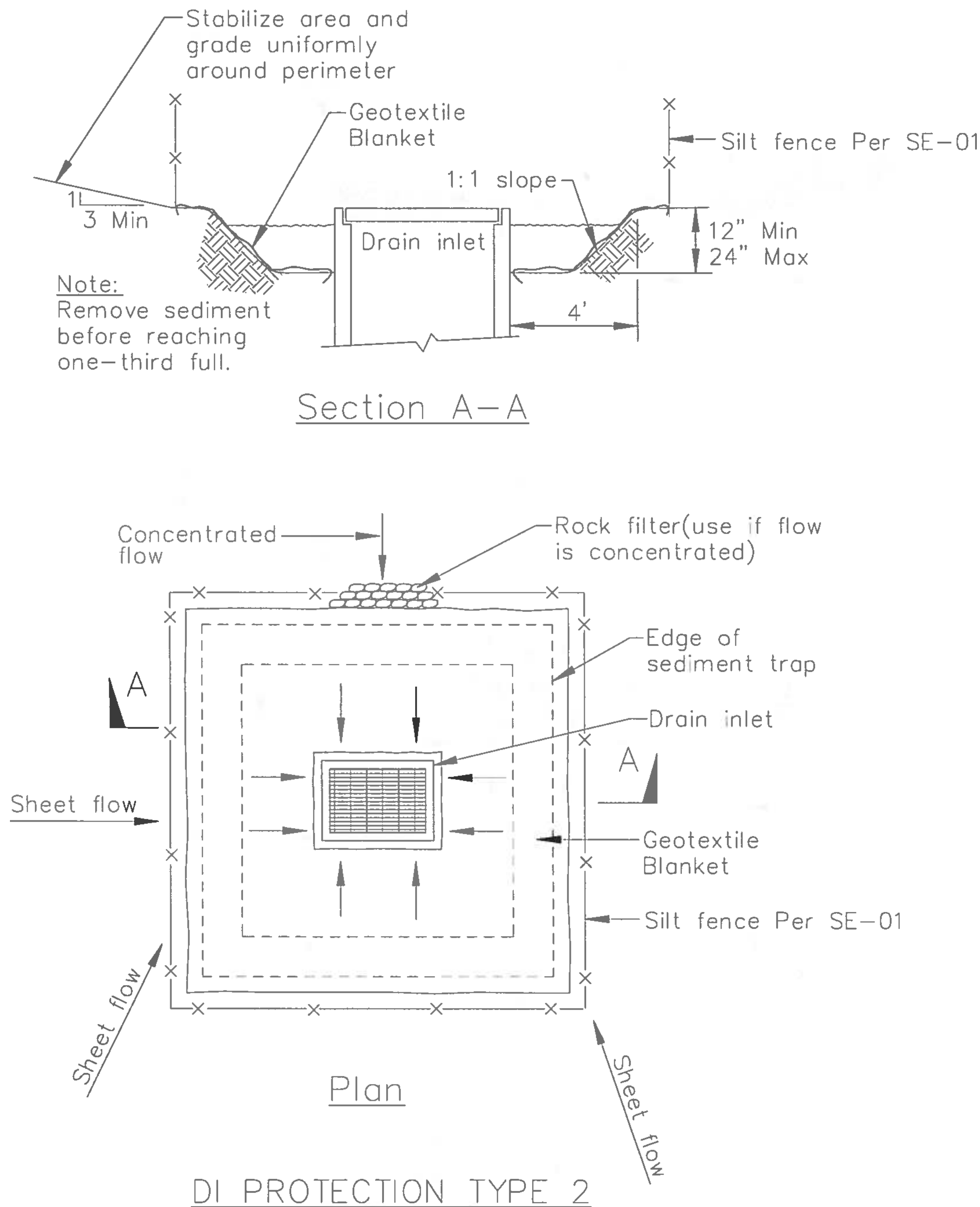
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



DI PROTECTION TYPE 1
NOT TO SCALE

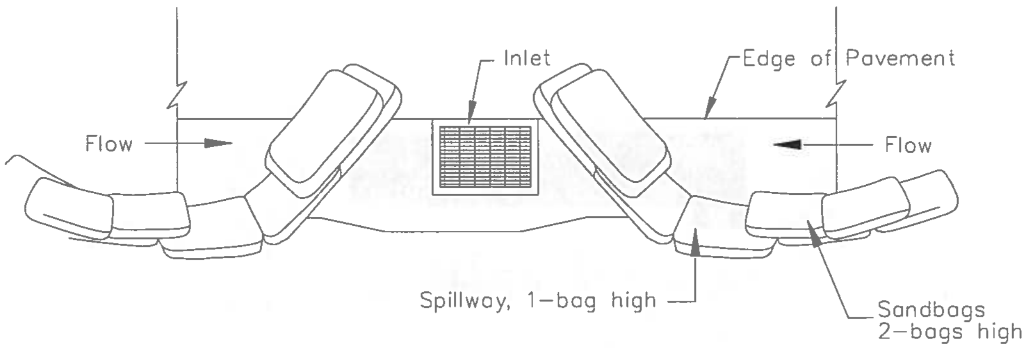
NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.

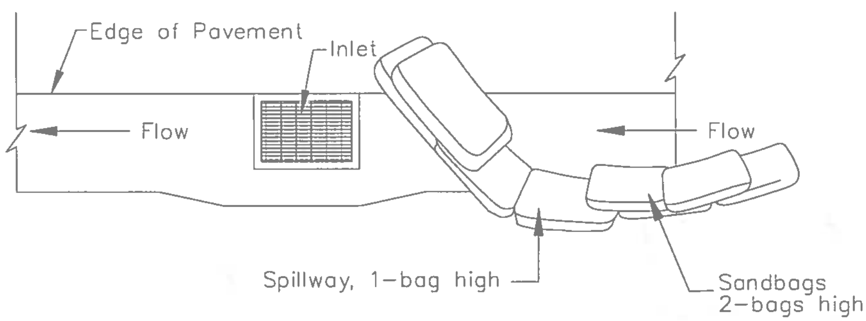


DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP



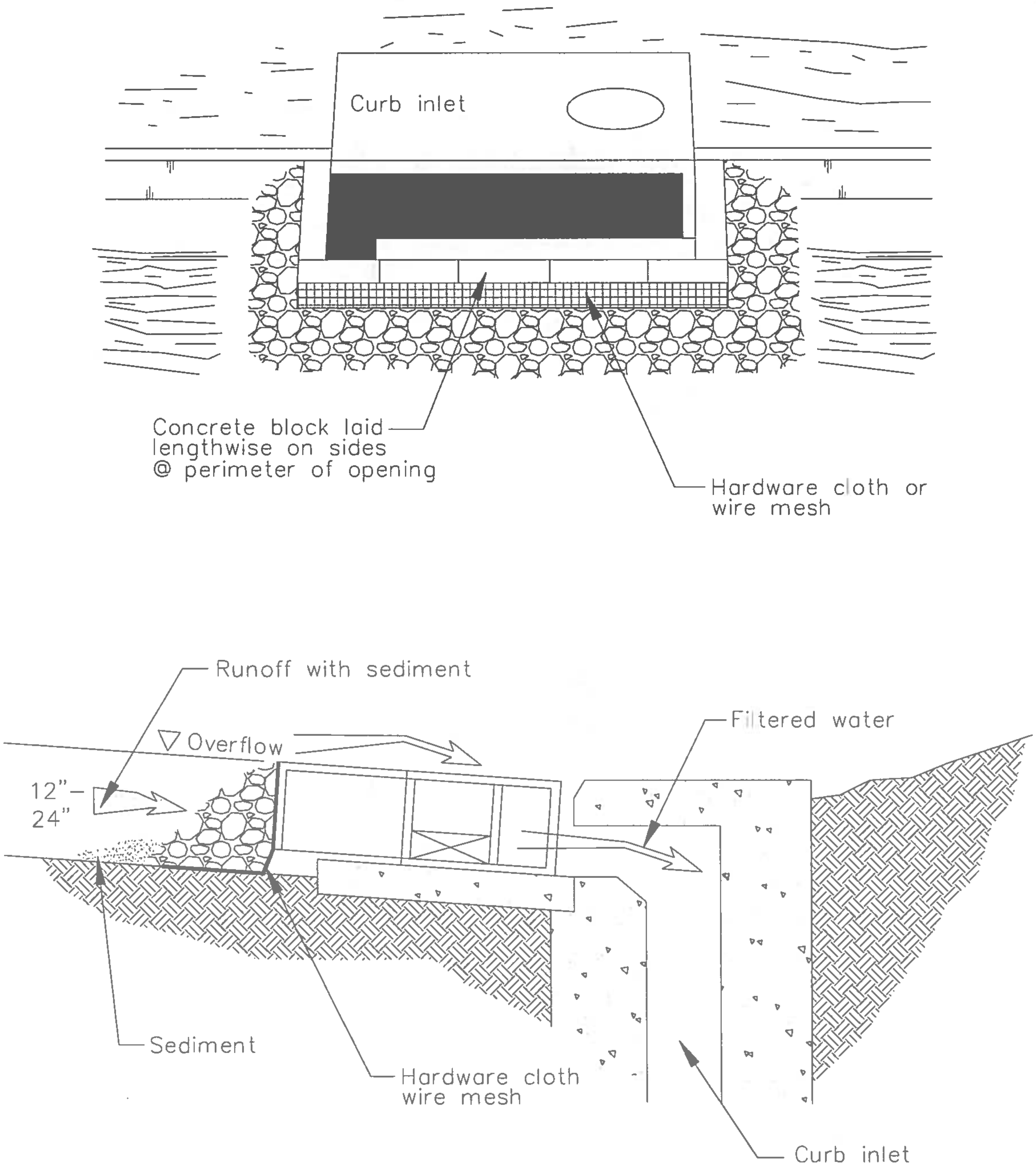
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short–term use.
2. Use to inhibit non–storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

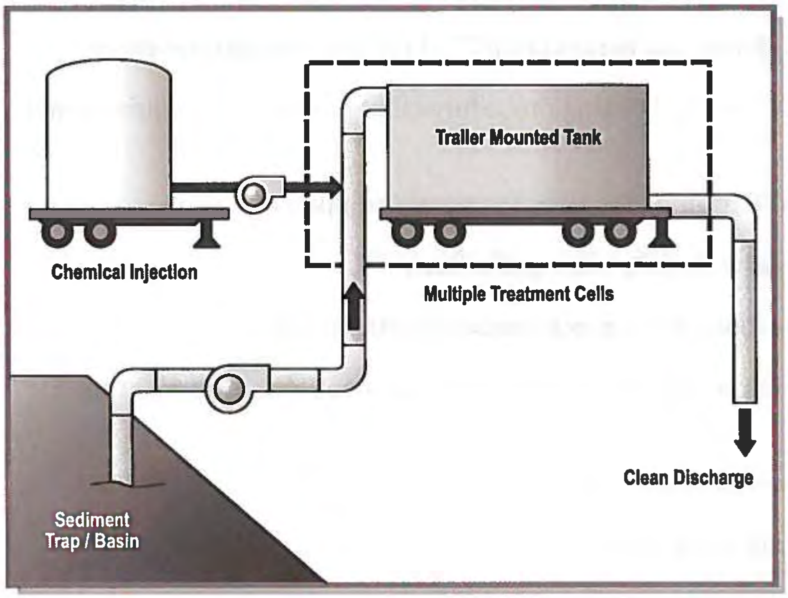
DI PROTECTION TYPE 3

NOT TO SCALE



DI PROTECTION – TYPE 4

NOT TO SCALE



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Active Treatment Systems (ATS) reduce turbidity of construction site runoff by introducing chemicals to stormwater through direct dosing or an electrical current to enhance flocculation, coagulation, and settling of the suspended sediment. Coagulants and flocculants are used to enhance settling and removal of suspended sediments and generally include inorganic salts and polymers (USACE, 2001). The increased flocculation aids in sedimentation and ability to remove fine suspended sediments, thus reducing stormwater runoff turbidity and improving water quality.

Suitable Applications

ATS can reliably provide exceptional reductions of turbidity and associated pollutants and should be considered where turbid discharges to sediment and turbidity sensitive waters cannot be avoided using traditional BMPs. Additionally, it may be appropriate to use an ATS when site constraints inhibit the ability to construct a correctly sized sediment basin, when clay and/or highly erosive soils are present, or when the site has very steep or long slope lengths.

Limitations

Dischargers choosing to utilize chemical treatment in an ATS must follow all guidelines of the Construction General Permit Attachment F – Active Treatment System Requirements. General limitations are as follows:

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- Numeric Effluent Limit (NEL) for all discharges (10 NTU daily flow-weighted average)
- Limited availability of chemical residual testing procedures that meet permit requirements for flow-through treatment
- Specific field and classroom ATS training required to operate equipment
- Batch treatment requires extensive toxicity testing of effluent
- Batch treatment requires large footprint to accommodate treatment cells
- Requires additional filtration to remove residual floc and treatment chemicals prior to discharge
- Petroleum based polymers should not be used
- Requires site-specific design and equipment
- Limited discharge rates depending on receiving water body
- Labor intensive operation and maintenance
- ATS costs are higher on a unit basis for smaller sites that would be expected to have a lower volume of treated runoff
- ATS costs are seasonably variable due to increases or decreases in rainfall volumes

Implementation

Turbidity is difficult to control once fine particles are suspended in stormwater runoff from a construction site. Sedimentation ponds are effective at removing larger particulate matter by gravity settling, but are ineffective at removing smaller particulates such as clay and fine silt. Sediment ponds are typically designed to remove sediment no smaller than medium silt (0.02 mm). ATS may be used to reduce the turbidity of stormwater runoff. With an ATS, very high turbidities can be reduced to levels comparable to what is found in streams during dry weather.

Criteria for ATS Product Use

Chemically treated stormwater discharged from construction sites must be non-toxic to aquatic organisms. The following protocol should be used to evaluate chemicals proposed for stormwater treatment at construction sites. Authorization to use a chemical in the field based on this protocol does not relieve the applicant from responsibility for meeting all discharge and receiving water criteria applicable to a site.

- An ATS Plan, which includes an Operation and Maintenance component, a Monitoring, Sampling and Reporting component, a Health and Safety component, and a Spill Prevention component must be prepared and submitted to the Regional Water Quality Control Board (RWQCB).

- Treatment chemicals should be approved by EPA for potable water use or otherwise be demonstrated to be protective of human health and the environment. Chemical residual or whole effluent toxicity testing is required.
- Prior to field use of chemical treatment, jar tests are to be conducted to demonstrate that turbidity reduction necessary to meet the NELs and receiving water criteria can be achieved. Test conditions, including but not limited to raw water quality and jar test procedures, should be indicative of field conditions. Although these small-scale tests cannot be expected to reproduce performance under field conditions, they are indicative of treatment capability. A minimum of six site-specific jar tests must be conducted per chemical.
- The proposed maximum dosage should be at least a factor of five lower than the no observed effects concentration (NOEC).
- Effluent discharge from an ATS to a receiving water is conditional upon the favorable results of full-scale whole effluent bioassay/toxicity testing for batch treatment systems and upon chemical residuals testing for flow-through systems.
- Contact the RWQCB for a list of treatment chemicals that may be pre-approved for use.

Active Treatment System Design Considerations

The design and operation of an ATS should take into consideration the factors that determine optimum, cost-effective performance. While site characteristics will influence system design, it is important to recognize the following overriding considerations:

- The right chemical must be used at the right dosage. A dosage that is either too low or too high will not produce the lowest turbidity. There is an optimum dosage rate. This is a situation where the adage "adding more is always better" is not the case.
- The coagulant must be mixed rapidly into the water to insure proper dispersion.
- The mixing system for batch treatment must be sized to provide adequate mixing for the design storage volume. Lack of adequate mixing during the flocculation phase results in flocs that are too small and/or insufficiently dense. Too much mixing can rapidly destroy floc as it is formed.
- Care must be taken in the design of the withdrawal system to minimize outflow velocities and to prevent floc discharge. The discharge should be directed through a filtration system such as sand, bag, or cartridge filter that would catch any unintended floc discharge.
- ATS is also regulated for pH of the discharge. A pH-adjusting chemical should be added into the treated water to control pH if the selected coagulant requires alteration of the pH of the discharge outside of the acceptable range.

Active Treatment System Design

ATS can be designed as batch treatment systems using either ponds or portable trailer-mounted tanks, or as flow-through systems using any number of proprietary designed systems.

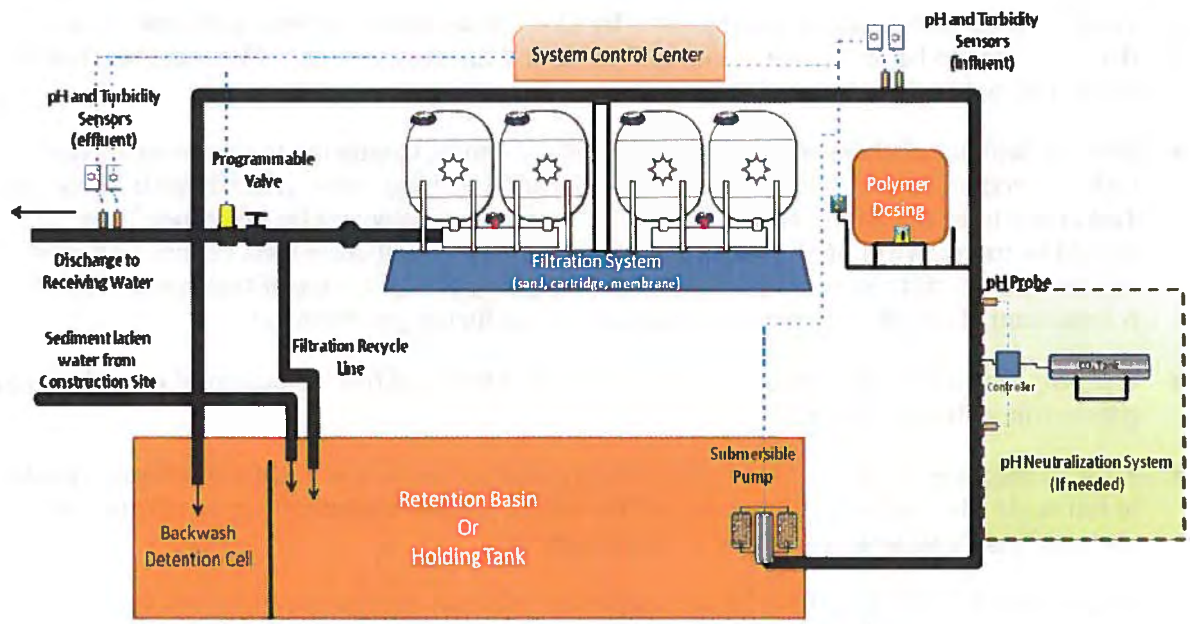

Figure has been adapted from Port of Seattle response to Washington Dept. of Ecology Action Order 2948

Batch Treatment

Batch Treatment systems consist of the stormwater collection system (either temporary diversion or the permanent site drainage system); a sediment basin, trap or holding tanks; pumps; a chemical feed system; treatment cells; and, interconnecting piping.

Batch treatment systems should use a minimum of two lined treatment cells. Multiple treatment cells allow for clarification of treated water while other cells are being filled or emptied. Treatment cells may be basins, traps, or tanks. Portable tanks may also be suitable for some sites.

The following equipment should be located in a secured, covered location:

- The chemical injector
- Secondary contaminant for acid, caustic, buffering compound, and treatment chemical
- Emergency shower and eyewash
- Monitoring equipment which consists of a pH meter and a turbidimeter (if not already within the instrumentation panel of the chemical injector)

Flow-through Treatment

At a minimum, a flow-through ATS system consists of the stormwater collection system (either temporary diversion or the permanent site drainage system), an untreated stormwater storage pond or holding tank, and a chemically enhanced filtration system.

Stormwater is collected at interception point(s) on the site and is diverted by gravity or by pumping to an untreated stormwater storage pond or other untreated stormwater holding area.

The stormwater is stored until treatment occurs. It is important that the holding pond be large enough to provide adequate storage.

Stormwater is then pumped from the untreated stormwater storage pond to the chemically enhanced filtration system where polymer is added. Adjustments to pH may be necessary before chemical addition. The filtration system continually monitors the stormwater for turbidity and pH. If the discharge water is out of the acceptable turbidity or pH range, the water is recycled to the untreated stormwater pond (or holding tank) where it can be retreated. Flow through systems must ensure that:

- Cumulative flow volume shall be recorded daily. The data recording system shall have the capacity to record a minimum of seven days of continuous data.
- Instrumentation systems are interfaced with system control to provide auto shutoff or recirculation in the event that effluent measurements exceed turbidity or pH.
- Upon system upset, power failure, or other catastrophic event, the ATS will default to a recirculation mode or safe shut down.
- The instrumentation system provides a method for controlling coagulant dose, to prevent potential overdosing.

Sizing Criteria

An ATS shall be designed and approved by a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Storm Water Quality (CPSWQ); a California registered civil engineer; or any other California registered engineer.

ATS must be designed to capture and treat (within 72 hours) runoff from the 10-year 24-hour storm event. The runoff volume of the watershed area to be treated from this size storm event is required to be calculated using the Rational Method with a runoff coefficient of 1.

If sediment basins are used to capture flow-through or batch treatment, see SE-2, Sediment Basin, for design criteria. Bypass should be provided around the ATS to accommodate extreme storm events. Primary settling should be encouraged in the sediment basin/storage pond. A forebay with access for maintenance may be beneficial.

The permissible discharge rate governed by potential downstream effect should be used to calculate the recommended size of the treatment cells. Local requirements related to Phase I or Phase II NPDES permit thresholds should be considered in developing maximum discharge rates the ATS Plan.

Costs

Costs for ATS may be significant due to equipment rental requirements and cost of chemicals. ATS cost is lower on a treated unit-basis for large construction sites with large volumes of runoff.

Inspection and Maintenance

ATS must be operated and maintained by individuals with experience in their use and trained in accordance with training requirements below. ATS should be monitored continuously while in use. A designated responsible person shall be on site daily at all times during treatment operations. Daily on-site visual monitoring of the system for proper performance shall be conducted and recorded in the project data log. The name, phone number, and training documentation of the person responsible for system operation and monitoring shall be included in the project data log.

The following monitoring requirements and results should be recorded in the data log:

Operational and Compliance Monitoring

- Effluent flow rate and volume shall be continuously monitored and recorded at 15- minute or less intervals.
- Influent and effluent pH must be continuously monitored and recorded at 15-minute or less intervals.
- Influent and effluent turbidity (expressed in NTU) must be continuously monitored and recorded at 15-minute or less intervals.
- The type and amount of chemical used for pH adjustment, if any, shall be monitored and recorded.
- Dose rate of chemical used in the ATS system (expressed in mg/L) shall be monitored and reported 15-minutes after startup and every 8 hours of operation.
- Laboratory duplicates – monthly laboratory duplicates for residual coagulant analysis must be performed and records shall be maintained onsite.
- Effluent shall be monitored and recorded for residual chemical/additive levels.
- If a residual chemical/additive test does not exist and the ATS is operating in a batch treatment mode of operation refer to the toxicity monitoring requirements below.

Toxicity Monitoring

<u>Batch Treatment</u>

Toxicity testing for systems operated in batch treatment mode should be made in accordance with the following:

- Acute toxicity testing on effluent samples representing effluent from each batch prior to discharge shall be undertaken. All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.
- Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in "Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012" for Fathead minnow, *Pimephales promelas*. Rainbow trout, *Oncorhynchus mykiss*, may be used as a substitute for fathead minnow.

All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.

Flow-through Treatment

Toxicity testing for systems operated in flow-through treatment mode should be made in accordance with the following:

- A residual chemical test method shall be used that has a method detection limit (MDL) of 10% or less than the maximum allowable threshold concentration (MATC) for the specific coagulant in use and for the most sensitive species of the chemical used. The MATC is equal to the geometric mean of the No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant.
- The residual chemical test method shall produce a result within one hour of sampling.
- A California State certified laboratory shall validate the selected residual chemical test. Specifically the lab will review the test protocol, test parameters, and the detection limit of the coagulant. The discharger shall electronically submit this documentation as part of the ATS Plan.

Numeric Effluent Limit (NEL) Compliance:

All chemically treated stormwater must be sampled and tested for compliance with pH and turbidity limits. These limits have been established by the Construction General Permit. Sampling and testing for other pollutants may also be necessary at some sites. Turbidity limits have been set as 10 NTU as a daily flow-weighted average or 20 NTU from a single sample. pH must be within the range of 6.0 to 9.0 standard units. It is often possible to discharge treated stormwater that has a lower turbidity than the receiving water and that matches the pH.

Treated stormwater samples and measurements should be taken from the discharge pipe or another location representative of the nature of the treated stormwater discharge. Samples used for determining compliance with the water quality standards in the receiving water should not be taken from the treatment pond prior to decanting. Compliance with the water quality standards is determined in the receiving water.

Operator Training:

Operators shall have training specific to using an ATS and liquid coagulants for stormwater discharges in California. The training shall be in the form of a formal class with a certificate and requirements for testing and certificate renewal. Training shall include a minimum of eight hours classroom and 32 hours field training.

Standard BMPs:

Erosion and sediment control BMPs should be implemented throughout the site to prevent erosion and discharge of sediment to the ATS. Some types of chemical coagulation and flocculation are only achievable in water below a certain turbidity; therefore minimizing the amount of sediment reaching the system will increase the likelihood of meeting effluent limits and will potentially lower costs of chemical dosing.

Sediment Removal and Disposal

- Sediment shall be removed from the storage or treatment cells as necessary to ensure that the cells maintain their required water storage (i.e., volume) capability.
- Handling and disposal of all solids generated during ATS operations shall be done in accordance with all local, state, and federal laws and regulations.
- If sediment is determined to be non-toxic, it may be incorporated into the site away from drainages.

References

Engineering and Design – Precipitation/Coagulation/Flocculation. United States Army Corps of Engineers, EM 1110-1-4012, 2001.

Evaluation of Active Treatment Systems (ATS) for Construction Site Runoff. California Building and Industry Association (prepared by Geosyntec Consultants), 2008.

Stormwater Management Manual for Western Washington, Volume II – Construction Stormwater Pollution Prevention, Washington State Department of Ecology, August 2001.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

Description and Purpose

Temporary silt dikes are pre-manufactured devices that are typically specified and installed for semi-permanent drainage and sediment control on the perimeter of disturbed sites or stockpiles and as check dams within channels.

Suitable Applications

Temporary silt dikes are generally used in areas as a substitute for fiber rolls and silt fences to slow down runoff water, divert drainage or contain fines and sediment. A temporary silt dike typically consists of a triangular foam or recycled rubber core covered in geotextile fabric. Temporary silt dikes are a linear control and have a variety of profiles (triangular, round, and square). Temporary silt dikes may be suitable for:

- On paved surfaces for perimeter protection.
- As check structures in channels.
- Along the perimeter of disturbed sites in lieu of silt fence.
- At operational storm drains as a form of inlet protection.
- Around temporary stockpiles or material/equipment storage areas.
- At the interface between graveled driveways and pavement.
- Along the toe of exposed and erodible slopes.

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Limitations

- Temporary silt dikes require additional measures to adhere to asphalt in cold and windy climates, as glue may not adhere adequately to the pavement.
- Temporary silt dikes may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the barrier, possibly causing flooding or bypass if sufficient space does not exist to accommodate ponding.
- Temporary silt dikes may require frequent maintenance especially when used near vehicle traffic or to detain concentrated flows (e.g. check dams or inlet protection).
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

When appropriately placed, temporary silt dikes intercept and slow sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. The core is porous, which allows the ponded runoff to flow slowly through the silt dike, releasing the runoff as sheet flows. Generally, temporary silt dikes should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control or as a non-stormwater perimeter control.

Design and Layout

- Temporary silt dikes used on soil should be attached to the ground per manufacturer specifications.
- Temporary silt dikes used on asphalt or concrete may be attached using a variety of methods, including nailing the dikes to the pavement, or using a high strength adhesive.
- Follow manufacturer specifications when installing temporary silt dikes.
- Allow sufficient space up slope from the silt dikes to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, temporary silt dike should be set back three feet from the slope toe to facilitate cleaning. Where site conditions do not allow set back, the silt dike may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- Butt ends of temporary silt dike tightly. Overlaps should be sealed in accordance with the manufacturer's detail.

Materials

- Several manufactured products are available.

Costs

- Silt dike averages $35-45 per 7 ft. section.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Temporary silt dike exposed to sunlight will need to be replaced more frequently due to photo-degradation.
- Reshape or replace sections of damaged temporary silt dike as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove temporary silt dikes when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of properly.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Compost Socks and Berms SE-13

Description and Purpose

Compost socks and berms act as three-dimensional biodegradable filtering structures to intercept runoff where sheet flow occurs and are generally placed at the site perimeter or at intervals on sloped areas. Compost socks are generally a mesh sock containing compost and a compost berm is a dike of compost, trapezoidal in cross section. When employed to intercept sheet flow, both BMPs are placed perpendicular to the flow of runoff, allowing filtered runoff to pass through the compost and retaining sediment (and potentially other pollutants). A compost sock can be assembled on site by filling a mesh sock (e.g. with a pneumatic blower). The compost berm should be constructed using a backhoe or equivalent and/or a pneumatic delivery (blower) system and should be properly compacted. Compost socks and berms act as filters, reduce runoff velocities, and in some cases, aid in establishing vegetation.

Compost is organic, biodegradable, and renewable. Compost provides soil structure that allows water to infiltrate the compost medium which helps prevent rill erosion and the retained moisture promotes seed germination and vegetation growth, in addition to providing organic matter and nutrients important for fostering vegetation. Compost improves soil quality and productivity, as well as erosion and sediment control. The compost of the compost sock or berm can be selected that targets site specific objectives in capturing sediment and other pollutants, supporting vegetation, or additional erosion control.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☒
Bacteria	☒
Oil and Grease	☒
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

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Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste. Many types of compost are products of municipal recycle or "Greenwaste" programs. Compost is organic and biodegradable and can be left onsite. There are many types of compost with a variety of properties with specific functions, and accordingly compost selection is an important design consideration in the application of this type of erosion and sediment control.

Suitable Applications

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow (compost berms should only be used at the top of slopes or on slopes 4:1 (H:V) or flatter, all other slope applications should use compost socks)
- Along the perimeter of a project
- As check dams in unlined ditches (compost socks only)
- Down-slope of exposed soil areas
- At operational storm drains as a form of inlet protection (compost socks only)
- Around temporary stockpiles

Compost socks and berms do not require special trenching or BMP removal compared to other sediment control methods (e.g. silt fence or fiber rolls). Compost socks and berms can remain in place after earth disturbing activities are completed or the compost components can be spread over the site providing nutrients for plant growth and augmenting soil structure. BMPs that remain in place are particularly advantageous below embankments, especially adjacent streams, by limiting re-entry and the disturbance to sensitive areas.

Compost can be pre-seeded prior to application (recommended by the EPA for construction site stormwater runoff control and required for compost socks) or seeded after installation (for compost berms only). The compost medium can also remove pollutants in stormwater including heavy metals; oil and grease; and hydrocarbons.

Limitations

- Compost can potentially leach nutrients (dissolved phosphorus and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies (Adams et. al, 2008).
- Compost may also contain other undesirable constituents that are detrimental to water quality. Compost should be obtained from a supplier certified by the California Integrated Waste Management Board or compost should otherwise meet the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7. Carefully consider the qualifications and experience of any compost producer/supplier.
- Application by hand is more time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of assembly.
- Compost socks and berms should not be employed at the base of slopes greater than 2:1 (H:V). They can be employed with other erosion control methods for steeper slopes.

- Difficult to move once saturated.
- Compost berms should not be applied in areas of concentrated flows.
- Compost socks and berms are easy to fix; however, they are susceptible to damage by frequent traffic. Compost socks can be used around heavy machinery, but regular disturbance decreases sock performance.

Implementation

Compost Materials

- California Compost Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3) define and require a quality of compost for application. Compost should comply with all physical and chemical requirements. Specific requirements are provided in Table 1, taken from Caltrans Standard Special Provision 10-1 (SSP 10-1), Erosion Control (Compost Blanket).
- The compost producer should be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility should certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.
- The compost producer should be a participant in United States Composting Council's Seal of Testing Assurance program.
- Compost medium parameter specifications for compost socks and berms have been developed to assist in compost selection, such as those provided by the American Association of State Highway Transportation Officials (AASHTO).
- Particle size is important parameter for selecting compost. Well consolidated coarser grades of compost (e.g. small and large pieces) perform better for filtration objectives, while finer grades better support vegetation. Particle size of the compost should be selected based on site conditions, such as expected precipitation, and filtration goals and / or long term plant nutrients.
- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air.
- If vegetation establishment is a desired function of the compost, a compost sample should be inspected by a qualified individual. Vegetation has different nutrient and moisture needs.
- Organic content of the compost is also important and should range from 30 to 65% depending on site conditions.

- Compost should not be derived from mixed municipal solid waste and should be reasonably free of visible contaminates.
- Compost should not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Metal concentrations in compost should not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.
- Compost should not possess objectionable odors.
- Compost should be weed free.

Table 1. Physical/Chemical Requirements of Compost
Reference - Caltrans SSP-10 Erosion Control Blanket (Compost)

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Installation

- Prior to application, prepare locations for socks and berms by removing brush and thick vegetation. The compost of the sock and/or berm should be allowed to come in full contact with the ground surface.

- Select method to apply the compost sock or berm. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations.

- The compost of the berm should be distributed evenly to the surface, compacted, and shaped trapezoidal in cross section. Berm design is generally consists of a base two times the height. AASHTO specification MP 9-03 provides compost berm dimensions based on anticipated site precipitation (AASHTO, 2003 and USEPA, 2009). State agencies, such as Oregon

Department of Environmental Quality (ODEQ) have developed berm dimension based on slope steepness and length (ODEQ, 2004).

- Compost socks can be assembled on site by filling mesh socks with the selected compost. Mesh socks can be tied at one end, filled, and then tied at the other end. The ends of socks can be interlocked until the desired length is achieved. The sock diameter is a function of slope steepness and length. Again, ASSHTO provides specifications for various parameters. Compost socks range from 8" to 18", but are typically 12" to 18" in diameter.

- Compost socks are typically placed in contours perpendicular to sheet flow. They can also be placed in V formation on a slope. Compost socks need to be anchored, typically stakes, through the center of the sock. To prevent water flowing around them, the ends of compost socks should be placed upslope.

- Locate compost socks and berms on level contours spaced as follows:

  - Slope inclination of 4:1 (H:V) or flatter: Socks and/or berms should be placed at a maximum interval of 20 ft.

  - Slope inclination between 4:1 and 2:1 (H:V): Socks should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).

  - Slope inclination 2:1 (H:V) or greater: Socks should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).

- Place perimeter socks and berms using a j-hook installation. Use of vegetation will also provide additional anchoring.

- Compost socks and berms can be placed around the perimeter of an affected area, like a silt fence, if the area is flat or on a contour. Do not place these socks and berms where ponded water could become an issue.

- If used at the toe of slopes, the compost sock or berm should at a minimum of 5 to 10 feet away.

- Use additional anchoring and erosion control BMPS in conjunction of the compost socks and berms as needed.

- Consider using compost berms or socks as necessary at the top and/or bottom of the slope for additional erosion control performance.

- Compost socks and berms can also be effective over rocky and frozen ground if installed properly.

- It is recommended that the drainage areas of these compost BMPs do not exceed 0.25 acre per 100 feet placement interval and runoff does not exceed 1 cubic foot per second.

Costs

Recently obtained vendor costs indicated $3.50 per linear foot for compost berm application and $2.00 per linear foot for 8" socks and $2.50 per linear foot for 12"socks. Costs do not include final compost sock or berm functions at the end of construction activities, including spreading or removal, if required. ODEQ estimates that compost berms cost 30 percent less than silt fences to install.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Once damage is identified, mend or reapply the sock or berm as needed. Washed out areas should be replaced. If the sock or berm height is breached during a storm, an additional sock can be stacked to increase the sock height and similarly the berm dimensions can be increased, as applicable. An additional sock or berm may be installed upslope, as needed. It may be necessary to apply an additional type of stormwater BMP, such as a compost blanket.

- Sediment contained by the sock or berm should be removed prior reaching 1/3 of the exposed height of the BMP. The sediment can be stabilized with the compost sock or berm with vegetation at the end of construction activities.

- Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.

- Limit traffic to minimize damage to BMPs or impede vegetation establishment.

References

An analysis of Composting as an Environmental Remediation Technology, U.S. Environmental Protection Agency (USEPA), Solid Waste and Emergency Response (5305W), EPA530-R-8-008, 1998.

Characteristics of Compost: Moisture Holding and Water Quality Improvement, Center for Research in Water Resources, Kirchoff, C., Malina, J., and Barrett, M., 2003.

Compost Utilization for Erosion Control, The University of Georgia College of Agricultural and Environmental Sciences, pubs.caes.uga.edu/caespubs/pubcd/B1200.htm, Faucette, B. and Risse, M., 2001.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Standard Special Provision 10-1, Erosion Control (Compost Blanket), State of California Department of Transportation (Caltrans). 2007 Update.

Evaluation of Environmental Benefits and Impacts of Compost and Industry Standard Erosion and Sediment Controls Measures Used in Construction Activities, Dissertation, Institute of Ecology, University of Georgia, Faucette, B., 2004.

National Pollutant Discharge Elimination System (NPDES), Compost Blankets, U.S. Environmental Protection Agency (USEPA). http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=118, 2009.

Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Designation MP-9, Compost for Erosion/Sediment Control (Filter Berms), Provisional, American Association of State Highway Transportation Officials (AASHTO), 2003.

Stormwater Best Management Practices (BMPs) Field Trials of Erosion Control Compost in Reclamation of Rock Quarry Operations, Nonpoint Source Protection Program CWA §319(h), Texas Commission on Environmental Quality, Adams, T., McFarland, A., Hauck, L., Barrett, M., and Eck, B., 2008.

Biofilter Bags SE-14

Categories

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-4 Check Dams

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

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Description and Purpose

Biofilter bags, or bio-bags, are a multi-purpose sediment control BMP consisting of a plastic mesh bag filled with 100% recycled wood product waste. Biofilter bags come in a variety of sizes (30" X 18" and 30" X 9" being common) and generally have between 1-2 cubic yards of recycled wood waste (or wood chips). Biofilter bags work by detaining flow and allowing a slow rate of discharge through the wood media. This action removes suspended sediment through gravity settling of the detained water and filtration within the bag.

Suitable Applications

Biofilter bags are a short-term BMP that can be rapidly deployed, maintained, and replaced. Biofilter bags can be an effective short-term solution to place in developed rills to prevent further erosion until permanent measures can be established. Suitable short-term applications include:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - Below other small cleared areas
  - Along the perimeter of a site (with low-expected flow)
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas

  - Along streams and channels

- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
  - At the top of slopes to divert runoff away from disturbed slopes
  - As check dams across mildly sloped construction roads
- Inlet Protection (See SE-10)
- Supplement to silt fences or other sediment control devices

Limitations

- Short life-span (2-3 months); regular maintenance and replacement required to ensure effectiveness. Bags will rapidly fill with sediment and reduce permeability.
- Easily damaged by construction vehicles.
- If not properly staked, will fail on slope applications.
- If improperly installed can allow undercutting or side-cutting flow.
- Not effective where water velocities or volumes are high.
- Potentially buoyant and easily displaced if not properly installed.

Implementation

General

Biofilter bags are a relatively low cost temporary BMP that are easily deployed and have a simple installation that can be performed by hand. Without proper installation, however, biofilter bags can fail due to their light weight, potential displacement, and multiple joint locations. One of the benefits of utilizing biofilter bags is that the media (wood-product) can be recycled or used onsite when no longer needed (where acceptable).

Design and Layout – Linear control

- Locate biofilter bags on level contours.
  - Slopes between 20:1 and 4:1 (H:V): Biofilter bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slopes between 4:1 and 2:1 (H:V): Biofilter bags should be placed at a maximum interval of 15 ft, with the first row near the slope toe.
  - Slopes 2:1 (H:V) or steeper: Biofilter bags should be placed at a maximum interval of 10 ft., with the first row placed the slope toe.

- Turn the ends of the biofilter bag barriers up slope to prevent runoff from going around the berm.

- Allow sufficient space up slope from the biofilter bag berm to allow ponding, and to provide room for sediment storage.

- Stake biofilter bags into a 1 to 2 in. deep trench with a width equal to the bag.

  - Drive one stake at each end of the bag.

  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.

- Biofilter bags should be overlapped (6 in.), not abutted.

Costs

Pre-filled biofilter bags cost approximately $2.50-$3.50 per bag, dependent upon size.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Biofilter bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace biofilter bags as needed.

- Repair washouts or other damage as needed.

- Sediment that is retained by the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Remove biofilter bag berms when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Biofilter media may be used on-site, if allowed.

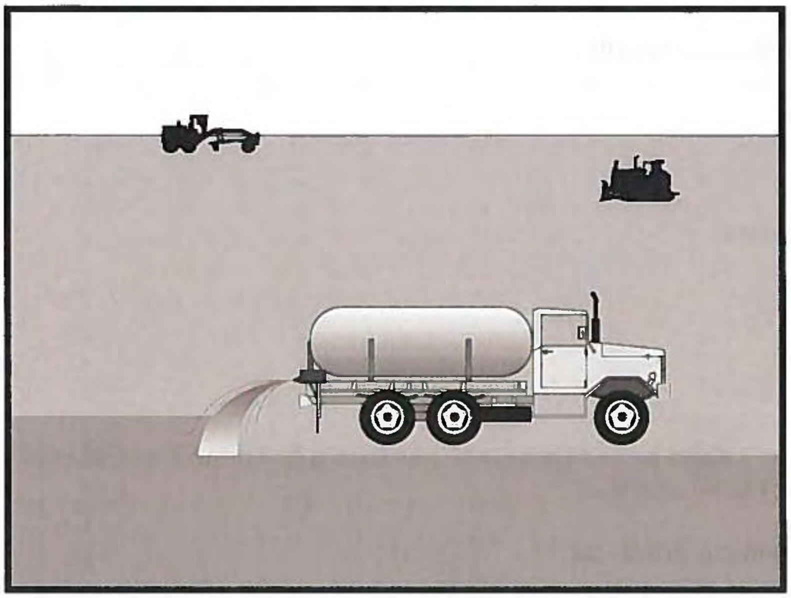
References

Catalog of Stormwater Best Management Practices for Idaho Cities and Counties. Volume 2, Section 7, BMP 34 – Biofilter Bags, Idaho Department of Environmental Quality, 2005.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Wind Erosion Control WE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

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- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montimorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	x	x	x	x	x			x
Disturbed Areas Subject to Traffic			x	x	x	x		x
Material Stockpiles		x	x	x			x	x
Demolition			x			x	x	
Clearing/ Excavation			x	x				x
Truck Traffic on Unpaved Roads			x	x	x	x	x	
Tracking					x	x		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

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APPENDIX H:

RWQCB NPDES PERMIT NO. CA0030210 AND CEASE AND DESIST ORDER NO. R2-2014-0011

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CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

San Francisco Bay Regional Water Quality Control Board

ORDER No. R2-2014-0010
NPDES No. CA0030210

The following discharger is subject to waste discharge requirements (WDRs) set forth in this Order:

Table 1. Discharger Information

Discharger	Lehigh Southwest Cement Company and Hanson Permanente Cement, Inc.
Facility Name	Permanente Plant
Facility Address	24001 Stevens Creek Blvd. Cupertino, CA, 95014 Santa Clara County
CIWQS Place Number	273205

Table 2. Discharge Locations

Discharge Point	Effluent Description	Discharge Point Latitude (North)	Discharge Point Longitude (West)	Receiving Water
001	Treated quarry dewatering water, Primary Crusher wash water, Cement Plant Reclaim Water System wastewater, Rock Plant aggregate wash water, Truck Wash water, non-stormwater, and stormwater, discharged from Pond 4A	37.31713°	-122.11165°	Permanente Creek
002	Settled stormwater, including stormwater from Crusher Slope Drainage Area east of Pond 13B, discharged from Pond 13B	37.31674°	-122.10167°	Permanente Creek
003	Stormwater from roads and hillsides, pumped from Dinky Shed Basin and discharged from Pond 9	37.31339°	-122.09058°	Permanente Creek
004	Settled stormwater discharged from Pond 17	37.31431°	-122.08893°	Permanente Creek
005	Settled stormwater from Aluminum Plant, entry road, and nearby hillside, discharged from Pond 20	37.31899°	-122.087159°	Permanente Creek
006	Settled stormwater from East Materials Storage Area, discharged from Pond 30	37.32241°	-122.08551°	Permanente Creek

Table 3. Administrative Information

This Order was adopted on:	March 12, 2014
This Order shall become effective on:	May 1, 2014
This Order shall expire on:	April 30, 2019
The Discharger shall file a Report of Waste Discharge as an application for reissuance of WDRs in accordance with California Code of Regulations, title 23, and an application for reissuance of a National Pollutant Discharge Elimination System (NPDES) permit no later than:	August 1, 2018
The U.S. Environmental Protection Agency (U.S. EPA) and the California Regional Water Quality Control Board, San Francisco Bay Region, have classified this discharge as follows:	Major

I, Bruce H. Wolfe, Executive Officer, do hereby certify that this Order with all attachments is a full, true, and correct copy of the Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on the date indicated above.

____

Bruce H. Wolfe, Executive Officer

Contents

I. Facility Information 4
II. Findings 4
III. Discharge Prohibitions 5
IV. Effluent Limitations and Discharge Specifications 5
  A. Discharge Point No. 001 5
  B. Discharge Point Nos. 002 through 005 6
  C. Discharge Point No. 006 6
  D. Whole Effluent Toxicity (Discharge Point No. 001) 7
V. Receiving Water Limitations 7
VI. Provisions 8
  A. Standard Provisions 8
  B. Monitoring and Reporting 9
  C. Special Provisions 9
    1. Reopener Provisions 9
    2. Effluent Characterization Study and Report 9
    3. Ambient Background Study and Report 10
    4. Pollutant Minimization Program 11
    5. Facility Reliability Assurance Plan and Status Report 12
    6. Stormwater Best Management Practices 12

Tables

Table 1. Discharger Information 1
Table 2. Discharge Locations 1
Table 3. Administrative Information 2
Table 4. Effluent Limitations – Discharge Point No. 001 5
Table 5. Effluent Limitations – Discharge Point Nos. 002 through 005 6
Table 6. Effluent Limitations – Discharge Point No. 006 6
Table 7. Stormwater Action Levels 14

Attachments

Attachment A – Definitions A-1
Attachment B – Facility Map B-1
Attachment C – Process Flow Diagram C-1
Attachment D – Federal Standard Provisions D-1
Attachment E – Monitoring and Reporting Program (MRP) E-1
Attachment F – Fact Sheet F-1
Attachment G – Regional Standard Provisions and Monitoring and Reporting Requirements G-1
Attachment H – Pretreatment Requirements H-1

I. FACILITY INFORMATION

Information describing the Lehigh Southwest Cement Company's (Discharger) Permanente Plant (Facility) is summarized in Table 1 and in Fact Sheet (Attachment F) sections I and II.

II. FINDINGS

The California Regional Water Quality Control Board, San Francisco Bay Region (Regional Water Board), finds the following:

A. Legal Authorities. This Order serves as WDRs pursuant to California Water Code article 4, chapter 4, division 7 (commencing with § 13260). This Order is also issued pursuant to federal Clean Water Act (CWA) section 402 and implementing regulations adopted by U.S. EPA, and Water Code chapter 5.5, division 7 (commencing with § 13370). It shall serve as an NPDES permit for point source discharges from this facility to surface waters.

B. Background and Rationale for Requirements. The Regional Water Board developed the requirements in this Order based on information the Discharger submitted as part of its application, information obtained through monitoring and reporting programs, and other available information. The Fact Sheet (Attachment F) contains background information and rationale for the requirements in this Order, and is hereby incorporated into and constitutes findings for this Order. Attachments A through E, and G are also incorporated into this Order.

C. Provisions and Requirements Implementing State Law. No provisions and requirements in this Order are included to implement State law only.

D. Notification of Interested Parties. The Regional Water Board notified the Discharger and interested agencies and persons of its intent to prescribe these WDRs and provided an opportunity to submit written comments and recommendations. The Fact Sheet provides details regarding the notification.

E. Consideration of Public Comment. The Regional Water Board, in a public meeting, heard and considered all comments pertaining to the discharge. The Fact Sheet provides details regarding the public hearing.

THEREFORE, IT IS HEREBY ORDERED that in order to meet the provisions of California Water Code division 7 (commencing with § 13000) and regulations adopted thereunder, and the provisions of the CWA and regulations and guidelines adopted thereunder, the Discharger shall comply with the requirements in this Order. Except for enforcement purposes, this Order rescinds the Discharger's coverage under Order No. R2-2008-0011 (*General Waste Discharge Requirements for Discharges of Process Wastewaters from Aggregate Mining, Sand Washing, and Sand Offloading Facilities to Surface Waters*, NPDES Permit No. CAG982001) and State Water Board Order No. 97-03-DWQ (*Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities,* NPDES Permit No. CAS000001) as of the effective date of this Order. The requirements of this Order shall supersede the requirements prescribed in those general permits as they apply to this Discharger as of the effective date of this Order.

III. DISCHARGE PROHIBITIONS

A. Discharge of treated or untreated wastewater at a location or in a manner different from that described in this Order for the final treatment and controls configuration shown in Attachment C, Schematic C-3, is prohibited.

B. Discharge greater than 167,000 gallons per hour (gph), as determined on an hourly basis, from Discharge Point No. 001 is prohibited.

C. Discharge from Discharge Point Nos. 002 through 006 is prohibited except as a result of precipitation or to discharge retained stormwater.

D. Discharge of kiln exhaust cooling water is prohibited.

IV. EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

A. Discharge Point No. 001

The Discharger shall comply with the following effluent limitations at Discharge Point No. 001, with compliance measured at Monitoring Location EFF-001 and EFF-001A as described in the Monitoring and Reporting Program (MRP).

Table 4. Effluent Limitations – Discharge Point No. 001

Parameter [1]	Units	Effluent Limitations			
		Average Monthly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Total Suspended Solids (TSS)	lbs/d	---	58	---	---
Oil and Grease	mg/L	10	20	---	---
pH [2]	s.u.	---	---	6.5	8.5
Total Residual Chlorine	mg/L	---	---	---	0.0
Settleable Matter	mL/L-hr	0.10	0.20	---	---
Chromium (VI) [3]	µg/L	8.0	16	---	---
Mercury	µg/L	0.020	0.041	---	---
Nickel [3]	µg/L	82	160	---	---
Selenium	µg/L	4.1	8.2	---	---
Thallium [3]	µg/L	1.7	3.4	---	---
Total Dissolved Solids (TDS)	mg/L	1,000	2,000	---	---
Turbidity	NTU	5.0	10	---	---

Unit Abbreviations:

ºC = degrees Celsius
µg/L = micrograms per liter
mg/L = milligrams per liter
mL/L-hr = milliliters per liter-hour
NTU = nephelometric turbidity units
s.u. = standard units
lbs/d = pounds per day

Footnotes:

[1] TSS is to be monitored at Monitoring Location EFF-001A.All other parameters are to be monitored at Monitoring Location EFF-001.

[2] If the Discharger monitors pH continuously, pursuant to 40 C.F.R. § 401.17 the Discharger shall be in compliance with this pH limitation provided that both of the following conditions are satisfied: (i) the total time during which the pH is outside the required range shall not exceed 7 hours and 26 minutes in any calendar month; and (ii) no individual excursion from the required pH range shall exceed 60 minutes.

[3] Compliance with the average monthly effluent limit shall be determined by the flow-weighted average effluent concentration, defined as the summed products of the pollutant concentration in each sample collected and analyzed in a calendar month multiplied by the volumetric flow rate at the time the sample was collected, divided by the sum of those flow rates. Non-detect results shall be treated as zero.

B. Discharge Point Nos. 002 through 005

The Discharger shall comply with the following effluent limitations at Discharge Point Nos. 002 through 005, with compliance measured at Monitoring Locations EFF-002 through EFF-005 as described in the MRP.

Table 5. Effluent Limitations – Discharge Point Nos. 002 through 005

Parameter	Units	Effluent Limitations			
		Average Monthly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Total Suspended Solids (TSS)	mg/L	---	50	---	---
Oil and Grease	mg/L	10	20	---	---
pH [1]	s.u.	---	---	6.5	8.5
Settleable Matter	mL/L-hr	0.10	0.20	---	---
Turbidity	NTU	---	40	---	---

Unit Abbreviations:

µg/L = micrograms per liter
mg/L = milligrams per liter
mL/L-hr = milliliters per liter-hour
NTU = nephelometric turbidity units
s.u. = standard units

Footnote:

[1] If the Discharger monitors pH continuously, pursuant to 40 C.F.R. § 401.17 the Discharger shall be in compliance with this pH limitation provided that both of the following conditions are satisfied: (i) the total time during which the pH is outside the required range shall not exceed 7 hours and 26 minutes in any calendar month; and (ii) no individual excursion from the required pH range shall exceed 60 minutes.

C. Discharge Point No. 006

The Discharger shall comply with the following effluent limitations at Discharge Point No. 006, with compliance measured at Monitoring Location EFF-006 as described in the MRP.

Table 6. Effluent Limitations – Discharge Point No. 006

Parameter	Units	Effluent Limitations			
		Average Monthly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
TSS	mg/L	---	50	---	---
pH[1]	s.u.	---	---	6.5	8.5
Settleable Matter	mL/L-hr	0.10	0.20	---	---

Unit Abbreviations:

mg/L = milligrams per liter
mL/L-hr = milliliters per liter-hour
s.u. = standard units

Footnote:

[1] If the Discharger monitors pH continuously, pursuant to 40 C.F.R. § 401.17 the Discharger shall be in compliance with this pH limitation provided that both of the following conditions are satisfied: (i) the total time during which the pH is outside the required range shall not exceed 7 hours and 26 minutes in any calendar month; and (ii) no individual excursion from the required pH range shall exceed 60 minutes.

D. Whole Effluent Toxicity (Discharge Point No. 001)

1. **Acute Toxicity.** Discharges at Discharge Point No. 001 shall comply with the following limitations, with compliance measured at Monitoring Location EFF-001 as described in the MRP:

   a. three-sample median value of not less than 90 percent survival; and

   b. single-sample value of not less than 70 percent survival.

   The three-sample median acute toxicity limitation is defined as follows: if one of the past two or fewer bioassays shows less than 90 percent survival, then survival of less than 90 percent in the next bioassay is a violation of this effluent limitation.

   Bioassays shall be performed using the most up-to-date U.S. EPA protocols and species as specified in MRP. If these protocols prove unworkable, the Executive Officer and the Environmental Laboratory Accreditation Program may grant exceptions in writing upon the Discharger's request with justification, provided that the revised protocols are equally protective.

   If the Discharger can demonstrate that toxicity exceeding the levels cited above is caused exclusively by ammonia and that the ammonia in the effluent would not cause toxicity in the receiving water when discharged (e.g., due to the pH of the receiving water), then such toxicity does not constitute a violation of this effluent limitation.

2. **Chronic Toxicity.** Discharges at Discharge Point No. 001, with compliance measured at Monitoring Location EFF-001 as described in the MRP, shall not contain chronic toxicity at a level that would cause or contribute to toxicity in the receiving water. Chronic toxicity is a detrimental biological effect on growth rate, reproduction, fertilization success, larval development, or any other relevant measure of the health of an organism population or community. Compliance with this limit shall be determined by analysis of indicator organisms and toxicity tests as described in the MRP.

V. RECEIVING WATER LIMITATIONS

A. The discharge shall not cause the following conditions to exist in receiving waters at any place:

1. Floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses;

2. Alteration of suspended sediment in such a manner as to cause nuisance or adversely affect beneficial uses, or detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life;

3. Suspended material in concentrations that cause nuisance or adversely affect beneficial uses;

4. Bottom deposits or aquatic growths to the extent that such deposits or growths cause nuisance or adversely affect beneficial uses;

5. Alteration of temperature beyond present natural background levels;

6. Changes in turbidity that cause nuisance or adversely affect beneficial uses, or increases from normal background light penetration or turbidity greater than 10 percent in areas where natural turbidity is greater than 50 nephelometric turbidity units;

7. Coloration that causes nuisance or adversely affects beneficial uses;

8. Visible, floating, suspended, or deposited oil or other products of petroleum origin; or

9. Toxic or other deleterious substances in concentrations or quantities that cause deleterious effects on wildlife, waterfowl, or other aquatic biota, or render any of these unfit for human consumption, either at levels created in the receiving waters or as a result of biological concentration.

B. The discharge shall not cause the following limits to be exceeded in receiving waters at any place within one foot of the water surface:

1.	Dissolved Oxygen	7.0 mg/L, minimum The median dissolved oxygen concentration for any three consecutive months shall not be less than 80% of the dissolved oxygen content at saturation. When natural factors cause concentrations less than that specified above, the discharge shall not cause further reduction in ambient dissolved oxygen concentrations.
2.	Dissolved Sulfide	Natural background levels
3.	pH	The pH shall not be depressed below 6.5 or raised above 8.5. The discharge shall not cause changes greater than 0.5 pH units in normal ambient pH levels.
4.	Nutrients	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

C. The discharge shall not cause a violation of any water quality standard for receiving waters adopted by the Regional Water Board or the State Water Resources Control Board (State Water Board) as required by the CWA and regulations adopted thereunder. If more stringent water quality standards are promulgated or approved pursuant to CWA section 303, or amendments thereto, the Regional Water Board may revise or modify this Order in accordance with the more stringent standards.

VI. PROVISIONS

A. Standard Provisions

1. The Discharger shall comply with all "Standard Provisions" in Attachment D.

2. The Discharger shall comply with all applicable provisions of the "Regional Standard Provisions, and Monitoring and Reporting Requirements for NPDES Wastewater Discharge Permits" in Attachment G.

B. Monitoring and Reporting

The Discharger shall comply with the MRP (Attachment E), and future revisions thereto, and applicable sampling and reporting requirements in Attachments D and G.

C. Special Provisions

1. Reopener Provisions

The Regional Water Board may modify or reopen this Order prior to its expiration date in any of the following circumstances as allowed by law:

a. If present or future investigations demonstrate that the discharges governed by this Order have or will have a reasonable potential to cause or contribute to, or will cease to have, adverse impacts on water quality or beneficial uses of the receiving waters.

b. If new or revised water quality objectives or total maximum daily loads (TMDLs) come into effect for San Francisco Bay and contiguous water bodies (whether statewide, regional, or site-specific). In such cases, effluent limitations in this Order may be modified as necessary to reflect the updated water quality objectives and wasteload allocations in the TMDLs. Adoption of the effluent limitations in this Order is not intended to restrict in any way future modifications based on legally adopted water quality objectives or TMDLs or as otherwise permitted under federal regulations governing NPDES permit modifications.

c. If translator, dilution, or other water quality studies provide a basis for determining that a permit condition should be modified.

d. If State Water Board precedential decisions, new policies, new laws, or new regulations are adopted.

e. If an administrative or judicial decision on a separate NPDES permit or waste discharge requirements addresses requirements similar to this discharge.

f. Or as otherwise authorized by law.

The Discharger may request a permit modification based on any of the circumstances above. With any such request, the Discharger shall include antidegradation and anti-backsliding analyses.

With the consent of the Discharger, the Executive Officer may make minor modifications to this Order for the purposes set forth in 40 C.F.R. section 122.63.

2. Effluent Characterization Study and Report

a. Study Elements. The Discharger shall continue to characterize and evaluate the discharges from the following discharge point to verify that the "no" or "cannot determine" reasonable potential analysis conclusions of this Order remain valid and to inform the next permit reissuance. The Discharger shall collect representative samples at the monitoring location set forth below, as defined in the MRP, at no less than the frequency specified below:

Discharge Point	Monitoring Location	Minimum Frequency
001	EFF-001	Once per calendar year

The samples shall be analyzed for the priority pollutants listed in Attachment G, Table C, except for those priority pollutants with effluent limitations where the MRP already requires monitoring. Compliance with this requirement shall be achieved in accordance with the specifications of Attachment G, sections III.A.1 and III.A.2.

The Discharger shall evaluate on an annual basis if concentrations of any of these priority pollutants significantly increase over past performance. The Discharger shall investigate the cause of any such increase. The investigation may include, but need not be limited to, an increase in monitoring frequency, monitoring of process streams, and monitoring of influent sources. The Discharger shall establish remedial measures addressing any increase resulting in reasonable potential to cause or contribute to an excursion above applicable water quality criteria. This requirement may be satisfied by including the constituent in the Discharger's Pollutant Minimization Program, described in Provision VI.C.4.

b. Reporting Requirements

i. Routine Reporting. The Discharger shall, within 30 days of receipt of analytical results, report the following in the transmittal letter for the appropriate self-monitoring report:

(a) Indication that a sample for this characterization study was collected; and

(b) Identity of priority pollutants detected at or above applicable water quality criteria (see Fact Sheet Table F-6 for the criteria), and the detected concentrations of those pollutants.

ii. Annual Reporting. The Discharger shall summarize the annual data evaluation and source investigation in the annual self-monitoring report; if samples are only taken once per year, one report can be submitted to satisfy the Routine Reporting described in (i) above and the Annual Reporting requirement herein.

iii. Final Report. The Discharger shall submit a final report that presents all these data with the application for permit reissuance.

3. Ambient Background Study and Report

a. Study Elements. The Discharger shall collect representative ambient background samples at Monitoring Location RSW-001A, as defined in the MRP, at least twice each year (once during the wet season between October 1 and April 30 and once during the dry season from May 1 to September 30). The samples shall be analyzed for the priority pollutants listed in Attachment G, Table C, plus pH, salinity, hardness, temperature, turbidity, and total dissolved solids (TDS). Compliance with this requirement shall be achieved in accordance with the specifications of Attachment G, sections III.A.1 and 2.

b. Reporting Requirements

i. Routine Reporting. The Discharger shall, within 30 days of receipt of analytical results, report the following in the transmittal letter for the appropriate self-monitoring report:

(a) Indication that a sample for this study was collected; and

(b) Monitoring results for the pollutants evaluated.

ii. Annual Reporting. The Discharger shall summarize the data in the annual self-monitoring report.

iii. Final Report. The Discharger shall submit a final report that presents all these data with the application for permit reissuance.

4. Pollutant Minimization Program

a. The Discharger shall develop and conduct a Pollutant Minimization Program as further described below when there is evidence (e.g., sample results reported as detected but not quantified [DNQ] when the effluent limitation is less than the method detection limit [MDL], sample results from analytical methods more sensitive than those methods required by this Order in accordance with SIP sections 2.4.2 or 2.4.3 above, presence of whole effluent toxicity, health advisories for fish consumption, or results of benthic or aquatic organism tissue sampling) that the priority pollutant is present in the effluent above an effluent limitation and either:

i. A sample result is reported as DNQ and the effluent limitation is less than the Reporting Level (RL); or

ii. A sample result is reported as not detected (ND) and the effluent limitation is less than the MDL, using definitions in Attachment A and reporting protocols described in the MRP.

b. If triggered by the reasons set forth in Provision VI.C.4.a, above, the Discharger's Pollutant Minimization Program shall include, but not be limited to, the following actions and submittals:

i. Annual review and semi-annual monitoring of potential sources of the reportable priority pollutants, which may include fish tissue monitoring and other bio-uptake sampling, or alternative measures when source monitoring is unlikely to produce useful analytical data;

ii. Quarterly monitoring for the reportable priority pollutants in the influent to the wastewater treatment system. The Executive Officer may approve commensurate alternative measures when influent monitoring is unlikely to produce useful analytical data;

iii. Submittal of a control strategy designed to proceed toward the goal of maintaining concentrations of the reportable priority pollutants in the effluent at or below the effluent limitation;

iv. Implementation of appropriate cost-effective control measures for the reportable priority pollutants, consistent with the control strategy; and

v. Inclusion of the following specific items within the annual report required by Provision VI.C.2.b above:

(a) All Pollutant Minimization Program monitoring results for the previous year;
(b) List of potential sources of the reportable priority pollutants;
(c) Summary of all actions undertaken pursuant to the control strategy; and
(d) Description of actions to be taken in the following year.

5. Facility Reliability Assurance Plan and Status Report

a. The Discharger shall submit a Facility Reliability Assurance Plan no later than May 16, 2014, that is acceptable to the Executive Officer and that describes measures in place (e.g., treatment and storage capacities, especially during high wet weather flows; critical system redundancies and spare parts; warning alarms; etc.) to ensure the reliability of the Discharger's system in preventing inadequately treated wastewater from being discharged and in preventing catastrophic failures at the ponds. The Facility Reliability Assurance Plan shall cover the interim and final treatment systems. Inadequately treated wastewater includes wastewater that bypasses any portion of treatment. The Facility Reliability Assurance Plan shall be maintained in usable condition and be available for reference and use by all relevant personnel.

b. The Discharger shall regularly review, revise, and update, as necessary, the Facility Reliability Assurance Plan to ensure that the document remains useful and relevant to current equipment and operational practices (e.g., it shall be updated any time significant changes are made to the treatment system, such as installation of the interim and final treatment systems). The Discharger shall conduct reviews annually and complete revisions or updates as necessary. For any significant changes in treatment equipment or operational practices, the Discharger shall complete relevant revisions as soon as practicable.

c. The Discharger shall submit a report describing the current status of its Facility Reliability Assurance Plan, including any recommended or planned actions and an estimated time schedule for these actions, with the annual SMR each year.

6. Stormwater Best Management Practices

The Discharger shall manage discharges through Discharge Point Nos. 002 through 006, according to the following minimum requirements, which supersede those of Attachment G, sections I.J.1 through I.J.4.

a. Stormwater Pollution Prevention Plan and Annual Report

i. The Discharger shall continue to implement its Stormwater Pollution Prevention Plan (SWPPP) for the Facility until it submits an updated SWPPP as required by Provision VI.C.6.a.ii, below.

ii. The Discharger shall submit and implement an updated SWPPP to the Executive Officer by May 16, 2014, and annually thereafter with the annual SMR due

February 1 each year. The Discharger shall also implement any changes to the SWPPP the Executive Officer deems necessary. The updated SWPPP shall contain information and describe measures consistent with the requirements in *Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities,* NPDES General Permit No. CAS000001 (State Water Board Order No. 97-03-DWQ), Section A, Storm Water Pollution Prevention Plan Requirements. If the Discharger determines that an update is not needed, it shall submit a letter to such effect with the annual SMR.

iii. The Discharger shall submit an Annual Stormwater Report by July 1 of each year providing data for the previous wet weather season. The Annual Stormwater Report shall, at a minimum, include the following:

(1) tabulated summary of all sampling results and a summary of visual observations taken during inspections;

(2) comprehensive discussion of the compliance record and any corrective actions taken or planned to ensure compliance with this Order; and

(3) comprehensive discussion of source identification and control programs for constituents that do not have effluent limitations (e.g., those in Table 7, below).

b. Best Management Practices Plan

i. The Discharger shall maintain a Best Management Practices (BMP) Plan in usable condition and available for reference and use by all appropriate personnel. The BMP Plan shall be developed and implemented to minimize the potential impact of periodic discharges on Permanente Creek, to prevent the accidental release of toxic or hazardous substances into the environment, and to minimize and mitigate the effects of any such releases using equipment and techniques available and practical for such use. The BMP Plan shall be consistent with U.S. EPA's *Guidance Manual for Developing Best Management Practices (BMP)* (October 1993, EPA 833-B-93-004) and shall, at minimum, include BMPs described in NPDES General Permit No. CAS000001 (State Water Board Order No. 97-03-DWQ), Section A, Storm Water Pollution Prevention Plan Requirements.

ii. The Discharger shall regularly review, and revise or update as necessary, the BMP Plan to ensure that it remains useful and relevant to current equipment and operations. At a minimum, the Discharger shall conduct reviews annually and complete revisions or updates as soon thereafter as possible. Appropriate revisions shall be completed within 90 days of any significant changes in Facility equipment or operations.

iii. The Discharger shall submit a report describing the current status of its BMP Plan, including any recommended or planned actions and an estimated schedule for completing these actions, upon Executive Officer request. The Discharger shall include a description or summary of its review and evaluation procedures and any changes to its BMP Plan in each annual SMR.

c. Additional Stormwater Provisions

i. Upon an initial detection of a pollutant at Discharge Point Nos. 002 through 006 in excess of the action levels in Table 7, below, the Discharger shall review the selection, design, installation, and implementation of its BMPs to identify necessary modifications. The Discharger shall complete such modifications before the next storm, if possible, or as soon as practical. Within 45 days of becoming aware of results that exceed these action levels, the Discharger shall report to the Executive Officer the exceedances, the results of its review of its BMPs, and additional BMPs to be implemented.

Table 7. Stormwater Action Levels

Parameter	Unit	Action Level
Conductivity	µmho/cm	200
Chromium (VI)	µg/L	16
Mercury	µg/L	2.4
Nickel	µg/L	1,020
Selenium	µg/L	5.0
Thallium	µg/L	1.7
Visible Oil	---	Presence
Visible Color	---	Presence

Unit Abbreviations:

µmho/cm = micromhos per centimeter
µg/L = micrograms per liter

ii. If after modifying its BMP Plan the Discharger continues to detect a pollutant in excess of the action levels above, the Discharger shall again review its control measures and perform either of the following tasks:

(1) Further modify and report as in Provision VI.C.6.c.i, above, or

(2) Determine that no further pollutant reductions are technologically available and economically practicable in light of best industry practice, document the rationale for concluding that no further pollutant reductions are achievable, and retain all records related to this documentation with its SWPPP. The Discharger shall also report these findings to the Executive Officer within 45 days of detecting the pollutant; written concurrence from the Executive Officer is required before the Discharger is authorized to stop improving its BMPs.

ATTACHMENT A – DEFINITIONS

Arithmetic Mean (μ)
Also called the average, the sum of measured values divided by the number of samples. For ambient water concentrations, the arithmetic mean is calculated as follows:

Arithmetic mean = $\mu = \Sigma x / n$ where: Σx is the sum of the measured ambient water concentrations, and n is the number of samples.

Average Monthly Effluent Limitation (AMEL)
The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Effluent Limitation (AWEL)
The highest allowable average of daily discharges over a calendar week (Sunday through Saturday), calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Bioaccumulative
Taken up by an organism from its surrounding medium through gill membranes, epithelial tissue, or from food and subsequently concentrated and retained in the body of the organism.

Carcinogenic
Known to cause cancer in living organisms.

Coefficient of Variation
Measure of data variability calculated as the estimated standard deviation divided by the arithmetic mean of the observed values.

Daily Discharge
Either: (1) the total mass of the constituent discharged over the calendar day (12:00 am through 11:59 pm) or any 24-hour period that reasonably represents a calendar day for purposes of sampling (as specified in the permit) for a constituent with limitations expressed in units of mass; or (2) the unweighted arithmetic mean measurement of the constituent over the day for a constituent with limitations expressed in other units of measurement (e.g., concentration).

The daily discharge may be determined by the analytical results of a composite sample taken over the course of one day (a calendar day or other 24-hour period defined as a day) or by the arithmetic mean of analytical results from one or more grab samples taken over the course of the day.

For composite sampling, if 1 day is defined as a 24-hour period other than a calendar day, the analytical result for the 24-hour period is considered the result for the calendar day in which the 24-hour period ends.

Detected, but Not Quantified (DNQ)
Sample result less than the RL, but greater than or equal to the laboratory's MDL. Sample results reported as DNQ are estimated concentrations.

Dilution Credit
Amount of dilution granted to a discharge in the calculation of a water quality-based effluent limitation, based on the allowance of a specified mixing zone. It is calculated from the dilution ratio or determined by conducting a mixing zone study or modeling the discharge and receiving water.

Effluent Concentration Allowance (ECA)
Value derived from the water quality criterion/objective, dilution credit, and ambient background concentration that is used, in conjunction with the CV for the effluent monitoring data, to calculate a long-term average (LTA) discharge concentration. The ECA has the same meaning as waste load allocation (WLA) as used in U.S. EPA guidance (*Technical Support Document For Water Quality-based Toxics Control*, March 1991, second printing, EPA/505/2-90-001).

Enclosed Bay
Indentation along the coast that encloses an area of oceanic water within a distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between the headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. Enclosed bays include, but are not limited to, Humboldt Bay, Bodega Harbor, Tomales Bay, Drake's Estero, San Francisco Bay, Morro Bay, Los Angeles-Long Beach Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay. Enclosed bays do not include inland surface waters or ocean waters.

Estimated Chemical Concentration
Concentration that results from the confirmed detection of the substance below the ML value by the analytical method.

Estuaries
Waters, including coastal lagoons, located at the mouths of streams that serve as areas of mixing for fresh and ocean waters. Coastal lagoons and mouths of streams that are temporarily separated from the ocean by sandbars are considered estuaries. Estuarine waters are considered to extend from a bay or the open ocean to a point upstream where there is no significant mixing of fresh water and seawater. Estuarine waters include, but are not limited to, the Sacramento-San Joaquin Delta, as defined in Water Code section 12220, Suisun Bay, Carquinez Strait downstream to the Carquinez Bridge, and appropriate areas of the Smith, Mad, Eel, Noyo, Russian, Klamath, San Diego, and Otay rivers. Estuaries do not include inland surface waters or ocean waters.

Inland Surface Waters
All surface waters of the state that do not include the ocean, enclosed bays, or estuaries.

Instantaneous Maximum Effluent Limitation
Highest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous maximum limitation).

Instantaneous Minimum Effluent Limitation
Lowest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous minimum limitation).

Maximum Daily Effluent Limitation (MDEL)
Highest allowable daily discharge of a pollutant, over a calendar day (or 24-hour period). For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the arithmetic mean measurement of the pollutant over the day.

Median
Middle measurement in a set of data. The median of a set of data is found by first arranging the measurements in order of magnitude (either increasing or decreasing order). If the number of measurements (n) is odd, then the median = $X_{(n+1)/2}$. If n is even, then the median = $(X_{n/2} + X_{(n/2)+1})/2$ (i.e., the midpoint between n/2 and n/2+1).

Method Detection Limit (MDL)
Minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero, as defined in in 40 C.F.R. part 136, Attachment B, revised as of July 3, 1999.

Minimum Level (ML)
Concentration at which the entire analytical system gives a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes, and processing steps have been followed.

Mixing Zone
Limited volume of receiving water allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall water body.

Not Detected (ND)
Sample results less than the laboratory's MDL.

Persistent Pollutants
Substances for which degradation or decomposition in the environment is nonexistent or very slow.

Pollutant Minimization Program
Program of waste minimization and pollution prevention actions that include, but are not limited to, product substitution, waste stream recycling, alternative waste management methods, and education of the public and businesses. The goal of the Pollutant Minimization Program is to reduce all potential sources of a priority pollutant through pollutant minimization (control) strategies, including pollution prevention measures as appropriate, to maintain the effluent concentration at or below the water quality-based effluent limitation. Pollution prevention measures may be particularly appropriate for persistent bioaccumulative priority pollutants where there is evidence that beneficial uses are being impacted. Cost effectiveness may be considered when establishing the requirements of a Pollutant Minimization Program. The completion and implementation of a Pollution Prevention Plan, if required pursuant to Water Code section 13263.3(d), is considered to fulfill Pollutant Minimization Program requirements.

Pollution Prevention
Any action that causes a net reduction in the use or generation of a hazardous substance or other pollutant that is discharged into water and includes, but is not limited to, input change, operational improvement, production process change, and product reformulation (as defined in Water Code section 13263.3). Pollution prevention does not include actions that merely shift a pollutant in wastewater from one environmental medium to another environmental medium, unless clear environmental benefits of such an approach are identified to the satisfaction of the State Water Board or Regional Water Board.

Reporting Level (RL)
ML (and its associated analytical method) chosen by the Discharger for reporting and compliance determination from the MLs included in this Order, including an additional factor if applicable as discussed herein. The MLs included in this Order correspond to approved analytical methods for reporting a sample result that are selected by the Regional Water Board either from SIP Appendix 4 in accordance with SIP section 2.4.2 or established in accordance with SIP section 2.4.3. The ML is based on the proper application of method-based analytical procedures for sample preparation and the absence of any matrix interferences. Other factors may be applied to the ML depending on the specific sample preparation steps employed. For example, the treatment typically applied in cases where there are matrix-effects is to dilute the sample or sample aliquot by a factor of ten. In such cases, this additional factor must be applied to the ML in the computation of the RL.

Source of Drinking Water
Any water designated as having a municipal or domestic supply (MUN) beneficial use.

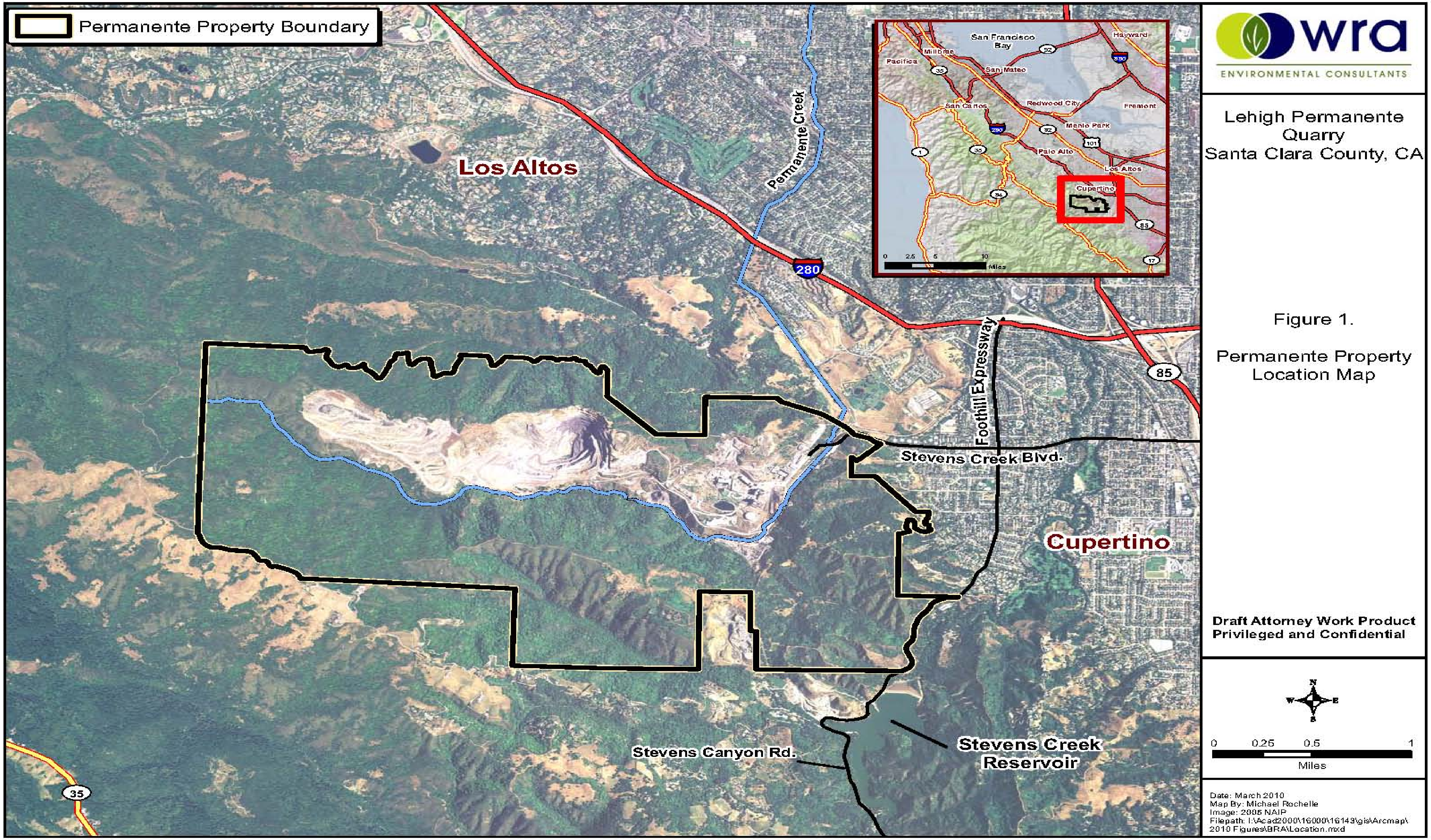
Standard Deviation (σ)
Measure of variability calculated as follows:

$$\sigma = (\sum[(x - \mu)^2]/(n - 1))^{0.5}$$

where:
x is the observed value;
μ is the arithmetic mean of the observed values; and
n is the number of samples.

Toxicity Reduction Evaluation (TRE)
Study conducted in a step-wise process designed to identify the causative agents of effluent or ambient toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in toxicity. The first steps of the TRE consist of the collection of data relevant to the toxicity, including additional toxicity testing, and an evaluation of facility operations and maintenance practices, and best management practices. A Toxicity Identification Evaluation (TIE) may be required as part of the TRE, if appropriate. A TIE is a set of procedures to identify the specific chemicals responsible for toxicity. These procedures are performed in three phases (characterization, identification, and confirmation) using aquatic organism toxicity tests.

ATTACHMENT B – FACILITY MAP



LEGEND

- Stormwater Collection Conveyance Infrastructure or Swale
- Fresh Water Conveyance Infrastructure
- Reclaim Water Conveyance Infrastructure
- Sewer Water Conveyance Infrastructure
- Discharge Point
- Ponds

NOTES

1) Conveyance infrastructure locations are approximate based on references and Golder site visit.

REFERENCES

1) Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
2) Hanson Permanente Cement Plant Water Line

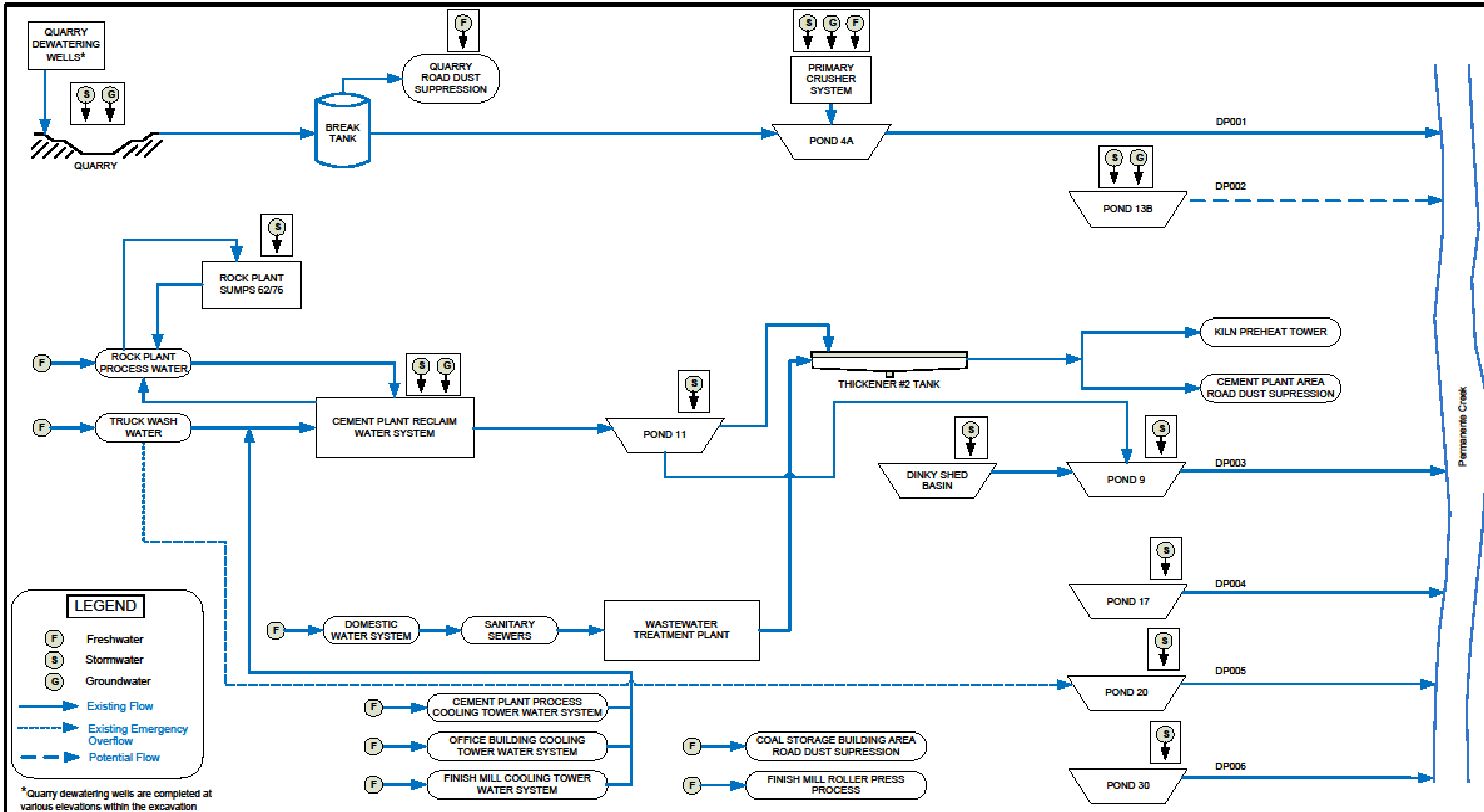
PROJECT
LEHIGH SOUTHWEST CEMENT COMPANY
PERMANENTE QUARRY

TITLE
WATER SYSTEM AND PIPING

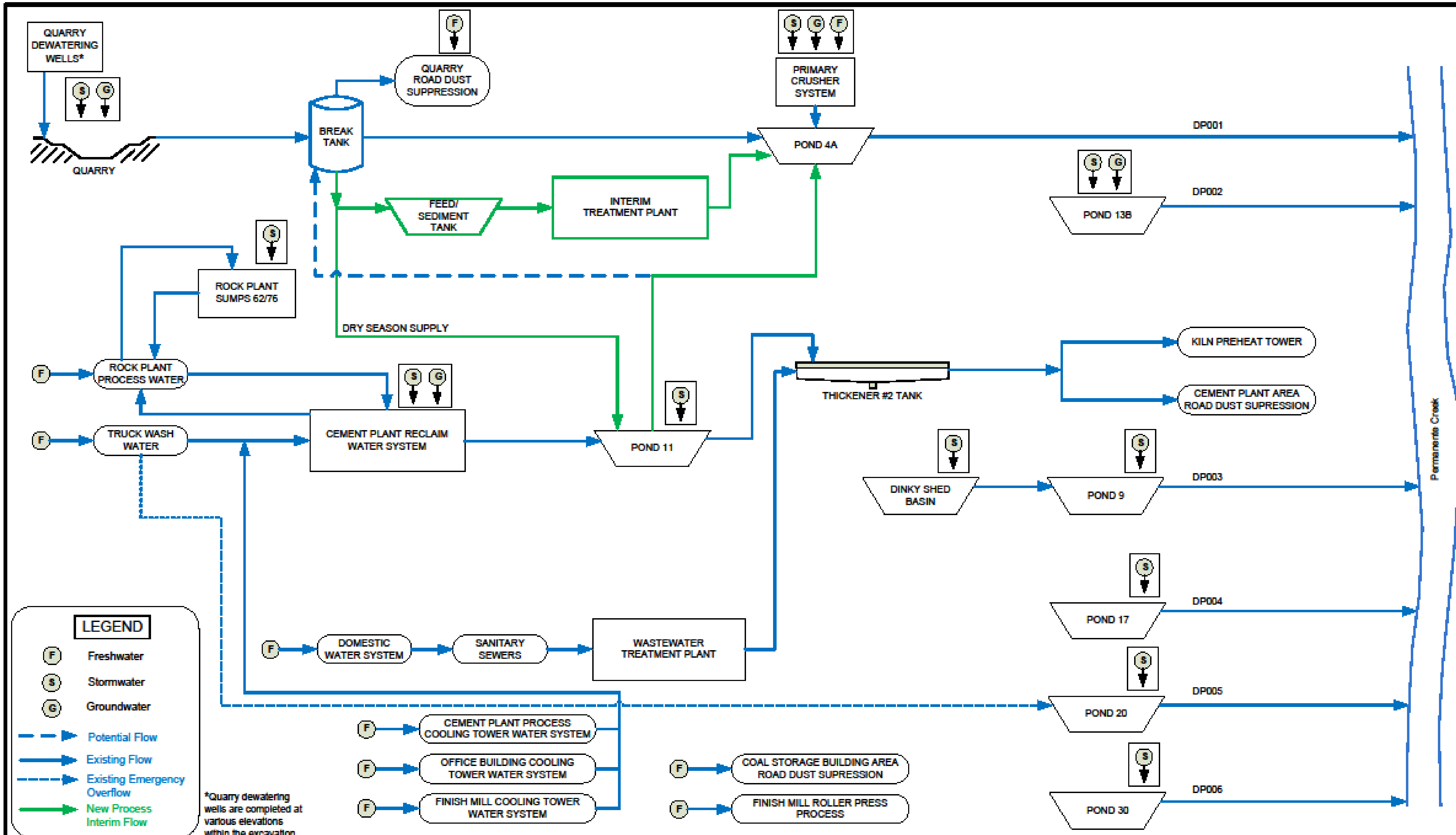
Golder Associates

FIGURE 4A-1

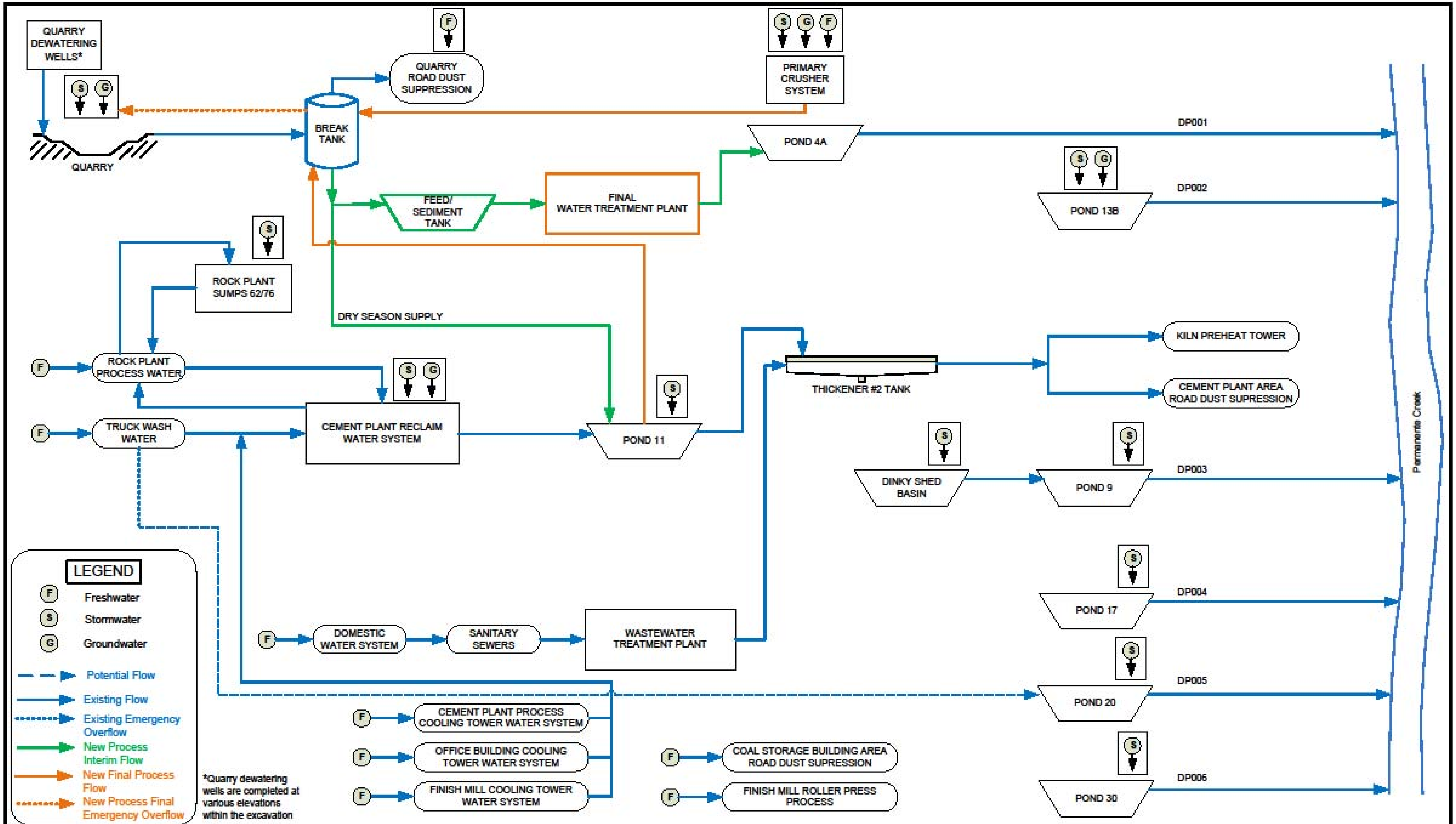
ATTACHMENT C – PROCESS FLOW DIAGRAMS C-1 THROUGH C-3



Golder Associates	PROJECT/REPORT LEHIGH SOUTHWEST CEMENT COMPANY PERMANENTE QUARRY AND CEMENT PLANT	PROJECT NO 063-7109-914	DATE MARCH 3, 2014
	TITLE FINAL LINE DRAWING OF FLOWS; CURRENT FLOW CONFIGURATION	FIGURE 3.1	R8



Golder Associates	PROJECT/REPORT LEHIGH SOUTHWEST CEMENT COMPANY PERMANENTE QUARRY AND CEMENT PLANT	PROJECT NO 063-7109-914	DATE MARCH 3, 2014
	TITLE FINAL LINE DRAWINGS OF FLOWS; INTERIM TREATMENT FLOW CONFIGURATION	FIGURE 3.2	R8



Golder Associates	PROJECT/REPORT: LEHIGH SOUTHWEST CEMENT COMPANY PERMANENTE QUARRY AND CEMENT PLANT	PROJECT NO: 063-7109-914	DATE: MARCH 3, 2014
	TITLE: FINAL LINE DRAWING OF FLOWS; FINAL TREATMENT FLOW CONFIGURATION	FIGURE: 3.3	R8

ATTACHMENT D –STANDARD PROVISIONS

I. STANDARD PROVISIONS – PERMIT COMPLIANCE

A. Duty to Comply

1. The Discharger must comply with all of the conditions of this Order. Any noncompliance constitutes a violation of the Clean Water Act (CWA) and the California Water Code and is grounds for enforcement action, for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. (40 C.F.R. § 122.41(a).)

2. The Discharger shall comply with effluent standards or prohibitions established under CWA section 307(a) for toxic pollutants and with standards for sewage sludge use or disposal established under CWA section 405(d) within the time provided in the regulations that establish these standards or prohibitions, even if this Order has not yet been modified to incorporate the requirement. (40 C.F.R. § 122.41(a)(1).)

B. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a Discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Order. (40 C.F.R. § 122.41(c).)

C. Duty to Mitigate

The Discharger shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this Order that has a reasonable likelihood of adversely affecting human health or the environment. (40 C.F.R. § 122.41(d).)

D. Proper Operation and Maintenance

The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Discharger to achieve compliance with the conditions of this Order. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems that are installed by a Discharger only when necessary to achieve compliance with the conditions of this Order. (40 C.F.R. § 122.41(e).)

E. Property Rights

1. This Order does not convey any property rights of any sort or any exclusive privileges. (40 C.F.R. § 122.41(g).)

2. The issuance of this Order does not authorize any injury to persons or property or invasion of other private rights, or any infringement of state or local law or regulations. (40 C.F.R. § 122.5(c).)

F. Inspection and Entry

The Discharger shall allow the Regional Water Board, State Water Board, U.S. EPA, or their authorized representatives (including an authorized contractor acting as their representative), upon the presentation of credentials and other documents, as may be required by law, to (40 C.F.R. § 122.41(i); Wat. Code, § 13383):

1. Enter upon the Discharger's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this Order (40 C.F.R. § 122.41(i)(1));

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order (40 C.F.R. § 122.41(i)(2));

3. Inspect and photograph, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order (40 C.F.R. § 122.41(i)(3)); and

4. Sample or monitor, at reasonable times, for the purposes of assuring Order compliance or as otherwise authorized by the CWA or the Water Code, any substances or parameters at any location. (40 C.F.R. § 122.41(i)(4).)

G. Bypass

1. Definitions

a. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility. (40 C.F.R. § 122.41(m)(1)(i).)

b. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities, which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production. (40 C.F.R. § 122.41(m)(1)(ii).)

2. Bypass not exceeding limitations. The Discharger may allow any bypass to occur which does not cause exceedances of effluent limitations, but only if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions listed in Standard Provisions – Permit Compliance I.G.3, I.G.4, and I.G.5 below. (40 C.F.R. § 122.41(m)(2).)

3. Prohibition of bypass. Bypass is prohibited, and the Regional Water Board may take enforcement action against a Discharger for bypass, unless (40 C.F.R. § 122.41(m)(4)(i)):

a. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage (40 C.F.R. § 122.41(m)(4)(i)(A));

b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance (40 C.F.R. § 122.41(m)(4)(i)(B)); and

c. The Discharger submitted notice to the Regional Water Board as required under Standard Provisions – Permit Compliance I.G.5 below. (40 C.F.R. § 122.41(m)(4)(i)(C).)

4. Approval. The Regional Water Board may approve an anticipated bypass, after considering its adverse effects, if the Regional Water Board determines that it will meet the three conditions listed in Standard Provisions—Permit Compliance I.G.3 above. (40 C.F.R. § 122.41(m)(4)(ii).)

5. Notice

a. Anticipated bypass. If the Discharger knows in advance of the need for a bypass, it shall submit a notice, if possible at least 10 days before the date of the bypass. (40 C.F.R. § 122.41(m)(3)(i).)

b. Unanticipated bypass. The Discharger shall submit notice of an unanticipated bypass as required in Standard Provisions - Reporting V.E below (24-hour notice). (40 C.F.R. § 122.41(m)(3)(ii).)

H. Upset

Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the Discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. (40 C.F.R. § 122.41(n)(1).)

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Standard Provisions – Permit Compliance I.H.2 below are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review. (40 C.F.R. § 122.41(n)(2).)

2. Conditions necessary for a demonstration of upset. A Discharger who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that (40 C.F.R. § 122.41(n)(3)):

a. An upset occurred and that the Discharger can identify the cause(s) of the upset (40 C.F.R. § 122.41(n)(3)(i));

b. The permitted facility was, at the time, being properly operated (40 C.F.R. § 122.41(n)(3)(ii));

c. The Discharger submitted notice of the upset as required in Standard Provisions—Reporting V.E.2.b below (24-hour notice) (40 C.F.R. § 122.41(n)(3)(iii)); and

d. The Discharger complied with any remedial measures required under Standard Provisions—Permit Compliance I.C above. (40 C.F.R. § 122.41(n)(3)(iv).)

3. **Burden of proof.** In any enforcement proceeding, the Discharger seeking to establish the occurrence of an upset has the burden of proof. (40 C.F.R. § 122.41(n)(4).)

II. STANDARD PROVISIONS—PERMIT ACTION

A. General

This Order may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Discharger for modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any Order condition. (40 C.F.R. § 122.41(f).)

B. Duty to Reapply

If the Discharger wishes to continue an activity regulated by this Order after the expiration date of this Order, the Discharger must apply for and obtain a new permit. (40 C.F.R. § 122.41(b).)

C. Transfers

This Order is not transferable to any person except after notice to the Regional Water Board. The Regional Water Board may require modification or revocation and reissuance of the Order to change the name of the Discharger and incorporate such other requirements as may be necessary under the CWA and the Water Code. (40 C.F.R. § 122.41(l)(3); § 122.61.)

III. STANDARD PROVISIONS – MONITORING

A. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. (40 C.F.R. § 122.41(j)(1).)

B. Monitoring results must be conducted according to test procedures under 40 C.F.R. part 136 or, in the case of sludge use or disposal, approved under 40 C.F.R. part 136 unless otherwise specified in 40 C.F.R. part 503 unless other test procedures have been specified in this Order. (40 C.F.R. § 122.41(j)(4); § 122.44(i)(1)(iv).)

IV. STANDARD PROVISIONS—RECORDS

A. Except for records of monitoring information required by this Order related to the Discharger's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 C.F.R. part 503), the Discharger shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this Order, and records of all data used to complete the application for this Order, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Regional Water Board Executive Officer at any time. (40 C.F.R. § 122.41(j)(2).)

B. Records of monitoring information shall include the following:

1. The date, exact place, and time of sampling or measurements (40 C.F.R. § 122.41(j)(3)(i));

2. The individual(s) who performed the sampling or measurements (40 C.F.R. § 122.41(j)(3)(ii));

3. The date(s) the analyses were performed (40 C.F.R. § 122.41(j)(3)(iii));

4. The individual(s) who performed the analyses (40 C.F.R. § 122.41(j)(3)(iv));

5. The analytical techniques or methods used (40 C.F.R. § 122.41(j)(3)(v)); and

6. The results of such analyses. (40 C.F.R. § 122.41(j)(3)(vi).)

C. Claims of confidentiality for the following information will be denied (40 C.F.R. § 122.7(b)):

1. The name and address of any permit applicant or Discharger (40 C.F.R. § 122.7(b)(1)); and

2. Permit applications and attachments, permits, and effluent data. (40 C.F.R. § 122.7(b)(2).)

V. STANDARD PROVISIONS—REPORTING

A. Duty to Provide Information

The Discharger shall furnish to the Regional Water Board, State Water Board, or U.S. EPA within a reasonable time, any information which the Regional Water Board, State Water Board, or U.S. EPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order or to determine compliance with this Order. Upon request, the Discharger shall also furnish to the Regional Water Board, State Water Board, or U.S. EPA copies of records required to be kept by this Order. (40 C.F.R. § 122.41(h); Wat. Code, § 13267.)

B. Signatory and Certification Requirements

1. All applications, reports, or information submitted to the Regional Water Board, State Water Board, and/or U.S. EPA shall be signed and certified in accordance with Standard Provisions—Reporting V.B.2, V.B.3, V.B.4, and V.B.5 below. (40 C.F.R. § 122.41(k).)

2. For a corporation, all permit applications shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures. (40 C.F.R. § 122.22(a)(1).)

For a partnership or sole proprietorship, all permit applications shall be signed by a general partner or the proprietor, respectively. (40 C.F.R. § 122.22(a)(2).)

For a municipality, state, federal, or other public agency, all permit applications shall be signed by either a principal executive officer or ranking elected official. For purposes of this provision, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA). (40 C.F.R. § 122.22(a)(3).).

3. All reports required by this Order and other information requested by the Regional Water Board, State Water Board, or U.S. EPA shall be signed by a person described in Standard Provisions – Reporting V.B.2 above, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Standard Provisions—Reporting V.B.2 above (40 C.F.R. § 122.22(b)(1));

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) (40 C.F.R. § 122.22(b)(2)); and

c. The written authorization is submitted to the Regional Water Board and State Water Board. (40 C.F.R. § 122.22(b)(3).)

4. If an authorization under Standard Provisions – Reporting V.B.3 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Standard Provisions—Reporting V.B.3 above must be submitted to the Regional Water Board and State Water Board prior to or together with any reports, information, or applications, to be signed by an authorized representative. (40 C.F.R. § 122.22(c).)

5. Any person signing a document under Standard Provisions—Reporting V.B.2 or V.B.3 above shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations." (40 C.F.R. § 122.22(d).)

C. Monitoring Reports

1. Monitoring results shall be reported at the intervals specified in the Monitoring and Reporting Program in this Order. (40 C.F.R. § 122.22(l)(4).)

2. Monitoring results must be reported on a Discharge Monitoring Report (DMR) form or forms provided or specified by the Regional Water Board or State Water Board for reporting results of monitoring of sludge use or disposal practices. (40 C.F.R. § 122.41(l)(4)(i).)

3. If the Discharger monitors any pollutant more frequently than required by this Order using test procedures approved under 40 C.F.R. part 136, or another method required for an industry-specific waste stream under 40 C.F.R. subchapters N or O, the results of such monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Regional Water Board. (40 C.F.R. § 122.41(l)(4)(ii).)

4. Calculations for all limitations, which require averaging of measurements, shall utilize an arithmetic mean unless otherwise specified in this Order. (40 C.F.R. § 122.41(l)(4)(iii).)

D. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this Order, shall be submitted no later than 14 days following each schedule date. (40 C.F.R. § 122.41(l)(5).)

E. Twenty-Four Hour Reporting

1. The Discharger shall report any noncompliance that may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the Discharger becomes aware of the circumstances. A written submission shall also be provided within five (5) days of the time the Discharger becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. (40 C.F.R. § 122.41(l)(6)(i).)

2. The following shall be included as information that must be reported within 24 hours under this paragraph (40 C.F.R. § 122.41(l)(6)(ii)):

   a. Any unanticipated bypass that exceeds any effluent limitation in this Order. (40 C.F.R. § 122.41(l)(6)(ii)(A).)

   b. Any upset that exceeds any effluent limitation in this Order. (40 C.F.R. § 122.41(l)(6)(ii)(B).)

3. The Regional Water Board may waive the above-required written report under this provision on a case-by-case basis if an oral report has been received within 24 hours. (40 C.F.R. § 122.41(l)(6)(iii).)

F. Planned Changes

The Discharger shall give notice to the Regional Water Board as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required under this provision only when (40 C.F.R. § 122.41(l)(1)):

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 C.F.R. section 122.29(b) (40 C.F.R. § 122.41(l)(1)(i)); or

2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in this Order. (Alternatively, for an existing manufacturing, commercial, mining, or silvicultural discharge as referenced in 40 C.F.R. section 122.42(a), this notification applies to pollutants that are subject neither to effluent limitations in this Order nor to notification requirements under 40 C.F.R. section 122.42(a)(1) (see Additional Provisions—Notification Levels VII.A.1).) (40 C.F.R. § 122.41(l)(1)(ii).)

3. The alteration or addition results in a significant change in the Discharger's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan. (40 C.F.R. § 122.41(l)(1)(iii).)

G. Anticipated Noncompliance

The Discharger shall give advance notice to the Regional Water Board or State Water Board of any planned changes in the permitted facility or activity that may result in noncompliance with this Order's requirements. (40 C.F.R. § 122.41(l)(2).)

H. Other Noncompliance

The Discharger shall report all instances of noncompliance not reported under Standard Provisions—Reporting V.C, V.D, and V.E above at the time monitoring reports are submitted. The reports shall contain the information listed in Standard Provision—Reporting V.E above. (40 C.F.R. § 122.41(l)(7).)

I. Other Information

When the Discharger becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Water Board, State Water Board, or U.S. EPA, the Discharger shall promptly submit such facts or information. (40 C.F.R. § 122.41(l)(8).)

VI. STANDARD PROVISIONS – ENFORCEMENT

A. The Regional Water Board is authorized to enforce the terms of this Order under several provisions of the Water Code, including, but not limited to, sections 13385, 13386, and 13387.

VII. ADDITIONAL PROVISIONS—NOTIFICATION LEVELS

A. Non-Municipal Facilities

Existing manufacturing, commercial, mining, and silvicultural Dischargers shall notify the Regional Water Board as soon as they know or have reason to believe (40 C.F.R. § 122.42(a)):

1. That any activity has occurred or will occur that would result in the discharge, on a routine or frequent basis, of any toxic pollutant that is not limited in this Order, if that discharge will exceed the highest of the following "notification levels" (40 C.F.R. § 122.42(a)(1)):

- **a.** 100 micrograms per liter (μg/L) (40 C.F.R. § 122.42(a)(1)(i));
- **b.** 200 μg/L for acrolein and acrylonitrile; 500 μg/L for 2,4-dinitrophenol and 2-methyl-4,6-dinitrophenol; and 1 milligram per liter (mg/L) for antimony (40 C.F.R. § 122.42(a)(1)(ii));
- **c.** Five (5) times the maximum concentration value reported for that pollutant in the Report of Waste Discharge (40 C.F.R. § 122.42(a)(1)(iii)); or
- **d.** The level established by the Regional Water Board in accordance with section 122.44(f). (40 C.F.R. § 122.42(a)(1)(iv).)

2. That any activity has occurred or will occur that would result in the discharge, on a non-routine or infrequent basis, of any toxic pollutant that is not limited in this Order, if that discharge will exceed the highest of the following "notification levels" (40 C.F.R. § 122.42(a)(2)):

- **a.** 500 micrograms per liter (μg/L) (40 C.F.R. § 122.42(a)(2)(i));
- **b.** 1 milligram per liter (mg/L) for antimony (40 C.F.R. § 122.42(a)(2)(ii));
- **c.** Ten (10) times the maximum concentration value reported for that pollutant in the Report of Waste Discharge (40 C.F.R. § 122.42(a)(2)(iii)); or
- **d.** The level established by the Regional Water Board in accordance with section 122.44(f). (40 C.F.R. § 122.42(a)(2)(iv).)

B. Publicly-Owned Treatment Works (POTWs)

All POTWs shall provide adequate notice to the Regional Water Board of the following (40 C.F.R. § 122.42(b)):

1. Any new introduction of pollutants into the POTW from an indirect discharger that would be subject to CWA sections 301 or 306 if it were directly discharging those pollutants (40 C.F.R. § 122.42(b)(1)); and

2. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of adoption of this Order. (40 C.F.R. § 122.42(b)(2).)

3. Adequate notice shall include information on the quality and quantity of effluent introduced into the POTW as well as any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW. (40 C.F.R. § 122.42(b)(3).)

ATTACHMENT E – MONITORING AND REPORTING PROGRAM (MRP)

Contents

I. General Monitoring Provisions E-2
II. Monitoring Locations E-2
III. Effluent Monitoring Requirements E-3
IV. Whole Effluent Toxicity Testing Requirements E-6
  A. Whole Effluent Acute Toxicity E-6
  B. Whole Effluent Chronic Toxicity E-6
V. Receiving Water Monitoring Requirements E-9
VI. Reporting Requirements E-10
  A. General Monitoring and Reporting Requirements E-10
  B. Self-Monitoring Reports (SMRs) E-10
  C. Discharge Monitoring Reports (DMRs) E-13
VII. Modifications to Attachment G E-14

Tables

Table E-1. Monitoring Locations E-2
Table E-2. Effluent Monitoring—Monitoring Locations EFF-001 and EFF-001A E-3
Table E-3. Effluent Monitoring—Monitoring Locations EFF-002 through EFF-005 ....E-4
Table E-4. Effluent Monitoring—Monitoring Location EFF-006 ....E-5
Table E-5. Receiving Water Monitoring—Monitoring Locations RSW-001 through RSW-004 ....E-10
Table E-6. CIWQS Reporting E-11
Table E-7. Monitoring Periods E-12

ATTACHMENT E – MONITORING AND REPORTING PROGRAM (MRP)

The Code of Federal Regulations (40 C.F.R. § 122.48) requires that all NPDES permits specify monitoring and reporting requirements. Water Code sections 13267 and 13383 also authorize the Regional Water Board to require technical and monitoring reports. This MRP establishes monitoring and reporting requirements that implement federal and State regulations.

I. GENERAL MONITORING PROVISIONS

A. The Discharger shall comply with this MRP. The Executive Officer may amend this MRP pursuant to 40 C.F.R. sections 122.62, 122.63, and 124.5. If any discrepancies exist between this MRP and the "Regional Standard Provisions, and Monitoring and Reporting Requirements (Supplement to Attachment D) for NPDES Wastewater Discharge Permits" (Attachment G), this MRP shall prevail.

B. The Discharger shall conduct all monitoring in accordance with Attachment D, section III, as supplemented by Attachment G. Equivalent test methods must be more sensitive than those specified in 40 C.F.R. section 136 and must be specified in this permit.

II. MONITORING LOCATIONS

The Discharger shall establish the following monitoring locations to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements in this Order.

Table E-1. Monitoring Locations

Sampling Location Type	Monitoring Location Name	Monitoring Location Description [1]
Effluent	EFF-001	A point in the outfall from Pond 4A (Discharge Point No. 001), following treatment and prior to the receiving water, at which all waste tributary to the outfall is present. *Latitude 37º,19',1.68" N Longitude 122º,6',41.94" W*
Effluent	EFF-001A	A point after filtration of wastewater from the Cement Plant Reclaim Water System, and before any other treatment step, prior to discharge to the receiving water via Discharge Point No. 001.
Effluent	EFF-002	A point in the outfall from Pond 13B (Discharge Point No. 002), prior to the receiving water, at which all waste tributary to the outfall is present. *Latitude 37º,19',0.27" N Longitude 122º,6',6.01" W*
Effluent	EFF-003	A point in the outfall from Pond 9 (Discharge Point No. 003), prior to the receiving water, at which all waste tributary to the outfall is present. *Latitude 37º,18',48.21" N Longitude 122º,5',26.09" W*
Effluent	EFF-004	A point in the outfall from Pond 17 (Discharge Point No. 004), prior to the receiving water, at which all waste tributary to the outfall is present. *Latitude 37º,18',51.53" N Longitude 122º,5',20.14 W*
Effluent	EFF-005	A point in the outfall from Pond 20 (Discharge Point No. 005), prior to the receiving water, at which all waste tributary to the outfall is present. *Latitude 37º,19',12.59" N Longitude 122º,5',21.98 W*
Effluent	EFF-006	A point in the outfall from Pond 30 (Discharge Point No. 006), prior to the receiving water, where all runoff from the East Materials Storage Area tributary to the outfall is present. *Latitude 37º,19',23.3" N Longitude 122º,5',7.9" W*
Receiving Water	RSW-001	A point in Permanente Creek within 50 feet upstream of in-stream Pond 13.

Sampling Location Type	Monitoring Location Name	Monitoring Location Description [1]
Receiving Water	RSW-001A	A point at the confluence of Wild Violet Creek and Permanente Creek upstream of Outfall 001. *Latitude 37º,19',13" N Longitude -122º,7',55" W*
Receiving Water	RSW-002	A point in Permanente Creek within 50 feet downstream of Discharge Point No. 002.
Receiving Water	RSW-003	A point in Permanente Creek within 50 feet downstream of Discharge Point No. 003.
Receiving Water	RSW-004	A point in Permanente Creek within 50 feet downstream of Discharge Point No. 006.

Footnote:

[1] Latitude and longitude information is approximate for administrative purposes.

III. EFFLUENT MONITORING REQUIREMENTS

A. The Discharger shall monitor effluent at Monitoring Locations EFF-001 and EFF-001A as follows:

Table E-2. Effluent Monitoring—Monitoring Locations EFF-001 and EFF-001A

Parameter	Units	Sample Type [1]	Minimum Sampling Frequency
Flow [2]	MGD	Continuous	Continuous/Day
Total Suspended Solids (TSS)[3]	mg/L	Grab	1/Week
Oil and Grease [4]	mg/L	Grab	1/Month
Temperature	°C	Grab	1/Month
pH [5]	standard units	Continuous or Grab	Continuous/Day or 1/Day
Total Residual Chlorine	mg/L	Grab	1/Day [6]
Settleable Matter	mL/L-hr	Grab	1/Month
Chromium (VI)	µg/L	Grab	2/Month
Mercury	µg/L	Grab	1/Month
Nickel	µg/L	Grab	2/Month
Selenium	µg/L	Grab	1/Month
Thallium	µg/L	Grab	2/Month
Total Dissolved Solids (TDS)	mg/L	Grab	1/Week
Turbidity	NTU	Grab	1/Day [6]
Acute Toxicity [7]	% Survival	C-24	1/ Quarter
Chronic Toxicity [8]	TUc	C-24	1/Quarter
Standard Observations [9]	---	---	1/Day [6]

Unit Abbreviations:

ºC = degrees Celsius
TUc = chronic toxicity units, equal to 100/NOEL, where NOEL = IC_{25}, EC_{25}, or NOEC
µg/L = micrograms per liter
mg/L = milligrams per liter
mL/L-hr = milliliters per liter-hour
MGD = million gallons per day
NTU = nephelometric turbidity units
% Survival = percent survival

Sample Type:

Continuous = measured continuously
C-24 = 24-hour composite sample

Grab = grab sample

Sampling Frequency:

Continuous/Day = measured continuously, and recorded and reported at least daily
1/Day = once per day
1/Week = once per week
1/Month = once per month
2/Month = twice per month
1/Quarter = once per quarter

Footnotes:

[1] Grab samples shall be collected during daylight hours.

[2] Flow shall be monitored continuously and the following information shall be reported in monthly self-monitoring reports:

- Daily average flow (gpd)
- Monthly average flow (MGD)
- Total monthly flow volume (MG)

Flow shall also be recorded simultaneously with sample collection for chromium (VI), nickel, and thallium.

[3] TSS is to be monitored at Monitoring Location EFF-001A.

[4] Oil and grease sampling and analysis shall be conducted in accordance with U.S. EPA Method 1664.

[5] pH shall be monitored once per day, Monday through Friday, at Monitoring Location EFF-002. If pH is monitored continuously, the minimum and maximum pH values for each day shall be reported in self-monitoring reports.

[6] This requirement applies Monday through Friday.

[7] Acute bioassay tests shall be performed in accordance with MRP section IV.A.

[8] Chronic bioassay tests shall be performed in accordance with MRP section IV.B.

[9] Standard observations are listed in Attachment G (Standard Provisions), section III.C.1, Receiving Water Observations.

B. The Discharger shall monitor effluent at Monitoring Locations EFF-002 through EFF-005 as follows:

Table E-3. Effluent Monitoring—Monitoring Locations EFF-002 through EFF-005

Parameter	Units	Sample Type [1]	Minimum Sampling Frequency
Flow [2]	MG	Continuous	1/Month
Total Suspended Solids (TSS)	mg/L	Grab	1/Quarter
Oil and Grease [3]	mg/L	Grab	1/Quarter
pH	standard units	Grab	1/Quarter
Settleable Matter	mL/L-hr	Grab	1/Quarter
Turbidity	NTU	Grab	1/Quarter
Conductivity	µmhos/cm	Grab	1/Quarter
Chromium (VI)	µg/L	Grab	1/Quarter
Mercury	µg/L	Grab	1/Quarter
Nickel	µg/L	Grab	1/Quarter
Selenium	µg/L	Grab	1/Quarter
Thallium	µg/L	Grab	1/Quarter
Standard Observations [4]	---	---	Each Occurrence

Unit Abbreviations:

µg/L = micrograms per liter
µmhos/cm = micromhos per centimeter
mg/L = milligrams per liter
mL/L-hr = milliliters per liter-hour
MG = million gallons
NTU = nephelometric turbidity units

Sample Type:

Continuous = measured continuously
Grab = grab sample

Sampling Frequency:

Each Occurrence = each significant stormwater discharge, defined as a continuous discharge of stormwater for a minimum of one hour, or an intermittent discharge of stormwater for a minimum of three hours, in a 12-hour period. Visual observations are only required in daylight during scheduled facility operating hours.
1/Month = once per month
1/Quarter = once per quarter

Footnotes:

[1] Grab samples shall be collected during daylight hours.

[2] Flow shall be monitored continuously at all monitoring locations. The following information shall be reported in monthly self-monitoring reports for all monitoring locations:
- Daily average flow (gpd)
- Monthly average flow (MGD)
- Total monthly flow volume (MG)

[3] Oil and grease sampling and analysis shall be conducted in accordance with U.S. EPA Method 1664.

[4] Standard observations are listed in Attachment G section III.C.1, Receiving Water Observations.

C. The Discharger shall monitor effluent at Monitoring Location EFF-006 as follows:

Table E-4. Effluent Monitoring—Monitoring Location EFF-006

Parameter	Units	Sample Type [1]	Minimum Sampling Frequency
Flow [2]	MG	Continuous	1/Month
Total Suspended Solids (TSS)	mg/L	Grab	1/Quarter
pH	standard units	Grab	1/Quarter
Settleable Matter	mL/L-hr	Grab	1/Quarter
Conductivity	µmhos/cm	Grab	1/Quarter
Total Organic Carbon [3]	mg/L	Grab	1/Quarter
Chromium (VI)	µg/L	Grab	1/Quarter
Mercury	µg/L	Grab	1/Quarter
Nickel	µg/L	Grab	1/Quarter
Selenium	µg/L	Grab	1/Quarter
Thallium	µg/L	Grab	1/Quarter
Standard Observations [4]	---	---	Each Occurrence

Unit Abbreviations:

µg/L = micrograms per liter
mg/L = milligrams per liter
mL/L-hr = milliliters per liter-hour
MG = million gallons per day
umhos/cm = micromhos per centimeter

Sample Type:

Continuous = measured continuously
Grab = grab sample

Sampling Frequency:

Each Occurrence = each significant stormwater discharge, defined as a continuous discharge of stormwater for a minimum of one hour, or an intermittent discharge of stormwater for a minimum of three hours, in a 12-hour period. Visual observations are only required in daylight during scheduled facility operating hours.
1/Month = once per month
1/Quarter = once per quarter

Footnotes:

[1] Grab samples shall be collected during daylight hours.

[2] Flow shall be monitored continuously and the following information shall be reported in monthly self-monitoring reports:
- Daily average flow (gpd)
- Monthly average flow (MGD)
- Total monthly flow volume (MG)

[3] Oil and grease may be substituted for total organic carbon. Oil and grease sampling and analysis shall be conducted in accordance with U.S. EPA Method 1664.

[4] Standard observations are listed in Attachment G section III.C.1, Receiving Water Observations.

IV. WHOLE EFFLUENT TOXICITY TESTING REQUIREMENTS

The Discharger shall monitor whole effluent acute and chronic toxicity at Discharge Point No. 001 (Monitoring Location EFF-001 as described in the MRP) as follows:

A. Whole Effluent Acute Toxicity

1. Compliance with the acute toxicity effluent limitations shall be evaluated by measuring survival of test organisms exposed to 96-hour static renewal bioassays.

2. Test organisms shall be rainbow trout (*Oncorhynchus mykiss*). The Executive Officer may specify a more sensitive organism or, if testing a particular organism proves unworkable, the most sensitive organism available.

3. All bioassays shall be performed according to the most up-to-date protocols in 40 C.F.R. part 136, currently *Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms,* 5th Edition (EPA-821-R-02-012).

4. If the Discharger demonstrates that specific identifiable substances in the discharge are rapidly rendered harmless upon discharge to the receiving water, compliance with the acute toxicity limit may be determined after test samples are adjusted to remove the influence of those substances. Written acknowledgement that the Executive Officer concurs with the Discharger's demonstration and that the adjustment will not remove the influence of other substances must be obtained prior to any such adjustment. The Discharger may manually adjust the pH of whole effluent acute toxicity samples prior to performing bioassays to minimize ammonia toxicity interference.

5. Bioassay water monitoring shall include, on a daily basis, residual chlorine, pH, dissolved oxygen, ammonia (if toxicity is observed), temperature, hardness, and alkalinity. These results shall be reported. If a violation of an acute toxicity limit occurs, the bioassay test shall be repeated with new fish as soon as practical and shall be repeated until a test fish survival rate of 90 percent or greater is observed. If the control fish survival rate is less than 90 percent, the bioassay test shall be restarted with new fish and shall continue as soon as practical until an acceptable test is completed (i.e., control fish survival rate is 90 percent or greater).

B. Whole Effluent Chronic Toxicity

1. Monitoring Requirements

a. Sampling. The Discharger shall collect 24-hour composite effluent samples on consecutive days for critical life stage toxicity testing as indicated below.

b. Test Species. The test species shall be daphnid (*Ceriodaphnia dubia)* unless a more sensitive species is identified.

The Discharger shall conduct a screening chronic toxicity test as described in

Appendix E-1, or as described in applicable State Water Board plan provisions that are effective after adoption of this Order, following any significant change in the nature of the effluent after implementation of the final treatment system. If there is no significant change in the nature of the effluent, the Discharger shall conduct a screening test for each discharge point and submit the results with its application for permit reissuance.

c. **Frequency.** The chronic toxicity monitoring frequency shall be as specified below:

   i. The Discharger shall monitor routinely at the minimum frequency specified in Table E-2.

   ii. The Discharger shall accelerate monitoring to monthly after either exceeding a three-sample median of 1.0 TUC or a single-sample maximum of 2.0 TU_c. Based on the TUc results, the Executive Officer may specify a different frequency for accelerated monitoring to ensure that accelerated monitoring provides useful information.

   iii. The Discharger shall return to routine monitoring if accelerated monitoring does not exceed either trigger in ii, above.

   iv. If accelerated monitoring confirms consistent toxicity in excess of either trigger in ii, above, the Discharger shall continue accelerated monitoring and initiate toxicity reduction evaluation (TRE) procedures in accordance with section V.B.3, below.

   v. The Discharger shall return to routine monitoring after implementing appropriate elements of the TRE, and either the toxicity drops below both triggers in ii, above, or, based on the TRE results, the Executive Officer determines that accelerated monitoring would no longer provide useful information.

   Monitoring conducted pursuant to a TRE shall satisfy the requirements for routine and accelerated monitoring while the TRE is underway.

d. **Methodology.** Sample collection, handling, and preservation shall be in accordance with U.S. EPA protocols. In addition, bioassays shall be conducted in compliance with the most recently promulgated test methods, as shown in Appendix E-1. These are *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms,* currently third edition (EPA-821-R-02-014), and *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* currently fourth Edition (EPA-821-R-02-013). If these protocols prove unworkable, the Executive Officer and the Environmental Laboratory Accreditation Program may grant exceptions in writing upon the Discharger's request with justification, provided that the revised protocols are equally protective. If the Discharger demonstrates that specific identifiable substances in the discharge are rapidly rendered harmless upon discharge to the receiving water, compliance with the chronic toxicity limit may be determined after test samples are adjusted to remove the influence of those substances. Written acknowledgement that the Executive Officer concurs with the Discharger's demonstration and that the adjustment will not remove the influence of other substances must be obtained prior to any such adjustment.

e. Dilution Series. The Discharger shall conduct tests at 100%, 50%, 25%, 12.5%, 6.25%, and 0%. The "%" represents percent effluent as discharged. Test sample pH may be controlled to the level of the effluent sample as received by the laboratory prior to being salted up.

2. Reporting Requirements

a. The Discharger shall provide toxicity test results for the current reporting period in the self-monitoring report and shall include the following, at a minimum, for each test:

i. Sample date

ii. Test initiation date

iii. Test species

iv. End point values for each dilution (e.g., number of young, growth rate, percent survival)

v. No Observable Effect Level (NOEL) values in percent effluent. The NOEL shall equal the IC_{25} or EC_{25} (see MRP Appendix E-1). If the IC_{25} or EC_{25} cannot be statistically determined, the NOEL shall equal to the No Observable Effect Concentration (NOEC) derived using hypothesis testing. The NOEC is the maximum percent effluent concentration that causes no observable effect on test organisms based on a critical life stage toxicity test.

vi. IC_{15}, IC_{25}, IC_{40}, and IC_{50} values (or EC_{15}, EC_{25}, EC_{40}, and EC_{50}) as percent effluent

vii. TUc values (100/NOEL, where NOEL = IC_{25}, EC_{25}, or NOEC

viii. Mean percent mortality (±s.d.) after 96 hours in 100% effluent (if applicable)

ix. IC_{50} or EC_{50} values for reference toxicant tests

x. Available water quality measurements for each test (e.g., pH, residual chlorine, dissolved oxygen, temperature, conductivity, hardness, salinity, and ammonia)

b. The Discharger shall provide the results of the most recent three chronic toxicity tests and the three-sample median in the self-monitoring report as TUc's.

3. Toxicity Reduction Evaluation (TRE)

a. The Discharger shall prepare a generic TRE work plan within 90 days of the effective date of this Order to be ready to respond to toxicity events. The Discharger shall review and update the work plan as necessary so that it remains current and applicable to the discharge and discharge facilities.

b. Within 30 days of exceeding either chronic toxicity trigger in section V.B.1.c.ii, above, the Discharger shall submit a TRE work plan, which shall be the generic work plan revised as appropriate for this toxicity event after consideration of available discharge data.

c. Within 30 days of completing an accelerated monitoring test observed to exceed either trigger in section V.B.1.c.ii, above, the Discharger shall initiate a TRE in accordance with a TRE work plan that incorporates any and all comments from the Executive Officer.

d. The TRE shall be specific to the discharge and be in accordance with current technical guidance and reference materials, including U.S. EPA guidance materials. The Discharger shall conduct the TRE as a tiered evaluation as summarized below:

i. Tier 1 shall consist of basic data collection (routine and accelerated monitoring).

ii. Tier 2 shall consist of evaluation of treatment process optimization, including operational practices and in-plant process chemicals.

iii. Tier 3 shall consist of a toxicity identification evaluation (TIE).

iv. Tier 4 shall consist of evaluation of options for additional effluent treatment processes.

v. Tier 5 shall consist of evaluation of options for modifications of in-plant treatment processes.

vi. Tier 6 shall consist of implementation of selected toxicity control measures, and follow-up monitoring and confirmation of implementation success.

e. The Discharger may end the TRE at any stage if monitoring finds there is no longer consistent toxicity (i.e., compliance with Provision IV.A.5 of the Order).

f. The objective of the TIE shall be to identify the substance or combination of substances causing the observed toxicity. The Discharger shall employ all reasonable efforts using currently available TIE methodologies.

g. As toxic substances are identified or characterized, the Discharger shall continue the TRE by determining the sources and evaluating alternative strategies for reducing or eliminating the toxic substances from the discharge. The Discharger shall take all reasonable steps to reduce toxicity to levels below the chronic toxicity limit.

h. Many recommended TRE elements parallel required or recommended efforts related to source control, pollution prevention, and stormwater control programs. TRE efforts should be coordinated with such efforts. To prevent duplication of efforts, evidence of complying with requirements or recommended efforts of such programs may be acceptable to demonstrate compliance with TRE requirements.

i. Chronic toxicity may be episodic and identification of causes of and reduction of sources of chronic toxicity may not be successful. Regional Water Board enforcement considerations will be based in part on the Discharger's actions and efforts to identify and control or reduce sources of consistent toxicity.

V. RECEIVING WATER MONITORING REQUIREMENTS

The Discharger shall monitor receiving waters at Monitoring Locations RSW-001 through RSW-004 (including RSW-001A) as follows:

Table E-5. Receiving Water Monitoring—Monitoring Locations RSW-001 through RSW-004

Parameter	Units	Sample Type	Minimum Sampling Frequency
Chromium (VI)	µg/L	Grab	1/Quarter
Mercury	µg/L	Grab	1/Quarter
Nickel	µg/L	Grab	1/Quarter
Selenium	µg/L	Grab	1/Quarter
Thallium	µg/L	Grab	1/Quarter
Dissolved Oxygen	mg/L and % Saturation	Grab	1/Quarter
Sulfides	mg/L	Grab	1/Quarter
Turbidity	NTU	Grab	1/Quarter
pH	Standard Units	Grab	1/Quarter
TDS	mg/L	Grab	1/Quarter
Chloride	mg/L	Grab	1/Quarter
Temperature	ºC	Grab	1/Quarter
Hardness	mg/L	Grab	1/Quarter
TSS [1]	mg/L	Grab	1/Quarter
Oil and Grease [1][2]	mg/L	Grab	1/Quarter
TOC [1]	mg/L	Grab	1/Quarter
Settleable Matter [1]	mL/L-hr	Grab	1/Quarter
Conductivity [1]	µmhos/cm	Grab	1/Quarter
Standard Observations [3]	---	---	1/Month

Unit Abbreviations:

ºC = degrees Celsius
µmhos/cm = micromhos per centimeter
µg/L = micrograms per liter
mg/L = milligrams per liter
mL/L-hr = milliliters per liter-hour
NTU = nephelometric turbidity units
% Saturation = percent saturation

Sampling Frequency:

1/Month = once per month
1/Quarter = once per quarter
1/5 Years = once per five years

Footnote:

[1] To be monitored at Monitoring Location RSW-001A only.

[2] Oil and grease sampling and analysis shall be conducted in accordance with U.S. EPA Method 1664.

[3] Standard observations are listed in Attachment G section III.C.1, Receiving Water Observations.

VI. REPORTING REQUIREMENTS

A. General Monitoring and Reporting Requirements

The Discharger shall comply with all Standard Provisions (Attachments D and G) related to monitoring, reporting, and recordkeeping, with modifications shown in section VII, below.

B. Self-Monitoring Reports (SMRs)

1. **SMR Format.** The Discharger shall electronically submit SMRs using the State Water Board's California Integrated Water Quality System (CIWQS) Web site (http://www.waterboards.ca.gov/ciwqs/index.html). The CIWQS website will provide

additional information for SMR submittal in the event of a planned service interruption for electronic submittal.

2. **SMR Due Dates and Contents.** The Discharger shall submit SMRs by the due dates, and with the contents, specified below:

   a. **Monthly SMRs —** Monthly SMRs shall be due 30 days after the end of each calendar month, covering that calendar month. The monthly SMR shall contain the applicable items described in sections V.B and V.C of both Attachments D and G of this Order. See Provisions VI.C.2 (Effluent Characterization Study and Report) and VI.C.3 (Ambient Background Study and Report) of this Order for information that must also be reported with monthly SMRs.

      Monthly SMRs shall include all new monitoring results obtained since the last SMR was submitted. If the Discharger monitors any pollutant more frequently than required by this Order, the Discharger shall include the results of such monitoring in the calculations and reporting for the SMR.

   b. **Annual SMR —** Annual SMRs shall be due February 1 each year, covering the previous calendar year. The annual SMR shall contain the items described in sections V.C.1.f of Attachment G. See also Provisions VI.C.2 (Effluent Characterization Study and Report), VI.C.3 (Ambient Background Study and Report), V.C.4.b.v, V.C.5.c, VI.C.6.a.ii, and VI.C.6.b.iii of the Order for requirements to submit reports with the annual SMR.

   c. **Specifications for Submitting SMRs to CIWQS —** The Discharger shall submit analytical results and other information using one of the following methods:

Table E-6. CIWQS Reporting

Parameter	Method of Reporting	
	EDF/CDF data upload or manual entry	**Attached File**
All parameters identified in influent, effluent, and receiving water monitoring tables (except Dissolved Oxygen and Temperature)	Required for all results	
Dissolved Oxygen Temperature	Required for monthly maximum and minimum results only [1]	Discharger may use this method for all results or keep records
Cyanide Arsenic Cadmium Chromium Copper Lead Mercury Nickel Selenium Silver Zinc Dioxins and Furans (by U.S. EPA Method 1613)	Required for all results [2]	
Antimony Beryllium	Not required (unless identified in	Discharger may use this method and submit results

Parameter	Method of Reporting	
	EDF/CDF data upload or manual entry	Attached File
Thallium Other Pollutants (by U.S. EPA Methods 601, 602, 608, 610, 614, 624, and 625)	influent, effluent, or receiving water monitoring tables), but encouraged [1]	with application for permit reissuance, unless data are submitted by CDF/EDF upload
Analytical Method	Not required (Discharger may select "data unavailable") [1]	
Collection Time Analysis Time	Not required (Discharger may select "0:00") [1]	

Footnotes:

[1] The Discharger shall continue to monitor at the minimum frequency specified in this MRP, keep records of the measurements, and make the records available upon request.

[2] These parameters require EDF/CDF data upload or manual entry regardless of whether monitoring is required by this MRP or other provisions of this Order (except for biosolids, sludge, or ash provisions).

The Discharger shall arrange all reported data in a tabular format and summarize data to clearly illustrate whether the Facility is operating in compliance with effluent limitations. The Discharger is not required to duplicate the submittal of data entered in a tabular format within CIWQS. When electronic submittal of data is required and CIWQS does not provide for entry into a tabular format, the Discharger shall electronically submit the data in a tabular format as an attachment.

3. **Monitoring Periods.** Monitoring periods for all required monitoring shall be as set forth below unless otherwise specified:

Table E-7. Monitoring Periods

Sampling Frequency	Monitoring Period Begins On…	Monitoring Period
Continuous	Permit effective date	All times
1/Day	Permit effective date	Midnight through 11:59 p.m. or any 24-hour period that reasonably represents a calendar day for purposes of sampling
1/Week	Sunday following permit effective date or on permit effective date if on Sunday	Sunday through Saturday
1/Month	First day of calendar month following permit effective date or on permit effective date if on first day of month	First day of calendar month through last day of calendar month
1/Quarter	First January 1, April 1, July 1, or October 1 following or on permit effective date	January 1 through March 31 April 1 through June 30 July 1 through September 30 October 1 through December 31
1/Year	January 1	January 1 through December 31
1/5 Years	Permit effective date	Once during the permit term within 12 months prior to applying for permit reissuance

4. **RL and MDL Reporting.** The Discharger shall report with each sample result the Reporting Level (RL) and Method Detection Limit (MDL) as determined by the procedure in 40 C.F.R.

part 136. The Discharger shall report the results of analytical determinations for the presence of chemical constituents in a sample using the following reporting protocols:

a. Sample results greater than or equal to the RL shall be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample).

b. Sample results less than the RL, but greater than or equal to the laboratory's MDL, shall be reported as "Detected, but Not Quantified," or DNQ. The estimated chemical concentration of the sample shall also be reported.

For purposes of data collection, the laboratory shall write the estimated chemical concentration next to DNQ. The laboratory may, if such information is available, include numerical estimates of the data quality for the reported result. Numerical estimates of data quality may be percent accuracy (+/- a percentage of the reported value), numerical ranges (low to high), or any other means the laboratory considers appropriate.

c. Sample results less than the laboratory's MDL shall be reported as "Not Detected" or ND.

d. The Discharger shall instruct laboratories to establish calibration standards so that the minimum level (ML) value (or its equivalent if there is differential treatment of samples relative to calibration standards) is the lowest calibration standard. At no time is the Discharger to use analytical data derived from extrapolation beyond the lowest point of the calibration curve.

5. Compliance Determination. Compliance with effluent limitations for priority pollutants shall be determined using sample reporting protocols defined above and in the Fact Sheet and Attachments A, D, and G. For purposes of reporting and administrative enforcement by the Regional Water Board and State Water Board, the Discharger shall be deemed out of compliance with effluent limitations if the concentration of the priority pollutant in the monitoring sample is greater than the effluent limitation and greater than or equal to the reporting level (RL).

C. Discharge Monitoring Reports (DMRs)

1. At any time during the term of this Order, the State Water Board or Regional Water Board may notify the Discharger to electronically submit DMRs. Until such notification is given, the Discharger shall submit DMRs in accordance with the requirements described below.

2. Once notified by the State Water Board or Regional Water Board, the Discharger shall submit hard copy DMRs. The Discharger shall sign and certify DMRs as Attachment D requires. The Discharger shall submit original DMRs to one of the addresses listed below:

Standard Mail	FedEx/UPS/Other Private Carriers
State Water Resources Control Board Division of Water Quality c/o DMR Processing Center PO Box 100 Sacramento, CA 95812-1000	State Water Resources Control Board Division of Water Quality c/o DMR Processing Center 1001 I Street, 15th Floor Sacramento, CA 95814

3. All discharge monitoring results shall be reported on official U.S. EPA pre-printed DMR forms (EPA Form 3320-1) or self-generated forms that follow the exact same format as EPA Form 3320-1.

VII. MODIFICATIONS TO ATTACHMENT G

This MRP modifies Attachment G as indicated below:

A. Attachment G sections I.J.1 (Stormwater Pollution Prevention Plan [SWPP Plan]) and I.J.3 (Stormwater Management Controls) are deleted.

B. Attachment G section III.A.3.b is revised as follows, and section III.A.3.c (Stormwater Monitoring) is deleted.

b. Conditions Triggering Accelerated Monitoring

1) If the results from two consecutive samples of a constituent monitored in a 30-day period exceed the monthly average limit for any parameter (or if the required sampling frequency is once per month and the monthly sample exceeds the monthly average limit), the Discharger shall, within 24 hours after the results are received, increase its sampling frequency to daily until the results from the additional sampling show that the parameter is in compliance with the monthly average limit. Total suspended solids (TSS), settleable matter, chromium (VI), mercury, nickel, selenium, total dissolved solids (TDS), and turbidity shall not be subject to this accelerated monitoring requirement because existing data already demonstrate the magnitude and duration of non-compliance with effluent limitations for these parameters.

2) If any maximum daily limit is exceeded, the Discharger shall increase its sampling frequency to daily within 24 hours after the results are received that indicate the exceedance of the maximum daily limit until two samples collected on consecutive days show compliance with the maximum daily limit. TSS, settleable matter, chromium (VI), mercury, nickel, selenium, TDS, and turbidity shall not be subject to this accelerated monitoring requirement because existing data already demonstrate the magnitude and duration of non-compliance with effluent limitations for these parameters.

3) If final or intermediate results of an acute bioassay test indicate a violation or threatened violation (e.g., the percentage of surviving test organisms of any single acute bioassay test is less than 70 percent), the Discharger shall initiate a new test as soon as practical, and the Discharger shall investigate the cause of the mortalities and report its findings in the next self-monitoring report (SMR).

4) The Discharger shall calibrate chlorine residual analyzers against grab samples as frequently as necessary to maintain accurate control and reliable operation. If an effluent violation is detected, the Discharger shall collect grab samples at least every 30 minutes until compliance with the limit is achieved, unless the Discharger monitors chlorine residual

continuously. In such cases, the Discharger shall continue to conduct continuous monitoring as required by its permit.

5) When a bypass occurs (except one subject to provision III.A.3.b.6 below), the Discharger shall monitor flows and collect samples on a daily basis for all constituents at affected discharge points that have effluent limits for the duration of the bypass (including acute toxicity using static renewals), except chronic toxicity, unless otherwise stipulated by the MRP.

6) Unless otherwise stipulated by the MRP, when a bypass approved pursuant to Attachment D, Standard Provisions, Sections I.G.2 or I.G.4, occurs, the Discharger shall monitor flows and, using appropriate procedures as specified in the MRP, collect and retain samples for affected discharge points on a daily basis for the duration of the bypass. The Discharger shall analyze for total suspended solids (TSS) using 24-hour composites (or more frequent increments) and for bacteria indicators with effluent limits using grab samples. If TSS exceeds 45 mg/L in any composite sample, the Discharger shall also analyze the retained samples for that discharge for all other constituents that have effluent limits, except oil and grease, mercury, dioxin-TEQ, and acute and chronic toxicity. Additionally, at least once each year, the Discharger shall analyze the retained samples for one approved bypass discharge event for all other constituents that have effluent limits, except oil and grease, mercury, dioxin-TEQ, and acute and chronic toxicity. This monitoring shall be in addition to the minimum monitoring specified in the MRP.

c. Stormwater Monitoring – *Deleted*

C. Attachment G section V.C.1.c.2 is revised as follows:

2) When determining compliance with an average monthly effluent limitation or maximum daily effluent limitation, and more than one sample result is available in a month, the Discharger shall compute the arithmetic mean unless the data set contains one or more reported determinations of detected but not quantified (DNQ) or nondetect (ND). In those cases, the Discharger shall compute the median in place of the arithmetic mean in accordance with the following procedure:

i. The data set shall be ranked from low to high, reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

ii. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

If a sample result, or the arithmetic mean or median of multiple sample results, is below the reporting limit, and there is evidence that the priority pollutant is present in the effluent above an effluent limitation and the Discharger conducts a Pollutant Minimization Program, the Discharger shall not be deemed out of compliance.

D. Attachment G sections V.C.1.f and V.C.1.g are revised as follows, and section V.C.1.h (Reporting data in electronic format) is deleted.

f. Annual self-monitoring report requirements

By the date specified in the MRP, the Discharger shall submit an annual report to the Regional Water Board covering the previous calendar year. The report shall contain the following:

1) Annual compliance summary table of treatment plant performance, including documentation of any blending events (this summary table is not required if the Discharger has submitted the year's monitoring results to CIWQS in electronic reporting format by EDF/CDF upload or manual entry);

2) Comprehensive discussion of treatment plant performance and compliance with the permit (This discussion shall include any corrective actions taken or planned, such as changes to facility equipment or operation practices that may be needed to achieve compliance, and any other actions taken or planned that are intended to improve performance and reliability of the Discharger's wastewater collection, treatment, or disposal practices.);

3) Both tabular and graphical summaries of the monitoring data for the previous year if parameters are monitored at a frequency of monthly or greater (this item is not required if the Discharger has submitted the year's monitoring results to CIWQS in electronic reporting format by EDF/CDF upload or manual entry);

4) List of approved analyses, including the following:

   (i) List of analyses for which the Discharger is certified;

   (ii) List of analyses performed for the Discharger by a separate certified laboratory (copies of reports signed by the laboratory director of that laboratory shall not be submitted but be retained onsite); and

   (iii) List of "waived" analyses, as approved;

5) Plan view drawing or map showing the Discharger's facility, flow routing, and sampling and observation station locations;

6) Results of annual facility inspection to verify that all elements of the SWPP Plan are accurate and up to date (only required if the Discharger

does not route all stormwater to the headworks of its wastewater treatment plant); and

7) Results of facility report reviews (The Discharger shall regularly review, revise, and update, as necessary, the O&M Manual, the Contingency Plan, the Spill Prevention Plan, and Wastewater Facilities Status Report so that these documents remain useful and relevant to current practices. At a minimum, reviews shall be conducted annually. The Discharger shall include, in each Annual Report, a description or summary of review and evaluation procedures, recommended or planned actions, and an estimated time schedule for implementing these actions. The Discharger shall complete changes to these documents to ensure they are up-to-date.).

g. Report submittal

The Discharger shall submit SMRs addressed as follows, unless the Discharger submits SMRs electronically to CIWQS:

California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612
Attn: NPDES Wastewater Division

h. Reporting data in electronic format – *Deleted*

E. Attachment G section V.E.2 (Unauthorized Discharges from Municipal Wastewater Treatment Plants) is deleted.

APPENDIX E-1
CHRONIC TOXICITY
DEFINITION OF TERMS AND SCREENING PHASE REQUIREMENTS

I. Definition of Terms

A. No observed effect level (NOEL) for compliance determination is equal to IC_{25} or EC_{25}. If the IC_{25} or EC_{25} cannot be statistically determined, the NOEL shall be equal to the NOEC derived using hypothesis testing.

B. Effective concentration (EC) is a point estimate of the toxicant concentration that would cause an adverse effect on a quantal, “all or nothing,” response (such as death, immobilization, or serious incapacitation) in a given percent of the test organisms. If the effect is death or immobility, the term lethal concentration (LC) may be used. EC values may be calculated using point estimation techniques such as probit, logit, and Spearman-Karber. EC_{25} is the concentration of toxicant (in percent effluent) that causes a response in 25 percent of the test organisms.

C. Inhibition concentration (IC) is a point estimate of the toxicant concentration that would cause a given percent reduction in a nonlethal, nonquantal biological measurement, such as growth. For example, an IC_{25} is the estimated concentration of toxicant that would cause a 25 percent reduction in average young per female or growth. IC values may be calculated using a linear interpolation method such as U.S. EPA's Bootstrap Procedure.

D. No observed effect concentration (NOEC) is the highest tested concentration of an effluent or a toxicant at which no adverse effects are observed on the aquatic test organisms at a specific time of observation. It is determined using hypothesis testing.

II. Chronic Toxicity Screening Phase Requirements

A. The Discharger shall perform screening phase monitoring:

1. Subsequent to any significant change in the nature of the effluent discharged through changes in sources or treatment, except those changes resulting from reductions in pollutant concentrations attributable to source control efforts, or

2. Prior to permit reissuance. Screening phase monitoring data shall be included in the NPDES permit application for reissuance. The information shall be as recent as possible, but may be based on screening phase monitoring conducted within 5 years before the permit expiration date.

B. Design of the screening phase shall, at a minimum, consist of the following elements:

1. Use of test species specified in Appendix E-2, attached, and use of the protocols referenced in those tables.

2. Two stages:

a. Stage 1 shall consist of a minimum of one battery of tests conducted concurrently. Selection of the type of test species and minimum number of tests shall be based on Appendix E-2 (attached).

b. Stage 2 shall consist of a minimum of two test batteries conducted at a monthly frequency using the three most sensitive species based on the Stage 1 test results.

3. Appropriate controls.

4. Concurrent reference toxicant tests.

5. Dilution series of 100%, 50%, 25%, 12.5%, 6.25%, and 0 %, where "%" is percent effluent as discharged, or as otherwise approved the Executive Officer if different dilution ratios are needed to reflect discharge conditions.

C. The Discharger shall submit a screening phase proposal. The proposal shall address each of the elements listed above. If within 30 days, the Executive Officer does not comment, the Discharger shall commence with screening phase monitoring.

APPENDIX E-2
SUMMARY OF TOXICITY TEST SPECIES REQUIREMENTS

Table AE-1. Critical Life Stage Toxicity Tests for Estuarine Waters

Species	(Scientific Name)	Effect	Test Duration	Reference
Alga	*(Skeletonema costatum)* *(Thalassiosira pseudonana)*	Growth rate	4 days	1
Red alga	*(Champia parvula)*	Number of cystocarps	7–9 days	3
Giant kelp	*(Macrocystis pyrifera)*	Percent germination; germ tube length	48 hours	2
Abalone	*(Haliotis rufescens)*	Abnormal shell development	48 hours	2
Oyster Mussel	*(Crassostrea gigas)* *(Mytilus edulis)*	Abnormal shell development; percent survival	48 hours	2
Echinoderms - Urchins Sand dollar	*(Strongylocentrotus purpuratus, S. franciscanus)* *(Dendraster excentricus)*	Percent fertilization or larval development	1 hour or 72 hours	2
Shrimp	*(Americamysis bahia)*	Percent survival; growth	7 days	3
Shrimp	*(Holmesimysis costata)*	Percent survival; growth	7 days	2
Topsmelt	*(Atherinops affinis)*	Percent survival; growth	7 days	2
Silversides	*(Menidia beryllina)*	Larval growth rate; percent survival	7 days	3

Toxicity Test References:

1. American Society for Testing Materials (ASTM). 1990. Standard Guide for Conducting Static 96-Hour Toxicity Tests with Microalgae. Procedure E 1218-90. ASTM, Philadelphia, PA.

2. Short-term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to West Coast Marine and Estuarine Organisms. EPA/600/R-95/136. August 1995.

3. Short-term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Marine and Estuarine Organisms. EPA/821/R-02/014. October 2002.

Table AE-2. Critical Life Stage Toxicity Tests for Fresh Waters

Species	(Scientific Name)	Effect	Test Duration	Reference
Fathead minnow	*(Pimephales promelas)*	Survival; growth rate	7 days	4
Water flea	*(Ceriodaphnia dubia)*	Survival; number of young	7 days	4
Alga	*(Selenastrum capricornutum)*	Final cell density	4 days	4

Toxicity Test Reference:

1. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, fourth Edition Chronic manual (EPA-821-R-02-013, October 2002).

Table AE-3. Toxicity Test Requirements for Stage One Screening Phase

Requirements	Receiving Water Characteristics		
	Discharges to Coast	Discharges to San Francisco Bay [1]	
	Ocean	Marine/Estuarine	Freshwater
Taxonomic diversity	1 plant 1 invertebrate 1 fish	1 plant 1 invertebrate 1 fish	1 plant 1 invertebrate 1 fish
Number of tests of each salinity type: Freshwater [2] Marine/Estuarine	0 4	1 or 2 3 or 4	3 0
Total number of tests	4	5	3

[1] (a) Marine refers to receiving water salinities greater than 1 part per thousand (ppt) at least 95 percent of the time during a normal water year.

(b) Freshwater refers to receiving water with salinities less than 1 ppt at least 95 percent of the time during a normal water year.

(c) Estuarine refers to receiving water salinities that fall between those of marine and freshwater, as described above.

[2] The freshwater species may be substituted with marine species if:

(a) The salinity of the effluent is above 1 ppt greater than 95 percent of the time, or

(b) The ionic strength (TDS or conductivity) of the effluent at the test concentration used to determine compliance is documented to be toxic to the test species.

ATTACHMENT F - FACT SHEET

Contents

I. Permit Information F-3
II. Facility Description F-4
  A. Discharge Points and Receiving Waters F-4
  B. Existing Wastewater Treatment and Controls F-5
  C. Future Wastewater Treatment and Controls F-5
  D. Summary of Existing Requirements and Monitoring Data F-6
  E. Compliance Summary F-9
III. Applicable Plans, Policies, and Regulations F-10
IV. Rationale For Effluent Limitations and Discharge Specifications F-12
  A. Discharge Prohibitions F-13
  B. Technology-Based Effluent Limitations F-14
    1. Scope and Authority F-14
    2. Effluent Limitations F-15
  C. Water Quality-Based Effluent Limitations F-16
    1. Scope and Authority F-16
    2. Beneficial Uses and Water Quality Criteria and Objectives F-17
    3. Need for Water Quality-Based Effluent Limitations (Reasonable Potential Analysis) .. F-18
    4. Water Quality-Based Effluent Limitation Calculations F-22
    5. Whole Effluent Acute Toxicity F-27
    6. Whole Effluent Chronic Toxicity F-27
  D. Effluent Limitation Considerations F-28
V. Rationale for Receiving Water Limitations F-33
VI. Rationale for Provisions F-33
  A. Standard Provisions F-33
  B. Monitoring and Reporting F-33
  C. Special Provisions F-33
    1. Reopener Provisions F-33
    2. Effluent Characterization Study and Report F-33
    3. Ambient Background Study and Report F-34
    4. Best Management Practices and Pollutant Minimization Program F-34
    5. Reliability Assurance Plan and Status Report F-34
    6. Stormwater Best Management Practices F-34
VII. Monitoring and Reporting Program (MRP) F-35
  A. MRP Requirements Rationale F-35
  B. Monitoring Requirements Summary F-36
VIII. Public Participation F-36

Tables

Table F-1. Facility Information....F-3
Table F-2. Outfall Locations....F-5
Table F-3. Historic Effluent Limitations and Monitoring Data....F-6
Table F-4. Beneficial Uses....F-11
Table F-5. Technology-Based Requirements for Cement Manufacturing and Mining....F-14
Table F-6. Reasonable Potential Analysis....F-19
Table F-7. WQBEL Calculations....F-26
Table F-8. Monitoring Requirements Summary....F-36

Attachment

Attachment F-1. Lehigh Permanente Facility Violations of Order No. R2-2008-0011Fourth Quarter 2011 through First Quarter 2013.... F-1-1

ATTACHMENT F – FACT SHEET

This Fact Sheet includes the legal requirements and technical rationale that serve as the basis for the requirements of this Order. As described in section II.B of the Order, the Regional Water Board incorporates this Fact Sheet as its findings supporting the issuance of the Order.

I. PERMIT INFORMATION

The following table summarizes administrative information related to the facility:

Table F-1. Facility Information

WDID	2 43I006267
CIWQS Place ID	273205
Discharger	Lehigh Southwest Cement Company and Hanson Permanente Cement, Inc.
Facility Name	Permanente Plant
Facility Address	24001 Stevens Creek Blvd. Cupertino, CA 95014
	Santa Clara County
Facility Contact, Title, Phone	Alan Sabawi, Plant Manager, Lehigh Hanson Region West, 408-996-4231
Authorized Person to Sign and Submit Reports	Same as Facility Contact
Mailing Address	Lehigh Southwest Cement Company 24001 Stevens Creek Blvd. Cupertino, CA 95014
Billing Address	Same as Mailing Address
Facility Type	Industrial, SIC Codes 3241 (Hydraulic cement production), 1422 (Crushed and broken limestone)
Major or Minor Facility	Major
Threat to Water Quality	1
Complexity	A
Pretreatment Program	N
Reclamation Requirements	Not Applicable
Permitted Flow	167,000 gallons per hour (gph) (Discharge Point 001)
Design Flow	167,000 gph (Discharge Point 001)
Watershed	Santa Clara Basin
Receiving Water	Permanente Creek
Receiving Water Type	Inland Surface Water (Fresh)

A. Lehigh Southwest Cement Company operates the Permanente Plant (Facility), a limestone quarry and cement production facility that also produces construction aggregate. Hanson Permanente Cement, Inc., owns the property on which the Facility is located at 24001 Stevens Creek Road. Together, Lehigh Southwest Cement Company and Hanson Permanente Cement, Inc., are hereinafter referred to as the Discharger. Operations at this site commenced in 1939.

For the purposes of this Order, references to the "discharger" or "permittee" in applicable federal and state laws, regulations, plans, or policy are held to be equivalent to references to the Discharger herein.

B. The Facility discharges wastewater to Permanente Creek, a water of the United States tributary to San Francisco Bay within the Santa Clara Basin watershed. Prior to this Order, these discharges were regulated pursuant to the *General Waste Discharge Requirements for Discharges of Process Wastewaters from Aggregate Mining, Sand Washing, and Sand Offloading Facilities to Surface Waters*, NPDES Permit No. CAG982001 (Order No. R2-2008-0011). The Facility also discharges stormwater runoff associated with industrial activities to Permanente Creek. Prior to this Order, these discharges were regulated pursuant to the *Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities,* NPDES Permit No. CAS000001 (State Water Board Order No. 97-03-DWQ). This Order terminates the Discharger's coverage under these two general permits because this Order regulates all these discharges. The Discharger is also currently regulated by Regional Water Board Order No. 94-038 for treatment and onsite discharge and reuse (or reclamation) of treated sanitary wastewaters. This Order does not affect Order No. 94-038.

Attachment B provides a general map of the Facility and area around the Facility. Attachment C provides flow schematics of the Facility's current and planned interim and final configurations.

Prior to making any change in the points of discharge, places of use, or purposes of use of treated wastewater that results in a decrease of flow in any portion of a watercourse, the Discharger must file a petition with the State Water Board, Division of Water Rights, and receive approval for such a change. The State Water Board retains jurisdictional authority to enforce such requirements under Water Code section 1211.

C. The Discharger filed a report of waste discharge and application for Waste Discharge Requirements (WDRs) and an NPDES permit on November 30, 2011. Supplemental information was requested on March 27, 2012, and received on May 14, 2012.

II. FACILITY DESCRIPTION

The Discharger mines and processes minerals at the Facility and produces Portland cement and construction aggregate from limestone and stone quarried onsite. It produces several types of wastewater, including quarry dewatering water, truck and equipment wash water, aggregate crushing and washing water, cement manufacture process wastewater, and industrial stormwater. This Order addresses all wastewaters (including industrial stormwater) associated with quarrying, crushed rock mining and processing, and cement manufacture at the Facility.

The Facility consists of an active mining area, a quarry pit, a cement manufacturing plant, several crushers and mills, a pre-calcining tower, and roads and a conveyor system for transporting mined raw materials. Wastewater and industrial stormwater are collected and managed through a system of berms, ditches, pipes, and ponds. The ponds discharge to Permanente Creek at several locations. Runoff also occurs as sheet flow from undisturbed areas.

A. Discharge Points and Receiving Waters

The Facility discharges to Permanente Creek, a fresh water stream tributary to San Francisco Bay. All the Facility's discharges are shallow water discharges. The discharge points are located in the Santa Clara Basin watershed, as indicated below. Although the Discharger intends to make a number of changes to the Facility during the term of this Order as described in section II.C, below, the discharge points will remain the same. The volume and nature of the wastewater discharged at each location will change, however, and this Order reflects these planned changes.

Table F-2. Outfall Locations

Discharge Point	Latitude (North)	Longitude (West)	Receiving Water
001	37.31713°	-122.11165°	Permanente Creek
002	37.31674°	-122.10167°	Permanente Creek
003	37.31339°	-122.09058°	Permanente Creek
004	37.31431°	-122.08893°	Permanente Creek
005	37.31899°	-122.08716°	Permanente Creek
006	37.32241°	-122.08551°	Permanente Creek

B. Existing Wastewater Treatment and Controls

Attachment C-1 provides a schematic depicting current wastewater and stormwater flows. As shown there, during normal operations, quarry dewatering water (including accumulated stormwater), and stormwater and wash water from the Primary Crusher System, are pumped to and discharged from Pond 4A (Discharge Point No. 001). Stormwater is stored in and sometimes discharged from Pond 13B (Discharge Point No. 002). Excess Rock Plant wash water is typically pumped to the Reclaim Water System (which includes Pond 11) and reused at the Cement Plant, or pumped to Discharge Point No. 001. Stormwater from the Rock Plant access road and surrounding areas flows to the Dinky Shed Basin and is pumped to and discharged from Pond 9 (Discharge Point No. 003), along with stormwater from nearby roads. Due to ongoing work at Pond 11, the Cement Plant Reclaim Water System also contributes non-stormwater flow to Pond 9. The Regional Water Board plans enforcement action to ensure the Discharger completes its work to eliminate all non-stormwater discharges to Pond 9. Additional Rock Plant stormwater is discharged from Pond 17 (Discharge Point No. 004). Stormwater from the entry road and old Aluminum Plant is discharged from Pond 20 (Discharge Point No. 005). Stormwater is also discharged from Pond 30 (Discharge Point No. 006).

Natural seeps occur from hillsides at the Facility. If this water comes into contact with industrial activity, or is otherwise collected, it is routed to one of the water systems (e.g., the quarry or Cement Plant Reclaim Water System).

Currently, all Facility discharges are treated by settling in the ponds or sumps from which the discharges occur. In addition, the discharge from Discharge Point No. 001 is filtered prior to settling and discharge, wash water from the Primary Crusher flows through an oil skimmer before being pumped to Pond 4A and discharged at Discharge Point No. 001, and discharges from Discharge Point No. 003 are filtered and pH adjusted, if necessary, prior to discharge.

C. Future Wastewater Treatment and Controls

The Discharger plans major changes to the Facility's wastewater treatment and controls to comply with a settlement agreement with the Sierra Club in *Sierra Club v. Lehigh Southwest Cement Company, and Hanson Permanente Cement, Inc.* and the effluent limitations of this Order. The requirements of this Order are based on the planned future wastewater treatment and controls. This Order does not authorize discharges inconsistent with future treatment and controls; therefore, such discharges would violate this Order.

The Discharger has begun bench-scale and pilot-scale testing of treatment technologies to meet the effluent limitations in this Order, particularly with respect to selenium. The technologies being tested include proprietary biological treatment, reverse osmosis, and iron co-precipitation. By

October 1, 2014, the Discharger will install and operate an interim treatment system that implements one or a combination of these treatment technologies and is capable of treating up to 24,000 gallons of wastewater per hour (gph). By September 30, 2017, the Discharger will construct and operate a final treatment system capable of treating all quarry pit water, process wastewater, and stormwater commingled with process wastewater discharged from the Facility (i.e., discharges from Pond 4A, which will include quarry pit water, stormwater, Primary Crusher process water, Cement Plant process waters, truck wash water, and Rock Plant aggregate wash water).

Attachments C-2 and C-3 provide schematics depicting interim and final wastewater and stormwater flows. Beginning on October 1, 2014, interim flows will be as follows:

- Up to 24,000 gph of quarry dewatering water will be directed to the interim treatment system prior to discharge from Discharge Point No. 001, instead of being directly discharged at Discharge Point No. 001;
- Cement Plant Reclaim Water System wastewater will be pumped to Discharge Point No. 001 as necessary, instead of being discharged at Discharge Point No. 003; and
- Rock Plant wash water will be directed to the Cement Plant Reclaim Water System.

Beginning on October 1, 2017, final flows will be as follows:

- All quarry dewatering water, Primary Crusher stormwater and wash water, and Cement Plant Reclaim Water System wastewater as necessary (including Rock Plant wash water and Truck Wash water) will be pumped to the final treatment system prior to discharge at Discharge Point No. 001 instead of being discharged as described above; and
- If necessary to meet effluent limitations, the Discharger will also treat dust suppression water runoff currently flowing to Ponds 13A and 13B.

D. Summary of Existing Requirements and Monitoring Data

Prior to this Order, the Facility was regulated under two general permits, one for its quarry operations and the other for its industrial stormwater. The data from quarry operations are presented below because they characterize wastewater discharges, including stormwater from a large portion of the Facility. The quarry operations were regulated pursuant to the *General Waste Discharge Requirements for Discharges of Process Wastewaters from Aggregate Mining, Sand Washing, and Sand Offloading Facilities to Surface Waters* (Order No. R2-2008-0011). Effluent limitations contained in that order and representative monitoring data from November 21, 2011, when coverage under that permit commenced, to March 31, 2013, are presented below.

Table F-3. Historic Effluent Limitations and Monitoring Data

Parameter	Units	Effluent Limitations					Monitoring Data (11/11–03/13)
		Monthly Average	Weekly Average	Daily Maximum	Instant-aneous Maximum	Instant-aneous Minimum	Highest Daily Discharge
Discharge Point No. 001 (Pond 4A)							
Total Suspended	mg/L	30	45	---	---	---	60

Parameter	Units	Effluent Limitations					Monitoring Data (11/11–03/13)
		Monthly Average	Weekly Average	Daily Maximum	Instant-aneous Maximum	Instant-aneous Minimum	Highest Daily Discharge
Solids (TSS)							
Turbidity	NTU		---	40	---	---	60
pH	s.u.	---	---	---	8.5	6.5	7.0 – 8.6
Settleable Matter	mL/L-hr	0.1	---	0.2	0.0	---	ND<0.1
Total Dissolved Solids	mg/L	---	---	500	---	---	1,200
Chloride	mg/L		---	250	---	---	62
Total Chlorine Residual	mg/L	---	---	---	0.0	---	ND<0.1
Acute Toxicity	% Survival	90 [1]	70 [2]	---	---	---	100%
Discharge Point No. 002 (Pond 13B)							
Total Suspended Solids (TSS)	mg/L	30	45	---	---	---	620
Turbidity	NTU		---	40	---	---	1,000
pH	s.u.	---	---	---	8.5	6.5	7.1 – 8.6
Settleable Matter	mL/L-hr	0.1	---	0.2	0.0	---	0.5
Total Dissolved Solids	mg/L	---	---	500	---	---	1,500
Chloride	mg/L		---	250	---	---	81
Total Chlorine Residual	mg/L	---	---	---	0.0	---	ND<0.1
Acute Toxicity	% Survival	90 [1]	70 [2]	---	---	---	100%
Discharge Point No. 003 (Pond 9)							
Total Suspended Solids (TSS)	mg/L	30	45	---	---	---	380
Turbidity	NTU		---	40	---	---	392
pH	s.u.	---	---	---	8.5	6.5	6.8 – 9.4
Settleable Matter	mL/L-hr	0.1	---	0.2	0.0	---	0.4
Total Dissolved Solids	mg/L	---	---	500	---	---	1,200
Chloride	mg/L		---	250	---	---	120
Total Chlorine Residual	mg/L	---	---	---	0.0	---	ND<0.1
Acute Toxicity	% Survival	90 [1]	70 [2]	---	---	---	100%
Discharge Point No. 004 (Pond 17) [3]							
Total Suspended Solids (TSS)	mg/L	30	45	---	---	---	140
Turbidity	NTU		---	40	---	---	220
pH	s.u.	---	---	---	8.5	6.5	6.5 – 8.3
Settleable Matter	mL/L-hr	0.1	---	0.2	0.0	---	0.5
Total Dissolved Solids	mg/L	---	---	500	---	---	550

Parameter	Units	Effluent Limitations					Monitoring Data (11/11–03/13)
		Monthly Average	Weekly Average	Daily Maximum	Instantaneous Maximum	Instantaneous Minimum	Highest Daily Discharge
Chloride	mg/L		---	250	---	---	19
Total Chlorine Residual	mg/L	---	---	---	0.0	---	ND (<0.1)
Acute Toxicity	% Survival	90 [1]	70 [2]	---	---	---	[3]
Discharge Point No. 005 (Pond 20) [4]							
Total Suspended Solids (TSS)	mg/L	30	45	---	---	---	200
Turbidity	NTU	---	---	40	---	---	94
pH	s.u.	---	---	---	8.5	6.5	7.5-8.8
Settleable Matter	mL/L-hr	0.1	---	0.2	0.0	---	1.1
Total Dissolved Solids	mg/L	---	---	500	---	---	1,200
Chloride	mg/L	---	---	250	---	---	59
Total Chlorine Residual	mg/L	---	---	---	0.0	---	ND (<0.1)
Acute Toxicity	% Survival	90 [1]	70 [2]	---	---	---	[4]
Rock Plant Sump Discharge [5]							
Total Suspended Solids (TSS)	mg/L	30	45	---	---	---	35
Turbidity	NTU	---	---	40	---	---	[5]
pH	s.u.	---	---	---	8.5	6.5	8.16
Settleable Matter	mL/L-hr	0.1	---	0.2	0.0	---	ND (<0.1)
Total Dissolved Solids	mg/L	---	---	500	---	---	940
Chloride	mg/L	---	---	250	---	---	[5]
Total Chlorine Residual	mg/L	---	---	---	0.0	---	ND (<0.1)
Acute Toxicity	% Survival	90 [1]	70 [2]	---	---	---	[5]

Unit Abbreviations:

mg/L = milligrams per liter
µg/L = micrograms per liter
mL/L/HR = milliliters per liter–hour
NTU = nephelometric turbidity units
% Survival = percent survival
s.u. = standard units

Footnotes:

[1] Minimum three-sample median survival

[2] Minimum single-sample survival

[3] Discharge Point No. 004 discharged from November 30 through December 3, 2012, and December 23 through 28, 2012. No acute toxicity sample was collected.

[4] Discharge Point No. 005 discharged on January 23, 2012; from November 28 through December 31, 2012; and on February 19, 2013. No acute toxicity sample was collected.

[5] The Rock Plant Sump discharged on December 26, 2012. No turbidity, chloride, or acute toxicity samples were collected.

E. Compliance Summary

Since 1992, the Facility had been regulated under the *General Permit for Discharges of Storm Water associated with Industrial Activities Excluding Construction Activities* (NPDES Permit No. CAS000001, currently State Water Board Order No. 97-03-DWQ). Based on Facility inspections and observed permit violations, that Order was determined to be inappropriate because it prohibited non-stormwater discharges integral to the Facility's operations, including discharges of quarry bottom water, truck and equipment wash-down water, and dust suppression water. While still maintaining coverage under the industrial stormwater general permit, the Discharger applied for an individual NPDES permit and enrolled under the *General Waste Discharge Requirements for Discharges of Process Wastewaters from Aggregate Mining, Sand Washing, and Sand Offloading Facilities to Surface Waters* (NPDES Permit No. CAG982001, Order No. R2-2008-0011) until an individual permit could be issued. The Discharger's violations of both orders and the Regional Water Board's enforcement actions are described below:

1. **Unauthorized Discharges Under Order No. 97-03-DWQ.** A February 10, 2010, U. S. EPA inspection found violations of Order No. 97-03-DWQ, including discharge of polluted stormwater and discharge of non-stormwater in violation of that order. Other violations included inadequate best management practices for pollution control, source control, erosion control, and material handling and storage; inadequate stormwater pollution prevention plan; and inadequate and unrepresentative monitoring locations. On March 26, 2010, the Regional Water Board's Assistant Executive Officer issued a Notice of Violation requiring the Discharger to correct these violations. A followup investigation by Regional Water Board, U.S. EPA, and California Department of Fish and Game staff on May 26, 2010, found that the Discharger had not corrected the violations.

   On September 15, 2010, the Santa Clara Valley Water District forwarded to the Regional Water Board a complaint it had received about increased flows in Permanente Creek. The Regional Water Board investigated and found, through an October 4, 2010, phone conversation with the Discharger, that the increased flows likely resulted from a routine discharge through Pond 4A (Discharge Point No. 001) of water pumped from the quarry pit. Regional Water Board staff verbally informed the Discharger that Order No. 97-03-DWQ prohibited the discharge. On November 29, 2010, the Assistant Executive Officer issued the Discharger a Water Code section 13267 order requiring characterization of the non-stormwater discharges from September 2010 back through the previous three years. The Discharger's response, received on December 13, 2010, did not meet the 13267 order's requirements.

   On February 18, 2011, the Assistant Executive Officer issued a second Notice of Violation requiring the Discharger to apply for an individual NPDES permit, enroll under NPDES Permit No. CAG982001 until an individual permit could be issued, and collect and submit data characterizing the Facility's non-stormwater discharges. The Assistant Executive Officer clarified and reiterated these requirements with a third Notice of Violation and 13267 order issued June 14, 2011. The Discharger initially applied for coverage under NPDES Permit No. CAG982001 on July 18, 2011. The Discharger provided supplemental submittals over the next several months, completing the application for all outfalls on October 25, 2011. The Discharger initially applied for an individual NPDES permit on November 30, 2011, submitting a complete application on May 14, 2012. The Discharger began collecting the data required by the June 2011 13267 order and continues to collect and report data under revisions to that order (the most recent revision, Order No. R2-2013-0005-A1, is dated June 2013).

On March 29, 2011, Regional Water Board staff inspected the Facility and observed an unauthorized discharge of sediment-laden water to Permanente Creek from an unknown pipe. The discharge was later determined to be cement manufacture process water that is normally recycled, but which on that day was diverted and discharged to Permanente Creek in violation of Order No. 97-03-DWQ. The Regional Water Board's Assistant Executive Officer issued Complaint No. R2-2011-0023, dated April 29, 2011, assessing a $10,000 Administrative Civil Liability (ACL). The Discharger paid the fine as set forth in ACL Settlement Agreement No. R2-2012-0039.

2. **Numeric Effluent Limitation Exceedances Under Order No. R2-2008-0011.** From November 2011 through December 2013, the Discharger exceeded the pH, settleable matter, total dissolved solids (TDS), total suspended solids (TSS), and turbidity limitations of Order No. R2-2008-0011. Specifically, the Discharger exceeded the pH limitations 80 times, the settleable matter limitations 16 times, the TDS limitation 314 times, the TSS limitations 45 times, the turbidity limitation 81 times, and the chloride limitation once. These exceedances are tabulated in Attachment F-1. Regional Water Board staff is working with U.S. EPA staff to determine appropriate next steps.

III. APPLICABLE PLANS, POLICIES, AND REGULATIONS

The requirements in this Order are based on the requirements and authorities described below:

A. Legal Authorities. This Order serves as WDRs pursuant to Water Code article 4, chapter 4, division 7 (commencing with § 13260). This Order is also issued pursuant to Clean Water Act (CWA) section 402 and implementing regulations adopted by U.S. EPA, and Water Code chapter 5.5, division 7 (commencing with § 13370). It shall serve as an NPDES permit for point source discharges from this facility to surface waters.

B. California Environmental Quality Act. Under Water Code section 13389, this action to adopt an NPDES permit is exempt from the provisions of the California Environmental Quality Act, Public Resources Code division 13, chapter 3 (commencing with § 21100). Compliance with the provisions of CEQA is only required for NPDES permit actions pertaining to new sources as defined by the federal Clean Water Act (i.e., sources constructed after New Source Performance Standards were published). The Facility has been in operation since before February 23, 1977, when the first relevant New Source Performance Standards were published. U. S. EPA guidance states that the source of an industrial discharge is the facility generating the discharge, not the system treating it; thus, Lehigh's construction of a new treatment system does not trigger new source requirements.

C. State and Federal Regulations, Policies, and Plans

1. **Water Quality Control Plan.** The San Francisco Bay Regional Water Board (Regional Water Board) adopted *The Water Quality Control Plan for the San Francisco Bay Basin* (hereinafter Basin Plan) that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. Requirements in this Order implement the Basin Plan. In addition, State Water Board Resolution 88-63 established State policy that all waters, with

certain exceptions, should be considered suitable or potentially suitable for municipal or domestic supply. Permanente Creek does not meet any of the exceptions under State Water Board Resolution 88-63. Therefore, the municipal or domestic supply beneficial use applies. Beneficial uses applicable to Permanente Creek are as follows:

Table F-4. Beneficial Uses

Discharge Points	Receiving Water	Beneficial Uses
001 002 003 004 005 006	Permanente Creek	Groundwater recharge (GWR) Cold freshwater habitat (COLD) Warm freshwater habitat (WARM) Preservation of rare, threatened or endangered species (RARE) Fish spawning (SPWN) Wildlife habitat (WILD) Contact water recreation (REC-1) Non-contact water recreation (REC-2) Municipal and domestic water supply (MUN)

2. **Thermal Plan.** The State Water Board adopted the *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California* (Thermal Plan) on January 7, 1971, and amended it on September 18, 1975. This plan contains temperature objectives for surface waters. Permanente Creek supports warm and cold water habitat beneficial uses; therefore, the Thermal Plan temperature objectives apply.

3. **National Toxics Rule (NTR) and California Toxics Rule (CTR).** U.S. EPA adopted the NTR on December 22, 1992, and amended it on May 4, 1995, and November 9, 1999. About 40 criteria in the NTR apply in California. On May 18, 2000, U.S. EPA adopted the CTR. The CTR promulgated new toxics criteria for California and incorporated the previously adopted NTR criteria that applied in the State. U.S. EPA amended the CTR on February 13, 2001. These rules contain water quality criteria for priority pollutants.

4. **State Implementation Policy.** On March 2, 2000, the State Water Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP). The SIP became effective on April 28, 2000, with respect to the priority pollutant criteria U.S. EPA promulgated for California through the NTR and the priority pollutant objectives the Regional Water Board established in the Basin Plan. The SIP became effective on May 18, 2000, with respect to the priority pollutant criteria U.S. EPA promulgated through the CTR. The State Water Board adopted amendments to the SIP on February 24, 2005, that became effective on July 13, 2005. The SIP establishes implementation provisions for priority pollutant criteria and objectives, and provisions for chronic toxicity control. Requirements of this Order implement the SIP.

5. **Antidegradation Policy.** Federal regulations at 40 C.F.R. section 131.12 requires that state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy through State Water Board Resolution 68-16, which is deemed to incorporate the federal antidegradation policy where the federal policy applies under federal law. Resolution 68-16 requires that existing water quality be maintained unless degradation is justified based on specific findings. The Basin Plan implements, and incorporates by reference, both the State and federal

antidegradation policies. Permitted discharges must be consistent with the antidegradation provisions of 40 C.F.R. section 131.12 and State Water Board Resolution 68-16.

6. **Safe, Clean, Affordable, and Accessible Water.** Water Code section 106.3 states that the policy of the State of California is that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. This Order promotes that policy by requiring discharges to meet maximum contaminant levels designed to protect human health and ensure that water is safe for domestic use.

7. **Anti-Backsliding Requirements.** CWA sections 402(o) and 303(d)(4) and 40 C.F.R. section 122.44(l) restrict backsliding in NPDES permits. These anti-backsliding provisions require that effluent limitations in a reissued permit be as stringent as those in the previous permit, with some exceptions in which limitations may be relaxed.

8. **Endangered Species Act Requirements.** This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code §§ 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C.A. §§ 1531 to 1544). This Order requires compliance with effluent limits, receiving water limits, and other requirements to protect the beneficial uses of waters of the State, including protecting rare, threatened, or endangered species. The Discharger is responsible for meeting all applicable Endangered Species Act requirements.

D. **Impaired Waters on CWA 303(d) List.** In October 2011, U.S. EPA approved a revised list of impaired waters prepared pursuant to CWA section 303(d), which requires identification of specific water bodies where it is expected that water quality standards will not be met after implementation of technology-based effluent limitations on point sources. Where it has not done so already, the Regional Water Board plans to adopt Total Maximum Daily Loads (TMDLs) for waters on the 303(d) list. TMDLs establish wasteload allocations for point sources and load allocations for non-point sources, and are established to achieve the water quality standards for the impaired waters.

Permanente Creek is listed as an impaired water body on the 303(d) list. The pollutants impairing Permanente Creek are diazinon, selenium, toxicity, and trash. On May 16, 2007, U.S. EPA approved a TMDL for diazinon and pesticide-related toxicity in urban creeks. The TMDL for diazinon and pesticide-related toxicity in urban creeks is incorporated into the Basin Plan. Only municipal stormwater received an allocation for diazinon and pesticide-related toxicity under the TMDL. No available data indicate that the Facility discharges diazinon or pesticides. TMDLs have not yet been completed for selenium or trash.

IV. RATIONALE FOR EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

The Clean Water Act requires point source dischargers to control the amount of conventional, non-conventional, and toxic pollutants discharged into waters of the United States. The control of pollutants discharged is established through effluent limitations and other requirements in NPDES permits. There are two principal bases for effluent limitations: 40 C.F.R. section 122.44(a) requires that permits include applicable technology-based limitations and standards; and 40 C.F.R. section 122.44(d) requires that permits include water quality-based effluent limitations to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of receiving waters.

A. Discharge Prohibitions

1. Prohibitions in this Order

a. **Discharge Prohibition III.A** (No discharge other than as described in this Order): This prohibition is based on 40 C.F.R. section 122.21(a), duty to apply, and Water Code section 13260, which requires filing an application and Report of Waste Discharge before discharges can occur. Discharges not described in the permit application and Report of Waste Discharge, and subsequently in this Order, are prohibited. This Order authorizes only discharges consistent with the final treatment and control configuration; therefore, discharges from other configurations are not authorized and would violate this Order.

b. **Discharge Prohibition III.B** (No flow above 167,000 gph at Discharge Point No. 001): This prohibition ensures that wastewater flows do not exceed the design capacity of the wastewater treatment facility to be constructed.

c. **Discharge Prohibition III.C** (No discharge other than that due to precipitation at Discharge Point Nos. 002 through 006, except for discharge of retained stormwater): This prohibition ensures that these discharge points only discharge stormwater.

d. **Discharge Prohibition III.D** (No discharge of kiln exhaust cooling water): This prohibition ensures that elevated temperature wastewater will not be discharged to Permanente Creek. During normal plant operations all kiln exhaust cooling water is evaporated; therefore, this Order implements this prohibition instead of an effluent temperature limitation.

2. **Exception to Shallow Water Discharge Prohibition.** Basin Plan Table 4-1, Discharge Prohibition 1, prohibits discharges not receiving a minimum of 10:1 initial dilution. Basin Plan section 4.2 provides for exceptions under certain circumstances:

- An inordinate burden would be placed on the Discharger relative to the beneficial uses protected, and an equivalent level of environmental protection can be achieved by alternate means;
- A discharge is approved as part of a reclamation project;
- Net environmental benefits will be derived as a result of the discharge; or
- A discharge is approved as part of a groundwater cleanup project.

The Basin Plan further states:

> Significant factors to be considered by the Regional Water Board in reviewing requests for exceptions will be the reliability of the discharger's system in preventing inadequately treated wastewater from being discharged to the receiving water and the environmental consequences of such discharges.

This Order grants an exception for discharges to Permanente Creek for the following reasons:

a. An inordinate burden would be placed on the Discharger relative to the beneficial uses protected to require the discharge to achieve 10:1 dilution in Permanente Creek.

Upstream flow in Permanente Creek is insufficient to achieve 10:1 dilution consistently throughout the year, and constructing and operating a deepwater outfall to provide consistent dilution (e.g., in San Francisco Bay) would require construction and operation of a discharge pipe several miles long.

b. Provision VI.C.5 of this Order requires the Discharger to provide an equivalent level of environmental protection by preparing and maintaining a Facility Reliability Assurance Plan and submitting reliability status reports. The plan will protect against discharge of inadequately-treated wastewater and provide protection against the potential effects of any abnormal discharge that could be caused by temporary treatment plant upset or malfunction.

B. Technology-Based Effluent Limitations

1. Scope and Authority

CWA section 301(b) and 40 C.F.R. section 122.44 require that permits include conditions meeting technology-based requirements at a minimum and any more stringent effluent limitations necessary to meet water quality standards. The discharges this Order authorizes must meet minimum federal technology-based requirements based on U.S. EPA-promulgated Effluent Limit Guidelines for the Cement Manufacturing Point Source Category at 40 C.F.R. section 411 and the Mining Point Source Category at 40 C.F.R. section 436. The effluent limitations established by these codes and their applicability to the discharges permitted by this Order are summarized below and in Table F-5.

- Regulations at 40 C.F.R. section 411 subpart A (Nonleaching Subcategory) apply to process wastewater from nonleaching cement manufacturing directed to Discharge Point No. 001.
- Regulations at 40 C.F.R. section 411 subpart C (Materials Storage Piles Runoff Subcategory) apply to Discharge Point Nos. 001 through 006 because these discharges contain runoff from raw materials, intermediate products, finished products, or waste materials.
- Regulations at 40 C.F.R. section 436 subparts B (Crushed Stone Subcategory) and C (Construction Sand and Gravel Subcategory) apply to Discharge Point Nos. 001 and 004 because these discharges contain mine dewatering water or wastewater associated with mining and processing crushed stone, such as the limestone used in cement manufacturing and the construction aggregate produced at the Facility.

The requirements of these Effluent Limit Guidelines are summarized below. The Basin Plan contains additional requirements for certain pollutants.

Table F-5. Technology-Based Requirements for Cement Manufacturing and Mining

Parameter	Maximum Daily Effluent Limitation
40 C.F.R. section 411 subpart A (applicable to 001)	
Total Suspended Solids (TSS) (process wastewater)	0.005 pounds per 1,000 pounds product
Temperature [1]	Not to exceed 3°C rise above inlet temperature
40 C.F.R. section 411 subpart C (applicable to 001 through 006)	
TSS (runoff) [2]	50 mg/L
Ph	6.0 – 9.0 standard units

Parameter	Maximum Daily Effluent Limitation
40 C.F.R. section 436 subparts B and C (applicable to 001)	
pH	6.0 – 9.0 standard units

Footnotes:

[1] Because Facility cooling water is evaporated after use and not discharged, this Order does not implement this limit.

[2] Untreated overflow from facilities designed, constructed, and operated to treat the volume of runoff from materials storage associated with a 10-year 24-hour rain event is not subject to this limitation. Because none of the Facility's ponds meet these conditions, all discharges covered by this Order are subject to this limitation.

2. Effluent Limitations

Rationales for this Order's technology-based effluent limitations are presented below. Based on existing discharge data, the Discharger is unlikely to be able to comply with these limits prior to implementing its planned future treatment and controls; therefore, discharges of these pollutants could violate this Order.

a. Discharge Point No. 001

Discharges from Discharge Point No. 001 are subject to the Effluent Limitation Guidelines in 40 C.F.R. as summarized in Table F-5.

i. **Total Suspended Solids (TSS).** The TSS effluent limitation applies to Monitoring Location EFF-001A and is based on the rate of cement production in accordance with 40 C.F.R. section 411 subpart A (Non-leaching Subcategory). The Discharger's Report of Waste Discharge reports its production rate as 11,520,000 pounds (lbs) of Portland cement per day. The maximum daily TSS limit is therefore calculated as follows:

11,520,000 lbs cement /day x 0.005 lbs TSS / 1,000 lbs cement = 58 lbs/day TSS

This Order does not contain the TSS effluent limitations in Basin Plan Table 4-2 because the Basin Plan states, "[the TSS limits] will not be used to preempt Effluent Guideline Limitations."

ii. **Oil and Grease.** The oil and grease effluent limitations are based on Basin Plan Table 4-2.

iii. **pH.** The pH effluent limitations are based on Basin Plan Table 4-2, which is more stringent than 40 C.F.R. sections 411 and 436.

iv. **Total Residual Chlorine.** The total residual chlorine effluent limitation is based on Basin Plan Table 4-2. Chlorine may be present when potable water is used onsite as make-up Primary Crusher wash water, Rock Plant wash water, Truck Wash water, or dust suppression water.

v. **Settleable Matter.** The settleable matter effluent limitations are based on Basin Plan Table 4-2.

b. Discharge Point Nos. 002 through 005

Discharges from Discharge Point Nos. 002 and 005 are subject to the Effluent Limitation Guidelines in 40 C.F.R. section 411 subpart C (Materials Storage Piles Runoff Subcategory).

i. **Total Suspended Solids (TSS).** The TSS effluent limitation is based on 40 C.F.R. section 411, Subpart C (Materials Storage Piles Runoff Subcategory). This Order does not contain the TSS effluent limitations in Basin Plan Table 4-2 because the Basin Plan states, "[the TSS limits] will not be used to preempt Effluent Guideline Limitations."

ii. **Oil and Grease.** The oil and grease effluent limitations are based on Basin Plan Table 4-2.

iii. **pH.** The pH effluent limitations are based on Basin Plan Table 4-2, which is more stringent than 40 C.F.R. sections 411 and 436..

iv. **Settleable Matter.** The settleable matter effluent limitations are based on Basin Plan Table 4-2.

v. **Turbidity.** The turbidity effluent limitation is established using Order No. R2-2008-0011, which previously regulated this discharge, as guidance. The limitation in that order was based on the performance of similar facilities. No changes to the Facility that would change the nature of this discharge or its treatment are planned; thus, the turbidity limit is the same as in that order.

c. Discharge Point No. 006

Discharges from Discharge Point No. 006 are subject to the Effluent Limitation Guidelines in 40 C.F.R. section 411 subpart C (Materials Storage Piles Runoff Subcategory).

i. **Total Suspended Solids (TSS).** The TSS effluent limitation is based on 40 C.F.R. section 411, Subpart C (Materials Storage Piles Runoff Subcategory). This Order does not contain the TSS effluent limitations in Basin Plan Table 4-2 because the Basin Plan states, "[the TSS limits] will not be used to preempt Effluent Guideline Limitations." Based on existing discharge data, the Discharger is unlikely to be able to comply at Discharge Point No. 006; therefore, these discharges may violate this Order.

ii. **pH.** The pH effluent limitations are based on Basin Plan Table 4-2, which is more stringent than 40 C.F.R. sections 411.

iii. **Settleable Matter.** The settleable matter effluent limitations are based on Basin Plan Table 4-2.

C. Water Quality-Based Effluent Limitations

1. Scope and Authority

This Order contains Water Quality Based Effluent Limitations (WQBELs) that implement water quality objectives that protect beneficial uses. CWA section 301(b) and 40 C.F.R. section

122.44(d) require that permits include limitations more stringent than federal technology-based requirements where necessary to achieve applicable water quality standards. According to 40 C.F.R. section 122.44(d)(1)(i), permits must include effluent limitations for all pollutants that are or may be discharged at levels that have a reasonable potential to cause or contribute to an exceedance of a water quality standard, including numeric and narrative objectives within a standard. Where reasonable potential has been established for a pollutant, but there is no numeric criterion or objective, WQBELs must be established using (1) U.S. EPA criteria guidance under CWA section 304(a), supplemented where necessary by other relevant information; (2) an indicator parameter for the pollutant of concern; or (3) a calculated numeric water quality criterion, such as a proposed state criterion or policy interpreting a narrative criterion, supplemented with relevant information (40 C.F.R. § 122.44[d][1][vi]). The process for determining reasonable potential and calculating WQBELs is intended to achieve applicable water quality objectives and criteria and protect designated uses of receiving waters as specified in the Basin Plan. This Order imposes numeric effluent limitations for pollutants with reasonable potential to cause or contribute to exceedances of water quality standards.

2. Beneficial Uses and Water Quality Criteria and Objectives

Discharge Point Nos. 001 through 006 discharge to Permanente Creek. Section III.C.1, above, identifies the beneficial uses of Permanente Creek. Water quality criteria and objectives to protect these beneficial uses are described below:

a. **Basin Plan Objectives.** The Basin Plan specifies numeric water quality objectives for numerous pollutants and narrative water quality objectives for others, including toxicity. The narrative toxicity objective states, “All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms.”

b. **California Toxics Rule Criteria.** The CTR specifies numeric aquatic life and human health criteria for numerous priority pollutants. These criteria apply to inland surface waters and enclosed bays and estuaries. Some human health criteria are for consumption of “water and organisms” and others are for consumption of “organisms only.” The CTR criteria applicable to “water and organisms” apply to Permanente Creek because it is considered a potential source of drinking water, as described in Fact Sheet section III.C.1, above.

c. **National Toxics Rule Criteria.** The NTR establishes numeric aquatic life and human health criteria for a number of toxic pollutants for San Francisco Bay waters upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta. The NTR criteria apply to Permanente Creek.

d. **Receiving Water Salinity.** Basin Plan section 4.6.2 (like the CTR and NTR) states that the salinity characteristics (i.e., freshwater versus saltwater) of the receiving water are to be considered in determining the applicable water quality objectives. Freshwater criteria apply to discharges to waters with salinities equal to or less than one part per thousand (ppt) at least 95 percent of the time. Saltwater criteria apply to discharges to waters with salinities equal to or greater than 10 ppt at least 95 percent of the time in a normal water year. For discharges to waters with salinities between these two categories, or tidally-influenced freshwaters that support estuarine beneficial uses, the water quality objectives are the lower of the salt or freshwater objectives (the latter calculated based on ambient hardness) for each substance.

Permanente Creek is an inland freshwater stream as confirmed by salinity data collected in 2011 and 2013. No salinity was detected in any sample. Permanente Creek is therefore classified as freshwater, and the reasonable potential analysis and WQBELs are based on freshwater water quality criteria and objectives.

e. Receiving Water Hardness. Ambient hardness data are used to calculate freshwater water quality objectives that are hardness dependent. The water quality objectives for this Order are based on a hardness of 252 mg/L as $CaCO_3$, which is the lowest observed hardness at the confluence of Wild Violet Creek and Permanente Creek (Monitoring Location RSW-001A as defined in the Monitoring and Reporting Program; see section IV.C.3.c, below).

3. Need for Water Quality-Based Effluent Limitations (Reasonable Potential Analysis)

Assessing whether a pollutant has reasonable potential to exceed a water quality objective is the fundamental step in determining whether a WQBEL is required. The reasonable potential analysis in this Order applies to Discharge Point No. 001, where process wastewaters are actively generated and discharged. These process wastewater discharges are subject to numeric WQBELs where reasonable potential is indicated. Discharges from the remaining outfalls consist of primarily stormwater subject to narrative WQBELs in the form of BMPs.

a. Methodology. State Implementation Policy section 1.3 sets forth the methodology used for this Order for assessing whether a pollutant has reasonable potential to exceed a water quality objective. The analysis begins with identifying the maximum effluent concentration (MEC) observed for each pollutant based on available effluent concentration data and the ambient background concentration (B). State Implementation Policy section 1.4.3 states that ambient background concentrations are either the maximum ambient concentration observed or, for water quality objectives intended to protect human health, the arithmetic mean of observed concentrations. There are three triggers in determining reasonable potential:

i. Trigger 1 is activated if the maximum effluent concentration is greater than or equal to the lowest applicable water quality objective (MEC $\geq$ water quality objective).

ii. Trigger 2 is activated if the ambient background concentration observed in the receiving water is greater than the water quality objective (B > water quality objective) *and* the pollutant is detected in any effluent sample.

iii. Trigger 3 is activated if a review of other information indicates that a WQBEL is needed to protect beneficial uses.

b. Effluent Data. The reasonable potential analysis for this Order is based on the combined effluent data from Discharge Point Nos. 001 through 003 that the Discharger collected from July 2011 through March 2013. Process wastewaters are currently routinely discharged from these points. Data on discharges from the remaining points are mainly for stormwater. Relying on the data from Discharge Point Nos. 001 through 003 is a conservative approach because the resulting reasonable potential analysis and effluent limitation calculations are based on data that reflect significantly higher pollutant concentrations than the treated effluent will have when all treatment and controls are in place, and because it excludes data from less contaminated stormwater-dominated discharges.

All the Facility's process wastewaters, including those currently discharged from Discharge Point Nos. 002 and 003, will be redirected and discharged from Discharge Point No. 001 as part of planned changes to meet this Order's requirements. Therefore, while the reasonable potential analysis reflects the data from Discharge Point Nos. 002 and 003, the resulting limits apply only to Discharge Point No. 001.

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c. **Ambient Background Data.** The reasonable potential analysis for this Order is based on background data collected in 2013 at Monitoring Location RSW-001A. This location was chosen based on its accessibility, geological appropriateness, likely perennial flow, and lack of chemical influences from the Facility or other land uses (*Background Monitoring Locations Plan and Reporting, Water Code section 13267 Order No. R2-2013-1005, Order Item No. 6,* Golder Associates, March 6, 2013). Background data were reported in a background monitoring report (*Background Monitoring Report, Water Code section 13267 Order No. R2-2013-1005, Order Item No. 6,* Golder Associates, March 22, 2013) and subsequent quarterly monitoring reports.

d. **Reasonable Potential Analysis.** The maximum effluent concentrations, most stringent applicable water quality criteria and objectives, and ambient background concentrations used in the analysis are presented in the following table, along with the reasonable potential analysis results (yes or no) for each pollutant. The pollutants that exhibit reasonable potential are chromium (VI), mercury, nickel, selenium, thallium, total dissolved solids (TDS), and turbidity.

Table F-6. Reasonable Potential Analysis

CTR #	Pollutant	Governing criterion or objective (μg/L)	MEC or Minimum DL [1][2] (μg/L)	B or Minimum DL [1][2] (μg/L)	Result [3]
1	Antimony	6.0	2.4	< 0.02	No
2	Arsenic	10	5.7	< 0.7	No
3	Beryllium	4.0	0.14	< 0.02	No
4	Cadmium	2.3	0.85	< 0.02	No
5a	Chromium (III)	50	13	0.75	No
5b	**Chromium (VI)**	**11**	**12**	**0.75**	**Yes**
6	Copper	26	11	< 0.04	No
7	Lead	15	0.96	< 0.02	No
8	**Mercury**	**0.025**	**0.51**	**< 0.0005**	**Yes**
9	**Nickel**	**100**	**350**	**1.8**	**Yes**
10	**Selenium**	**5.0**	**75**	**< 0.07**	**Yes**
11	Silver	32	0.10	< 0.020	No
12	**Thallium**	**1.7**	**2.0**	**< 0.020**	**Yes**
13	Zinc	329	170	< 0.5	No
14	Cyanide	5.2	3.5	2.9	No
15	Asbestos	7000000	593	51	No
16	2,3,7,8-TCDD (Dioxin)	0.000000013	< 4.45x10-7	6.30E-07	U
17	Acrolein	320	< 0.50	< 0.62	No
18	Acrylonitrile	0.059	< 0.19	< 0.19	U
19	Benzene	1.0	< 0.053	< 0.053	No
20	Bromoform	4.3	< 0.093	< 0.093	No
21	Carbon Tetrachloride	0.25	< 0.11	< 0.11	No
22	Chlorobenzene	70	< 0.083	< 0.083	No

CTR #	Pollutant	Governing criterion or objective (μg/L)	MEC or Minimum DL [1][2] (μg/L)	B or Minimum DL [1][2] (μg/L)	Result [3]
23	Chlorodibromomethane	0.401	< 0.075	< 0.075	No
24	Chloroethane	No Criteria	< 0.13	< 0.13	U
25	2-Chloroethylvinyl Ether	No Criteria	< 0.93	< 0.93	U
26	Chloroform	No Criteria	< 0.11	< 0.11	U
27	Dichlorobromomethane	0.56	< 0.095	< 0.095	No
28	1,1-Dichloroethane	5	< 0.072	< 0.072	No
29	1,2-Dichloroethane	0.38	< 0.17	< 0.17	No
30	1,1-Dichloroethylene	0.057	< 0.14	< 0.14	U
31	1,2-Dichloropropane	0.52	< 0.12	< 0.12	No
32	1,3-Dichloropropylene	0.5	< 0.06	< 0.060	No
33	Ethylbenzene	300	< 0.08	< 0.080	No
34	Methyl Bromide	48	Unavailable	Unavailable	No
35	Methyl Chloride	No Criteria	Unavailable	Unavailable	U
36	Methylene Chloride	4.7	< 0.17	< 0.48	No
37	1,1,2,2-Tetrachloroethane	0.17	< 0.086	< 0.086	No
38	Tetrachloroethylene	0.8	< 0.092	< 0.092	No
39	Toluene	150	< 0.092	< 0.092	No
40	1,2-Trans-Dichloroethylene	10	< 0.11	< 0.11	No
41	1,1,1-Trichloroethane	200	< 0.091	< 0.091	No
42	1,1,2-Trichloroethane	0.6	< 0.13	< 0.13	No
43	Trichloroethylene	2.7	< 0.12	< 0.12	No
44	Vinyl Chloride	0.5	< 0.060	< 0.060	No
45	Chlorophenol	120	< 0.66	< 0.66	No
46	2,4-Dichlorophenol	93	< 0.66	< 0.66	No
47	2,4-Dimethylphenol	540	< 1.2	< 1.2	No
48	2-Methyl-4,6-Dinitrophenol	13.4	< 0.75	< 0.75	No
49	2,4-Dinitrophenol	70	< 1.3	< 1.3	No
50	2-Nitrophenol	No Criteria	< 0.90	< 0.90	U
51	4-Nitrophenol	No Criteria	< 0.99	< 0.99	U
52	3-Methyl-4-Chlorophenol	No Criteria	1.6	< 0.58	U
53	Pentachlorophenol	0.28	< 1.4	< 1.4	U
54	Phenol	21000	< 0.46	< 0.46	No
55	2,4,6-Trichlorophenol	2.1	< 0.74	< 0.74	No
56	Acenaphthene	1200	< 0.57	< 0.57	No
57	Acenaphthylene	No Criteria	< 0.48	< 0.48	U
58	Anthracene	9600	< 0.39	< 0.39	No
59	Benzidine	0.00012	< 3.4	< 3.4	No
60	Benzo(a)Anthracene	0.0044	< 0.39	< 0.39	No
61	Benzo(a)Pyrene	0.0044	< 0.5	< 0.50	No
62	Benzo(b)Fluoranthene	0.0044	< 0.64	< 0.64	No
63	Benzo(ghi)Perylene	No Criteria	< 0.93	< 0.93	U
64	Benzo(k)Fluoranthene	0.0044	< 0.34	< 0.34	No
65	Bis(2-Chloroethoxy)Methane	No Criteria	< 0.81	< 0.81	U
66	Bis(2-Chloroethyl)Ether	0.031	< 0.14	< 0.14	U
67	Bis(2-Chloroisopropyl)Ether	1400	< 0.41	< 0.41	No
68	Bis(2-Ethylhexyl)Phthalate	1.8	< 0.83	< 0.83	No
69	4-Bromophenyl Phenyl Ether	No Criteria	< 0.43	< 0.43	U
70	Butylbenzyl Phthalate	3000	< 0.64	< 0.64	No
71	2-Chloronaphthalene	1700	< 0.57	< 0.57	No
72	4-Chlorophenyl Phenyl Ether	No Criteria	< 0.93	< 0.93	U
73	Chrysene	0.0044	< 0.76	< 0.76	No
74	Dibenzo(a,h)Anthracene	0.0044	< 0.83	< 0.83	No
75	1,2-Dichlorobenzene	600	< 0.099	< 0.099	No
76	1,3-Dichlorobenzene	400	< 0.069	< 0.069	No
77	1,4-Dichlorobenzene	5	< 0.11	< 0.11	No

CTR #	Pollutant	Governing criterion or objective (µg/L)	MEC or Minimum DL [1][2] (µg/L)	B or Minimum DL [1][2] (µg/L)	Result [3]
78	3,3-Dichlorobenzidine	0.04	< 2	< 2.0	No
79	Diethyl Phthalate	23000	< 0.86	< 0.86	No
80	Dimethyl Phthalate	313000	< 0.68	< 0.68	No
81	Di-n-Butyl Phthalate	2700	< 0.91	< 0.91	No
82	2,4-Dinitrotoluene	0.11	< 0.68	< 0.68	U
83	2,6-Dinitrotoluene	No Criteria	< 0.54	< 0.54	U
84	Di-n-Octyl Phthalate	No Criteria	< 0.65	< 0.65	U
85	1,2-Diphenylhydrazine	0.04	< 0.3	< 0.33	U
86	Fluoranthene	300	< 0.76	< 0.76	No
87	Fluorene	1300	< 0.81	< 0.81	No
88	Hexachlorobenzene	0.00075	< 0.89	< 0.89	No
89	Hexachlorobutadiene	0.44	< 0.84	< 0.84	U
90	Hexachlorocyclopentadiene	50	< 0.45	< 0.45	No
91	Hexachloroethane	1.9	< 0.58	< 0.58	No
92	Indeno(1,2,3-cd) Pyrene	0.0044	< 0.63	< 0.63	No
93	Isophorone	8.4	< 0.81	< 0.81	No
94	Naphthalene	No Criteria	< 0.66	< 0.66	U
95	Nitrobenzene	17	< 0.74	< 0.74	No
96	N-Nitrosodimethylamine	0.00069	< 1.1	< 1.1	U
97	N-Nitrosodi-n-Propylamine	0.005	< 0.85	< 0.85	U
98	N-Nitrosodiphenylamine	5	< 0.9	< 0.90	No
99	Phenanthrene	No Criteria	< 0.65	< 0.65	U
100	Pyrene	960	< 0.45	< 0.45	No
101	1,2,4-Trichlorobenzene	5	< 0.59	< 0.59	No
102	Aldrin	0.00013	< 0.004	< 0.0040	No
103	alpha-BHC	0.0039	< 0.002	< 0.0020	No
104	beta-BHC	0.014	< 0.002	< 0.0020	No
105	gamma-BHC	0.019	< 0.002	< 0.0020	No
106	delta-BHC	No Criteria	< 0.001	< 0.0010	U
107	Chlordane	0.00057	< 0.035	< 0.035	No
108	4,4-DDT	0.00059	< 0.005	< 0.0050	No
109	4,4-DDE	0.00059	< 0.003	< 0.0030	No
110	4,4-DDD	0.00083	< 0.002	< 0.0020	No
111	Dieldrin	0.00014	< 0.002	< 0.0020	No
112	alpha-Endosulfan	0.056	< 0.003	< 0.0030	No
113	beta-Endosulfan	0.056	< 0.002	< 0.0020	No
114	Endosulfan Sulfate	110	< 0.002	< 0.0020	No
115	Endrin	0.036	< 0.003	< 0.0030	No
116	Endrin Aldehyde	0.76	< 0.002	< 0.0020	No
117	Heptachlor	0.00021	< 0.002	< 0.0020	No
118	Heptachlor Epoxide	0.0001	< 0.002	< 0.0020	No
119-125	PCBs sum	0.00017	< 0.32	< 0.32	No
126	Toxaphene	0.0002	< 0.45	< 0.45	No
	Tributyltin	0.072	< 0.05	< 0.050	No
	Total PAHs	No Criteria	< 9.55	< 9.97	No
	Total Ammonia (mg/L N)	0.95 [4]	0.13	0.12	No
	Total Dissolved Solids (mg/L)	**1,000**	**1,500**	**310**	**Yes**
	Turbidity (NTU)	**5.0**	**1,000**	**1.7**	**Yes**
	Chloride (mg/L)	250	120	11	No

Footnotes:

[1] The maximum effluent concentration and ambient background concentration are the actual detected concentrations unless preceded by a "<" sign, in which case the value shown is the minimum detection level (DL).

[2] The maximum effluent concentration or ambient background concentration is "Unavailable" when there are no monitoring data for the constituent.

[3] RPA Results = Yes, if MEC ≥ WQC, B > WQC and MEC is detected, or Trigger 3
= No, if MEC and B are < WQC or all effluent data are undetected
= Undetermined (U), if no criteria have been promulgated or data are insufficient.

[4] The total ammonia water quality objective (as nitrogen) is translated from the Basin Plan's annual median un-ionized ammonia water quality objective of 0.025 mg/L using the salinity, pH, and temperature of the receiving water according to *Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013*, EPA Publication No. 822-R-13-001. U.S. EPA, April, 2013.

e. **Temperature.** Permanente Creek supports warm and cold water habitat beneficial uses; Basin Plan and Thermal Plan temperature objectives therefore apply. Available temperature data are insufficient to determine if the discharges to Permanente Creek cause any exceedances of temperature objectives: no effluent data are available and receiving water data cover only the first quarter of 2013. Available receiving water data do not show an impact from the Facility on the receiving water temperature, but additional data, including dry season data, are needed to fully characterize the receiving water temperature year-round. The Monitoring and Reporting Program requires monitoring of background, effluent, and downstream receiving water temperatures to support future reasonable potential analysis.

f. **Constituents with limited data.** In some cases, reasonable potential cannot be determined because effluent data are limited or ambient background concentrations are unavailable. Provision VI.C.2 of this Order requires the Discharger to continue monitoring for these constituents in its effluent. When additional data become available, further analysis will be conducted to determine whether numeric effluent limitations are necessary.

g. **Pollutants with No Reasonable Potential.** This Order does not contain WQBELs for constituents that do not demonstrate reasonable potential; however, Provision VI.C.2 of this Order still requires monitoring for those pollutants. If concentrations are found to have increased significantly, Provision VI.C.2 requires the Discharger to investigate the sources of the increases and implement remedial measures if the increases threaten receiving water quality.

4. Water Quality-Based Effluent Limitation Calculations

WQBELs were developed for the pollutants determined to have reasonable potential to cause or contribute to exceedances of water quality objectives. The WQBELs are based on the procedures specified in State Implementation Policy section 1.4.

a. **WQBEL Development.** For those pollutants with reasonable potential, average monthly effluent limitations (AMELs) and maximum daily effluent limitations (MDELs) were developed as explained below:

(1) Chromium (VI)

(a) Water Quality Criteria. The most stringent chromium (VI) criteria are the Basin Plan and NTR freshwater aquatic life chronic and acute criteria of 11 and 16 µg/L. The California Department of Public Health has proposed a more stringent Maximum Contaminant Level of 10 µg/L. We have not implemented it as the water quality criterion for chromium (VI) because it has not been promulgated and may change. If a more stringent Maximum Contaminant Level is promulgated during the term of this Order, the Regional Water Board may reopen the permit or update the effluent limitation when reissuing the permit.

(b) **Reasonable Potential Analysis.** This Order establishes effluent limitations for chromium (VI) because the MEC of 12 µg/L exceeds the governing criterion of 11 µg/L, demonstrating Reasonable Potential by Trigger 1.

(c) **WQBELs.** Effluent limitations for chromium (VI), calculated based on a default data coefficient of variation of 0.6 and no dilution credit, are an AMEL of 8.0 µg/L and an MDEL of 16 µg/L. The default coefficient of variation is used because the coefficient of variation for effluent from the planned treatment system is unknown. Based on existing discharge data, the Discharger is unlikely to be able to comply with these WQBELs prior to implementing its planned future treatment and controls; therefore, chromium (VI) discharges may violate this Order. This Order implements this limit as a flow-weighted average to better control the mass discharged, as chromium is of particular concern with respect to the municipal and domestic supply beneficial use, and the limits are close to the MCL.

(2) Mercury

(a) **Water Quality Objectives.** The most stringent mercury objectives are the Basin Plan freshwater aquatic life chronic and acute objectives of 0.025 and 2.4 µg/L.

(b) **Reasonable Potential Analysis.** This Order establishes effluent limitations for mercury because the MEC of 0.051 µg/L exceeds the governing objective of 0.025 µg/L, demonstrating reasonable potential by Trigger 1.

(c) **WQBELs.** Effluent limitations for mercury, calculated based on a default effluent data coefficient of variation of 0.6 and no dilution credit, are an AMEL of 0.020 µg/L and an MDEL of 0.041 µg/L. The default coefficient of variation is used because the coefficient of variation for effluent from the planned treatment system is unknown. Based on existing discharge data, the Discharger is unlikely to be able to comply with these WQBELs prior to implementing its planned future treatment and controls; therefore, mercury discharges may violate this Order.

(3) Nickel

(a) **Water Quality Objective.** The most stringent nickel objective is the Basin Plan section 3.3.22 objective for municipal supply of 100 µg/L. This is the primary Maximum Contaminant Level for drinking water in CCR title 22.

(b) **Reasonable Potential Analysis.** This Order establishes effluent limitations for nickel because the MEC of 350 µg/L exceeds the governing objective of 100 µg/L, demonstrating reasonable potential by Trigger 1.

(c) **WQBELs.** Effluent limitations for nickel, calculated based on a default effluent data coefficient of variation of 0.6 and no dilution credit, are an AMEL of 82 µg/L and an MDEL of 160 µg/L. The default coefficient of variation is used because the coefficient of variation for effluent from the planned treatment system is unknown. Based on existing discharge data, the Discharger is unlikely to be able to comply with these WQBELs prior to implementing its planned future treatment and controls; therefore, nickel discharges may violate this Order. This

Order implements this limit as a flow-weighted average to better control the mass discharged, as nickel is of particular concern with respect to the municipal and domestic supply beneficial use, and the limits are close to the MCL.

(4) Selenium

(a) Water Quality Criteria. The most stringent selenium criteria are the NTR freshwater aquatic life chronic and acute criteria of 5.0 and 20 µg/L.

(b) Reasonable Potential Analysis. This Order establishes effluent limitations for selenium because the MEC of 75 µg/L exceeds the governing criterion of 5.0 µg/L, demonstrating reasonable potential by Trigger 1.

(c) WQBELs. Effluent limitations for selenium, calculated based on a default effluent data coefficient of variation of 0.6 and no dilution credit, are an AMEL of 4.1 µg/L and an MDEL of 8.2 µg/L. The default coefficient of variation is used because the coefficient of variation for effluent from the planned treatment system is unknown. Based on existing discharge data, the Discharger is unlikely to be able to comply with these WQBELs prior to implementing its planned future treatment and controls; therefore, selenium discharges may violate this Order.

(5) Thallium

(a) Water Quality Criterion. The most stringent thallium criterion is the CTR human health criterion of 1.7 µg/L when both water and organisms are consumed from the receiving water.

(b) Reasonable Potential Analysis. This Order establishes effluent limitations for thallium because the MEC of 2.0 µg/L exceeds the governing criterion of 1.7 µg/L, demonstrating reasonable potential by Trigger 1.

(c) WQBELs. Effluent limitations for thallium, calculated based on a default effluent data coefficient of variation 0.6 and no dilution credit, are an AMEL of 1.7 µg/L and an MDEL of 3.4 µg/L. The default coefficient of variation is used because the coefficient of variation for effluent from the planned treatment system is unknown. This Order implements this limit as a flow-weighted average to better control the mass discharged, as thallium is of particular concern with respect to the municipal and domestic supply beneficial use, and the limits are close to the MCL.

(6) Total Dissolved Solids (TDS)

(a) Water Quality Objective. The most stringent TDS objective is the Basin Plan section 3.3.22 objective for municipal supply. Basin Plan section 3.3.22 establishes the secondary Maximum Contaminant Levels at CCR title 22, Tables 64449-A and B, as water quality objectives for municipal and agricultural water supply. For TDS, the secondary Maximum Contaminant Level is listed as a range from 500 mg/L to 1,000 mg/L. This Order uses 1,000 mg/L because the secondary Maximum Contaminant Levels are guidelines for aesthetic considerations, such as taste, color and odor, cosmetic effects, and technical effects, such as staining, scaling, and corrosion. Contaminants subject to secondary Maximum

Contaminant Levels do not present human health or aquatic life risks when at concentrations below the secondary Maximum Contaminant Level.

(b) Reasonable Potential Analysis. This Order establishes effluent limitations for TDS because the MEC of 1,500 mg/L exceeds the governing objective of 1,000 mg/L, demonstrating reasonable potential by Trigger 1.

(c) WQBELs. For TDS, WQBELs are calculated using the State Implementation Policy as guidance. Although the secondary Maximum Contaminant Levels do not have defined averaging periods, the TDS WQBELs are calculated in a manner similar to those for human health objectives (i.e., as a long-term averages) because water used downstream for municipal supply would likely be well mixed with water from other sources over time prior to use. Effluent limitations for TDS, calculated based on a default effluent data coefficient of variation 0.6 and no dilution credit, are an AMEL of 1,000 mg/L and an MDEL of 2,000 mg/L. The default coefficient of variation is used because the coefficient of variation for effluent from the planned treatment system is unknown. Based on existing discharge data, the Discharger is unlikely to be able to comply with these WQBELs prior to implementing its planned future treatment and controls; therefore, TDS discharges may violate this Order.

(7) Turbidity

(a) Water Quality Objective. The most stringent turbidity objective is the Basin Plan section 3.3.22 objective for municipal supply. Basin Plan section 3.3.22 establishes the secondary Maximum Contaminant Levels at CCR title 22, Tables 64449-A and B, as water quality objectives for municipal and agricultural water supply. For turbidity, the secondary Maximum Contaminant Level is 5.0 nephelometric turbidity units (NTU).

(b) Reasonable Potential Analysis. This Order establishes effluent limitations for turbidity because the MEC of 1,000 NTU exceeds the governing objective of 5.0 NTU, demonstrating reasonable potential by Trigger 1.

(c) WQBELs. For turbidity, WQBELs are calculated using the SIP as guidance. Secondary Maximum Contaminant Levels do not have defined averaging periods; the WQBELs are calculated similar to human health objectives (i.e., as a long-term average) because water used downstream for municipal supply would receive additional treatment and would likely be mixed with water from other sources. The default coefficient of variation is used because the coefficient of variation for effluent from the planned treatment system is unknown. Effluent limitations for turbidity, calculated based on a default effluent data coefficient of variation 0.6 and no dilution credit, are an AMEL of 5.0 NTU and an MDEL of 10 NTU. Based on existing discharge data, the Discharger is unlikely to be able to comply with these WQBELs prior to implementing its planned future treatment and controls; therefore, turbidity discharges may violate this Order.

b. Calculations. The following table shows the WQBEL calculations.

Table F-7. WQBEL Calculations

PRIORITY POLLUTANTS	Chromium (VI)	Mercury	Nickel	Selenium	Thallium	Total Dissolved Solids	Turbidity
Units	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	NTU
Basis and Criteria type	BP & CTR FW Aquatic Life	BP & CTR FW Aquatic Life	Title 22 Primary MCL	CTR Chronic	Human Health	Title 22 Secondary MCL	Title 22 Secondary MCL
Criteria -Acute	16	2.4	-----	20	-----	-----	-----
Criteria -Chronic	11	0.025	-----	5.0	-----	-----	-----
SSO Criteria -Acute	-----	-----	-----	-----	-----	-----	-----
SSO Criteria -Chronic	-----	-----	-----	-----	-----	-----	-----
Water Effects ratio (WER)	1	1	1	1	1	1	1
Lowest WQO	11	0.025	100	5.0	1.7	1,000	5.0
Site Specific Translator - MDEL	-----	-----	-----	-----	-----	-----	-----
Site Specific Translator - AMEL	-----	-----	-----	-----	-----	-----	-----
Dilution Factor (D) (if applicable)	0	0	0	0	0	0	0
No. of samples per month	4	4	4	4	4	4	4
Aquatic life criteria analysis required? (Y/N)	Y	Y	Y	Y	N	N	N
HH criteria analysis required? (Y/N)	N	Y	Y	N	Y	Y	Y
Applicable Acute WQO	16	2.4		20			
Applicable Chronic WQO	11	0.025	100	5.0			
HH criteria		0.050	610		1.7	1000	5.0
Background (Maximum Conc for Aquatic Life calc)	0.75	0.00050	1.8	0.47			
Background (Average Conc for Human Health calc)		0.00050	1.0		0.020	300	6.1
Is the pollutant on the 303d list (Y/N)?	N	Y	N	Y	N	N	N
ECA acute	16	2.4		20			
ECA chronic	11	0.025	100	5.0			
ECA HH		0.050	610		1.7	1000	5.0
Number of data points <10 or at least 80% of data reported non detect? (Y/N)	Y	N	N	N	N	N	N
Avg of effluent data points	3.4	0.0075	75	33	0.35	959	25
Std Dev of effluent data points	2.5	0.011	102	25	0.40	169	73
CV calculated	N/A	N/A	N/A	N/A	N/A	N/A	N/A

PRIORITY POLLUTANTS	Chromium (VI)	Mercury	Nickel	Selenium	Thallium	Total Dissolved Solids	Turbidity
Units	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	NTU
CV (Selected) - Final	0.60	0.60	0.60	0.60	0.60	0.60	0.60
ECA acute mult99	0.32	0.32	0.32	0.32			
ECA chronic mult99	0.53	0.53	0.53	0.53			
LTA acute	5.1	0.77		6.4			
LTA chronic	5.8	0.013	53	2.6			
minimum of LTAs	5.1	0.013	53	2.6			
AMEL mult95	1.6	1.6	1.6	1.6	1.6	1.6	1.6
MDEL mult99	3.1	3	3.1	3.1	3.1	3.1	3.1
AMEL (aq life)	8.0	0.020	82	4.1			
MDEL(aq life)	16	0.041	164	8.2			
MDEL/AMEL Multiplier	2.0	2.0	2.0	2.0	2.0	2.0	2.0
AMEL (human hlth)		0.050	610		1.7	1000	5.0
MDEL (human hlth)		0.10	1224		3.4	2006	10
minimum of AMEL for Aq. life vs HH	8.0	0.020	82	4.1	1.7	1000	5.0
minimum of MDEL for Aq. Life vs HH	16	0.041	164	8.2	3.4	2006	10
Current limit in permit (30-day average)	-----	-----	-----	-----	-----	-----	-----
Current limit in permit (daily)	-----	-----	-----	-----	-----	-----	-----
Final limit - AMEL	8.0	0.020	82	4.1	1.7	1,000	5.0
Final limit - MDEL	16	0.041	160	8.2	3.4	2,000	10

5. Whole Effluent Acute Toxicity

This Order includes effluent limitations for whole effluent acute toxicity based on Basin Plan Table 4-3. The approved test species specified in the Monitoring and Reporting Program is the rainbow trout (*Oncorhynchus mykiss*), which was also the approved test species under the *General Waste Discharge Requirements for Discharges of Process Wastewaters from Aggregate Mining, Sand Washing, and Sand Offloading Facilities to Surface Waters* (Order No. R2-2008-0011).

6. Whole Effluent Chronic Toxicity

a. **Water Quality Objective.** Basin Plan section 3.3.18 states, "There shall be no chronic toxicity in ambient waters. Chronic toxicity is a detrimental biological effect on growth rate, reproduction, fertilization success, larval development, population abundance, community composition, or any other relevant measure of the health of an organism, population, or community."

b. **Reasonable Potential Analysis.** The Discharger's chronic toxicity monitoring indicates reasonable potential to cause or contribute to a violation of the Basin Plan's chronic toxicity water quality objective. Order No. R2-2013-1005 required the Discharger to monitor chronic toxicity pursuant to Water Code section 13267. The Discharger collected samples from ponds 4A and 9, and from Permanente Creek downstream of ponds 13A and 13B, on March 25, 27, and 29, 2013. The samples were toxic to daphnid (*Ceriodaphnia dubia)*, with results ranging from 2.5 to 27 chronic toxicity units (TU_c). The samples were not toxic to other species tested. The Discharger responded by preparing a *Toxicity Reduction Evaluation Work Plan for Ceriodaphnia dubia* (Robertson-Bryan, Inc., May 2013) and initiating accelerated monitoring in compliance with Order No. R2-2013-1005.

c. **Requirements.** This Order contains a narrative chronic toxicity effluent limitation based on the Basin Plan's narrative toxicity water quality objective. The Monitoring and Reporting Program also includes requirements for chronic toxicity monitoring and monitoring "triggers" for initiation of accelerated monitoring when exceeded and implementation of a chronic toxicity reduction evaluation in some circumstances. The accelerated monitoring triggers are based on Basin Plan Table 4-5. These requirements are also consistent with the State Implementation Policy.

d. **Screening Phase Study and Monitoring Requirements**. The Discharger's chronic toxicity test results indicate that *Ceriodaphnia dubia* is the most sensitive species of those tested. The Monitoring and Reporting Program requires the Discharger to conduct another chronic toxicity screening phase study if there is a significant change in the nature of the effluent after implementation of the final treatment system or prior to permit reissuance to ensure that the most sensitive species is used for testing.

D. Effluent Limitation Considerations

1. **Anti-backsliding.** This Order complies with the anti-backsliding provisions of CWA sections 402(o) and 303(d)(4) and 40 C.F.R. section 122.44(l), which generally require effluent limitations in a reissued permit to be as stringent as those previously in the permit. This Order is a new permit; it does not reissue an existing permit. Moreover, implementation of the interim and final treatment systems constitutes substantially changed circumstances from those in existence at the time coverage commenced under the *General Permit for Discharges of Storm Water associated with Industrial Activities Excluding Construction Activities* and *General Waste Discharge Requirements for Discharges of Process Wastewaters from Aggregate Mining, Sand Washing, and Sand Offloading Facilities to Surface Waters* (NPDES General Permit Nos. CAS000001 and CAG982001). Because the changed circumstances would constitute cause for permit modification, or revocation and reissuance, under 40 C.F.R. section 122.62, backsliding would be allowed. Moreover, with a few exceptions discussed below, the requirements of this Order are at least as stringent as those of NPDES General Permit Nos. CAS000001 and CAG982001.

a. **Total Dissolved Solids (TDS).** Order No. R2-2008-0011 imposed a TDS MDEL of 500 mg/L. This Order imposes a TDS AMEL of 1,000 mg/L and an MDEL of 2,000 mg/L, and will not result in a violation of the water quality standards for TDS. Backsliding is permissible under CWA sections 402(o)(1) and 303(d)(4)(B) because this Order complies with antidegradation policies and the receiving water is in attainment with the TDS water quality objective. Backsliding is also permissible under CWA sections 402(o)(2)(C) and 402(o)(2)(E) because the Discharger cannot remove TDS without taking unreasonable measures that would involve greater adverse environmental consequences (e.g., using reverse osmosis would result in a brine needing offsite disposal and result in undesirable trucking and air pollution). See section IV.D.2.d, below.

b. **Chloride.** Order No. R2-2008-0011 imposed a chloride MDEL of 250 mg/L. This Order does not establish a chloride effluent limitation because there is no reasonable potential for the discharge to cause or contribute to a violation of the chloride water quality objective. Elimination of this limitation is consistent with State Water Board Order No. WQ 2001-16.

c. **Total Suspended Solids (TSS).** Order No. R2-2008-0011 imposed a TSS average weekly effluent limit of 45 mg/L and an average monthly limit of 30 mg/L. For discharges from Discharge Point No. 001, this Order imposes a mass limit of 58 lbs/day. For other discharges, this Order imposes a maximum daily limit of 50 mg/L. These limits are based on the Effluent Limit Guidelines for the Cement Manufacturing Point Source Category at 40 C.F.R. section 411. They comply with anti-backsliding regulations because the mass-based limit is not comparable to the previous concentration-based limits in Order No. R2-2008-0011, and because the concentration-based maximum daily limit is not comparable to the previous weekly and monthly limits. This finding is consistent with State Water Board Order No. WQ 2001-06.

2. **Antidegradation.** Federal regulations at 40 C.F.R. section 131.12 require that state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy through State Water Board Resolution No. 68-16, *Statement of Policy with Respect to Maintaining High Quality of Waters in California*, which is deemed to incorporate the federal antidegradation policy where the federal policy applies under federal law. Resolution No. 68-16 requires that existing water quality be maintained unless degradation is justified based on specific findings. Administrative Procedures Update (APU) No. 90-004 provides guidance for implementing the antidegradation policies.

a. **Potential Degradation.** The discharges covered by this Order have been occurring since about 1939, well before the adoption of Resolution No. 68-16 in 1968 and the federal antidegradation policy in 1975. According to a State Water Board guidance memorandum (William Attwater, Chief Counsel, October 7, 1987), "…the federal antidegradation policy ordinarily does not apply to consideration of existing discharges, even if exceptions or variances from other applicable water quality objectives or effluent guidelines are required to permit the discharge to continue." According to the memorandum, considerations in determining whether to perform an antidegradation analysis include the following:

1. whether there are new discharges or an expansion of existing facilities,

2. whether there would be a reduction in the level of treatment of an existing discharge,

3. whether an existing outfall has been relocated,

4. whether there has been a substantial increase in mass emissions, and

5. whether there has been a change in water quality from a point source or non-point source discharge or water diversion.

None of these conditions apply to this Order.

No antidegradation analysis is required when the Regional Water Board has no reason to believe that baseline water quality will be reduced. APU No. 90-004 defines "baseline" water quality as follows:

> Baseline quality is defined as the best quality of the receiving water that has existed since 1968 when considering Resolution No. 68-16, or since 1975 under the federal policy, unless subsequent lowering was due to regulatory action consistent with State and federal antidegration policies. If poorer water quality was permitted, the most recent water quality resulting from permitted action is the baseline water quality to be considered in any antidegration analysis.

Existing Permanente Creek water quality is likely the best that has existed since 1968 because the Facility was already operating in 1968, and no subsequent regulatory action has allowed lowering water quality. Subsequent regulation (e.g., through NPDES General Permit Nos. CAG982001 and CAS000001) likely improved water quality somewhat. Therefore, existing water quality is the appropriate baseline for analysis. Because this Order will improve Permanente Creek water quality substantially relative to its existing quality, no degradation will occur, and no findings justifying degradation are necessary.

To the extent that an argument could be made that baseline water quality is the most recent water quality resulting from permitted action (i.e., the water quality that should have existed had the Discharger complied with previous regulatory requirements), this Order still complies with antidegradation policies. With the exception of TDS (discussed below), this Order allows no additional flow or less stringent effluent limits than those in the previous general permits; therefore, it results in no lowering of water quality compared to the water quality that would have resulted from compliance with those permits. (The TSS limitation in this Order is roughly equivalent to that in NPDES Permit No. CAG982001; it is revised here to reflect applicable Effluent Limitation Guidelines.)

The following simple antidegradation analysis for TDS is sufficient, and a complete antidegradation analysis is unwarranted, because the proposed discharge will not be adverse to the intent and purpose of the antidegradation policies. APU No. 90-004 allows a "simple" analysis when the water quality reduction would be spatially localized or limited. Any degradation this Order would allow would be spatially limited to the stretch of Permanente Creek adjacent to the Facility. APU No. 90-004 also allows a "simple" analysis when the proposed action would produce only minor effects that would not result in a significant water quality reduction. This would be the case since this Order would result in receiving water TDS concentrations in the range contemplated by the secondary Maximum Contaminant Levels for drinking water (the applicable water quality objectives).

b. **Total Dissolved Solids (TDS).** The potential for TDS degradation may be evaluated by comparing the receiving water quality associated with this Order to the water quality associated with compliance with the previous permits; however, the water quality associated with compliance with the previous permits is unknown due to frequent non-compliance with those permits. In lieu of such data, existing data collected upstream of the Facility may be used to represent baseline conditions for analytical purposes. Upstream data represent much better water quality and thus provide for a very conservative analysis. Upstream water quality is likely better than any water quality downstream since the Facility commenced operations. Upstream TDS data collected at Monitoring Location RSW-001A from April 2011 through June 2013 indicate concentrations from 290 mg/L to 330 mg/L. A typical concentration appears to be about 310 mg/L.

Because proposed treatment and controls are unlikely to remove much TDS from the Facility's discharges, future receiving water quality can be estimated from existing downstream conditions. Downstream TDS data collected at or below Pond 30 from July 2011 through June 2013 indicate concentrations from 700 mg/L to 1,000 mg/L. A typical concentration appears to be about 870 mg/L. Therefore, this Order could potentially allow Permanente Creek to be degraded, at most, as TDS concentrations increase from about 310 mg/L to about 870 mg/L. Any actual degradation would likely be much less because this assessment is very conservative, and this potential degradation has already occurred due to ongoing Facility operations.

As explained below, any potential TDS degradation in Permanente Creek is consistent with antidegradation policies for the following reasons:

1. beneficial uses will be fully protected;

2. any limited degradation would provide maximum benefit to the people of California and accommodate important economic and social development; and

3. best practicable treatment or control of the discharge will ensure that pollution or nuisance will not occur.

c. Beneficial Use Protection. Antidegradation policies allow degradation only for waters that are not designated as an outstanding national resource (Tier 1) and that do not violate water quality objectives (Tier 3). They allow degradation of other waters (Tier 2) to accommodate important economic or social development to the maximum benefit of the people of the State (as long as receiving waters continue to meet water quality objectives). Permanente Creek is a Tier 2 water because it is not classified as an outstanding national resource and because it meets the Basin Plan section 3.3.22 TDS objectives for municipal supply (which range from 500 mg/L to 1,000 mg/L). Permanente Creek TDS is below 500 mg/L upstream of the Facility and below 1,000 mg/L downstream of the Facility. This Order requires water quality objectives to continue being met in Permanente Creek to fully protect beneficial uses.

d. Economic and Social Development, and Public Benefits. Assuming beneficial uses will be protected, antidegradation policies allow degradation if necessary to support important economic or social development and when the degradation maximizes benefits for the people of California.

The potential for non-water-quality environmental impacts justifies the potential TDS degradation. Options for additional TDS removal pose significant environmental risks. Meeting a TDS effluent limit of 500 mg/L instead of 1,000 mg/L would require operating a very large reverse osmosis system. Such systems are complex, material-intensive, and energy-intensive operations. They result in relatively large volumes of a concentrated liquid brine waste (the removed TDS) that must be hauled offsite by truck for disposal. The more TDS removed, the greater the amount of brine waste produced. Operating such a complex treatment system and handling the brine waste would increase the risk of system upsets, breakdowns, and accidents, including traffic accidents, which could lead to uncontrolled releases of concentrated liquid brine waste to Permanente Creek or elsewhere. Moreover, treatment and hauling would increase carbon dioxide emissions and other air pollution, some of which would contribute to climate change. This Order balances these competing environmental interests; it minimizes environmental impacts while protecting Permanente Creek beneficial uses.

e. **Best Practicable Treatment or Control.** This Order requires the best practicable treatment or control of the discharge in light of the adverse impacts and other considerations associated with additional TDS treatment discussed above. No Effluent Limitation Guidelines define best practicable control technology currently available (BPT) or best conventional pollutant control technology (BCT) for the TDS from this Facility. This TDS is also not amenable to source reduction since it primarily results from groundwater seeping into the mining pit. Because the TDS limits in this Order will ensure that Permanente Creek will meet TDS water quality standards, this Order will also ensure that pollution or nuisance will not occur.

3. **Stringency of Requirements for Individual Pollutants.** This Order contains both technology-based and WQBELs for individual pollutants. This Order’s technology-based requirements implement minimum, applicable federal technology-based requirements. In addition, this Order contains more stringent effluent limitations as necessary to meet water quality standards. Collectively, this Order’s restrictions on individual pollutants are no more stringent than required to implement CWA requirements.

This Order’s WQBELs have been derived to implement water quality objectives that protect beneficial uses. The beneficial uses and water quality objectives have been approved pursuant to federal law and are the applicable federal water quality standards. To the extent that WQBELs were derived from the CTR, the CTR is the applicable standard pursuant to 40 C.F.R. section 131.38. The procedures for calculating these WQBELs are based on the CTR, as implemented in accordance with the State Implementation Policy, which U.S. EPA approved on May 18, 2000. U.S. EPA approved most Basin Plan beneficial uses and water quality objectives prior to May 30, 2000. Beneficial uses and water quality objectives submitted to U.S. EPA prior to May 30, 2000, but not approved by U.S. EPA before that date, are nonetheless “applicable water quality standards for purposes of the Clean Water Act” pursuant to 40 C.F.R. section 131.21(c)(1). U.S. EPA approved the remaining beneficial uses and water quality objectives so they are applicable water quality standards pursuant to 40 C.F.R. section 131.21(c)(2).

V. RATIONALE FOR RECEIVING WATER LIMITATIONS

The receiving water limitations in sections V.A.1 and V.A.2 of the Order are based on Basin Plan narrative and numeric water quality objectives. The receiving water limitation in section V.A.3 of the Order requires compliance with federal and State water quality standards.

VI. RATIONALE FOR PROVISIONS

A. Standard Provisions

Attachment D contains standard provisions that apply to all NPDES permits in accordance with 40 C.F.R. section 122.41 and additional conditions applicable to specific categories of permits in accordance with 40 C.F.R. section 122.42. The Discharger must comply with these provisions. The conditions set forth in 40 C.F.R. sections 122.41(a)(1) and (b) through (n) apply to all state-issued NPDES permits and must be incorporated into the permits either expressly or by reference.

In accordance with 40 C.F.R. section 123.25(a)(12), states may omit or modify conditions to impose more stringent requirements. Attachment G contains standard provisions that supplement the federal standard provisions in Attachment D.

This Order omits federal conditions that address enforcement authority specified in 40 C.F.R. sections 122.41(j)(5) and (k)(2) because the State's enforcement authority under the Water Code is more stringent. In lieu of these conditions, this Order incorporates Water Code section 13387(e) by reference.

B. Monitoring and Reporting

Pursuant to 40 C.F.R. section 122.48, NPDES permits must specify requirements for recording and reporting monitoring results. Water Code sections 13267 and 13383, and 40 C.F.R. sections 122.41(h) and (j), authorize the Regional Water Board to require technical and monitoring reports. This Order establishes monitoring and reporting requirements, contained in the Monitoring and Reporting Program (Attachment E), that implement federal and State requirements. For more background regarding these requirements, see section VII of this Fact Sheet.

C. Special Provisions

1. Reopener Provisions

These provisions are based on 40 C.F.R. sections 122.62 and 122.63 and allow modification of this Order and its effluent limitations as necessary in response to updated water quality objectives, regulations, or other new and relevant information that may become available in the future, and other circumstances as allowed by law.

2. Effluent Characterization Study and Report

This Order does not include effluent limitations for priority pollutants that do not demonstrate reasonable potential, but this provision requires the Discharger to continue monitoring for these pollutants as described in the Monitoring and Reporting Program and Attachment G. This requirement is authorized pursuant to Water Code section 13267, and is necessary to inform the next permit reissuance and to ensure that the Discharger takes timely steps in response to any unanticipated change in effluent quality during the term of this Order.

3. Ambient Background Study and Report

This provision is necessary to provide data for future reasonable potential analyses and is authorized pursuant to Water Code section 13267.

4. Best Management Practices and Pollutant Minimization Program

This provision is based on SIP section 2.4.5.

5. Reliability Assurance Plan and Status Report

This provision is required to support the exception to Basin Plan Discharge Prohibition 1 discussed in section IV.A.2 of this Fact Sheet.

6. Stormwater Best Management Practices

Reasonable potential exists for certain pollutants in Facility stormwater, such as chromium (VI), mercury, nickel, selenium, and thallium, to cause or contribute to violations of water quality objectives based on detections of these pollutants in Facility stormwater. Provision VI.C.6 is based on Basin Plan section 4.8 and 40 C.F.R. part 122.44(k), which requires permits to establish best management practices (BMPs) to control or abate the discharge of pollutants in stormwater discharges when numeric effluent limitations are infeasible. U.S. EPA's *NPDES Permit Writers' Manual* (EPA-833-K-10-001, September 2010, page 9-4) indicates that numeric effluent limits are infeasible "when the types of pollutants vary greatly over time." For many pollutants at Discharge Point Nos. 002 through 006, numeric WQBELs are infeasible because the pollutants in stormwater vary greatly over time. Storms occur irregularly, unpredictably, uncontrollably, and occasionally in large volumes for short periods, so the resulting types of pollutants mobilized by storm runoff vary greatly.

This Order addresses these discharges with BMP requirements modeled on the State Water Board's *Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities,* NPDES Permit No. CAS000001 (State Water Board Order No. 07-03-DWQ) and U.S. EPA's NPDES Stormwater Multi-Sector General Permit for Industrial Activities (2008). Most of the action levels are modeled on those permits' benchmark concentrations. For pollutants with reasonable potential but no benchmark concentration, the water quality objective is the action level. The action level for chromium (VI) is the Basin Plan chronic water quality objective, and the one for thallium is the Basin Plan human health water quality objective.

Action levels are not effluent limitations. Their purpose is to facilitate implementation of the Facility's SWPPP by allowing the Discharger to evaluate the effectiveness of its BMPs in reducing or preventing pollutant discharges. Provision VI.C.6.c requires the Discharger to review and, if possible, improve its BMPs if the action levels are exceeded. Action levels will be evaluated and, if necessary, may be revised in future permit reissuances based on effluent monitoring data.

VII. MONITORING AND REPORTING PROGRAM (MRP)

Attachment E contains the MRP for this Order. It specifies sampling stations, pollutants to be monitored (including all parameters for which effluent limitations are specified), monitoring frequencies, and reporting requirements. The following provides the rationale for the MRP requirements.

A. MRP Requirements Rationale

1. **Effluent Monitoring.** Effluent flow monitoring is necessary at Monitoring Location EFF-001 to evaluate compliance with Prohibition III.B and to understand Facility operations. Monitoring at Monitoring Location EFF-001A is necessary to evaluate compliance with the TSS effluent limitation at Discharge Point No. 001. The waste stream from the Cement Plant Reclaim Water System is diluted by other waste streams conveyed to Discharge Point No. 001, and solids must be removed to a low level prior to the intermediate or final treatment system. Hence, TSS monitoring for this pollutant is to be done after filtration and before any other treatment. Effluent flow monitoring is necessary at Monitoring Locations EFF-002 through EFF-006 to evaluate the Discharger’s management of Facility stormwater. Monitoring for the other parameters is necessary at Monitoring Locations EFF-001 through EFF-006 to evaluate compliance with this Order’s effluent limitations. Monitoring is also needed at Monitoring Locations EFF-002 through EFF-006 to evaluate the effectiveness of the Discharger’s stormwater BMPs and to compare discharge concentrations with the action levels in Provision VI.C.6.c.ii. Provision VI.C.2 requires monitoring for additional priority pollutants at Monitoring Location EFF-001 for which there are no effluent limits to inform the next permit reissuance and to ensure that the Discharger takes timely steps in response to any unanticipated change in effluent quality.

2. **Whole Effluent Toxicity Testing**. Acute and chronic whole effluent toxicity tests are necessary to evaluate compliance with acute and chronic toxicity effluent limitations. Chronic toxicity tests are also necessary to evaluate whether chronic toxicity triggers the need for a Toxicity Reduction Evaluation.

3. **Receiving Water Monitoring.** Receiving water monitoring is necessary to characterize the receiving water (e.g., to provide background values for future reasonable potential analyses, particularly at Monitoring Location RSW-001A) and the effects of the discharges on the receiving water (i.e., to determine compliance with receiving water limitations). Monitoring Location RSW-001A was chosen to monitor background water quality based on the *Background Monitoring Report* (Golder Associates, March 22, 2013), which found that Monitoring Location RSW-001A was unaffected by Facility operations, was accessible for sampling, and had similar geologic conditions as the discharge locations. Monitoring Locations RSW-001, RSW-002, and RSW-003 were chosen to monitor downstream of the most frequently used discharge points (Discharge Point Nos. 001, 002, and 003); Monitoring Location RSW-004 was chosen to monitor downstream of the remaining discharge points, which typically discharge as a result of precipitation. Provision VI.C.3 requires monitoring for additional priority pollutants at Monitoring Location RSW-001A to inform the next permit reissuance.

B. Monitoring Requirements Summary

The table below summarizes routine monitoring requirements. This table is for informational purposes only. The actual requirements are specified in the MRP and elsewhere in this Order.

Table F-8. Monitoring Requirements Summary

Parameter	Effluent EFF-001 and EFF-001A	Effluent EFF-002 through 005	Effluent EFF-006	Receiving Water RSW-001A	Receiving Water RSW-001 through -004
Flow	Continuous[1]	1/Month[1]	1/Month [1]		
TSS	1/Week[2]	1/Quarter	1/Quarter	1/Quarter	
Oil and Grease	1/Month	1/Quarter		1/Quarter	
Total Organic Carbon			1/Quarter	1/Quarter	
Temperature	1/Month			1/Quarter	1/Quarter
pH	Continuous or 1/Day	1/Quarter	1/Quarter	1/Quarter	1/Quarter
Total Residual Chlorine	1/Day				
Settleable Matter	1/Month	1/Quarter	1/Quarter	1/Quarter	
Turbidity	1/Day	1/Quarter		1/Quarter	1/Quarter
Conductivity		1/Quarter	1/Quarter	1/Quarter	
Metals[3]	2/Month	1/Quarter	1/Quarter	1/Quarter	
TDS	1/Week			1/Quarter	1/Quarter
Chloride					1/Quarter
Acute Toxicity	1/Quarter				
Chronic Toxicity	1/Quarter				
Dissolved Oxygen				1/Quarter	1/Quarter
Sulfides				1/Quarter	1/Quarter
Hardness				1/Quarter	1/Quarter
Other priority pollutants	1/Year				
Standard Observations	1/Day	Each Occurrence	Each Occurrence		1/Month

Footnotes:

[1] For Monitoring Location EFF-001, the following flow information is to be reported:

- Daily average flow (gpd)
- Monthly average flow (MGD)
- Total monthly flow volume (MG)

Flow is also to be recorded simultaneously with sample collection for chromium (VI), nickel, and thallium.
For Monitoring Locations EFF-002 through EFF-006, total monthly flow volume (MG) is to be reported.

[2] TSS is to be monitored at EFF-001A.

[3] The metals are chromium (VI), mercury, nickel, selenium, and thallium. Mercury and selenium are to be monitored at minimum one time per month.

VIII. PUBLIC PARTICIPATION

The Regional Water Board considered the issuance of this Order that will serve as an NPDES permit for the Facility. As a step in the Order adoption process, Regional Water Board staff developed a tentative Order and encouraged public participation in the Order adoption process.

A. Notification of Interested Parties. The Regional Water Board notified the Discharger and interested agencies and persons of its intent to prescribe WDRs for the discharge and provided an opportunity to submit written comments and recommendations. Notification was provided through the *Cupertino Courier*. The public had access to the agenda and any changes in dates and locations through the Regional Water Board's website at http://www.waterboards.ca.gov/sanfranciscobay.

B. Written Comments. Interested persons were invited to submit written comments concerning the tentative WDRs as explained through the notification process. Comments were due either in person or by mail at the Regional Water Board office at 1515 Clay Street, Suite 1400, Oakland, California 94612, to the attention of John H Madigan, P.E.

For full staff response and Regional Water Board consideration, the written comments were due at the Regional Water Board office by **5:00 p.m. on December 23, 2013.**

C. Public Hearing. The Regional Water Board held a public hearing on the tentative WDRs during its regular meeting at the following date and time, and at the following location:

Date:	Wednesday, March 12, 2014
Time:	9:00 a.m.
Location:	Elihu Harris State Office Building 1515 Clay Street, 1st Floor Auditorium Oakland, CA 94612
Contact:	John H. Madigan, (510) 622-2405, JMadigan@waterboards.ca.gov

Interested persons were invited to attend. At the public hearing, the Regional Water Board heard testimony pertinent to the discharge, WDRs, and permit. For accuracy of the record, important testimony was requested to be in writing.

Dates and venues change. The Regional Water Board web address is http://www.waterboards.ca.gov/sanfranciscobay, where one could access the current agenda for changes in dates and locations.

D. Reconsideration of Waste Discharge Requirements. Any aggrieved person may petition the State Water Board to review the Regional Water Board's decision regarding the final WDRs. The State Water Board must receive the petition at the following address within 30 calendar days of the Regional Water Board action:

State Water Resources Control Board
Office of Chief Counsel
P.O. Box 100, 1001 I Street
Sacramento, CA 95812-0100

For instructions on how to file a petition for review, see http://www.waterboards.ca.gov/public_notices/petitions/water_quality/wqpetition_instr.shtml.

E. Information and Copying. The Report of Waste Discharge, related supporting documents, and comments received are on file and may be inspected at the address above at any time between 9:00 a.m. and 5:00 p.m., Monday through Friday. Copying of documents may be arranged by calling (510) 622-2300.

F. Register of Interested Persons. Any person interested in being placed on the mailing list for information regarding the WDRs and NPDES permit should contact the Regional Water Board, reference the Facility, and provide a name, address, and phone number.

G. Additional Information. Requests for additional information or questions regarding this Order should be directed to John H. Madigan, (510) 622-2405, JMadigan@waterboards.ca.gov.

ATTACHMENT F-1

Lehigh Permanente Facility
Exceedances of Order No. R2-2008-0011
Fourth Quarter 2011 through First Quarter 2013

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
Discharge Point No. 001 (Pond 4A)					
12/26/2012	pH	Daily Maximum	s.u.	8.50	8.56
12/1/2011	TDS	Daily Maximum	mg/L	500	1,000
12/5/2011	TDS	Daily Maximum	mg/L	500	970
12/14/2011	TDS	Daily Maximum	mg/L	500	905
12/19/2011	TDS	Daily Maximum	mg/L	500	950
12/27/2011	TDS	Daily Maximum	mg/L	500	1,000
1/3/2012	TDS	Daily Maximum	mg/L	500	860
1/10/2012	TDS	Daily Maximum	mg/L	500	930
1/17/2012	TDS	Daily Maximum	mg/L	500	1,000
1/20/2012	TDS	Daily Maximum	mg/L	500	1,200
1/28/2012	TDS	Daily Maximum	mg/L	500	760
1/30/2012	TDS	Daily Maximum	mg/L	500	880
2/6/2012	TDS	Daily Maximum	mg/L	500	890
2/13/2012	TDS	Daily Maximum	mg/L	500	920
2/14/2012	TDS	Daily Maximum	mg/L	500	850
2/21/2012	TDS	Daily Maximum	mg/L	500	840
2/27/2012	TDS	Daily Maximum	mg/L	500	860
3/5/2012	TDS	Daily Maximum	mg/L	500	860
3/6/2012	TDS	Daily Maximum	mg/L	500	950
3/12/2012	TDS	Daily Maximum	mg/L	500	960
3/14/2012	TDS	Daily Maximum	mg/L	500	820
3/19/2012	TDS	Daily Maximum	mg/L	500	860
3/26/2012	TDS	Daily Maximum	mg/L	500	920
4/2/2012	TDS	Daily Maximum	mg/L	500	1,100
4/9/2012	TDS	Daily Maximum	mg/L	500	1,100
4/16/2012	TDS	Daily Maximum	mg/L	500	920
4/23/2012	TDS	Daily Maximum	mg/L	500	950
4/30/2012	TDS	Daily Maximum	mg/L	500	910
5/7/2012	TDS	Daily Maximum	mg/L	500	900
5/14/2012	TDS	Daily Maximum	mg/L	500	950
5/21/2012	TDS	Daily Maximum	mg/L	500	890
5/29/2012	TDS	Daily Maximum	mg/L	500	790
6/4/2012	TDS	Daily Maximum	mg/L	500	940
6/11/2012	TDS	Daily Maximum	mg/L	500	920
6/18/2012	TDS	Daily Maximum	mg/L	500	1,000
6/25/2012	TDS	Daily Maximum	mg/L	500	930
7/2/2012	TDS	Daily Maximum	mg/L	500	940
7/9/2012	TDS	Daily Maximum	mg/L	500	870

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
7/16/2012	TDS	Daily Maximum	mg/L	500	970
7/23/2012	TDS	Daily Maximum	mg/L	500	930
7/30/2012	TDS	Daily Maximum	mg/L	500	940
8/6/2012	TDS	Daily Maximum	mg/L	500	920
8/13/2012	TDS	Daily Maximum	mg/L	500	920
8/20/2012	TDS	Daily Maximum	mg/L	500	930
8/27/2012	TDS	Daily Maximum	mg/L	500	940
9/4/2012	TDS	Daily Maximum	mg/L	500	950
9/10/2012	TDS	Daily Maximum	mg/L	500	940
9/17/2012	TDS	Daily Maximum	mg/L	500	990
9/24/2012	TDS	Daily Maximum	mg/L	500	950
10/1/2012	TDS	Daily Maximum	mg/L	500	1,000
10/8/2012	TDS	Daily Maximum	mg/L	500	1,100
10/15/2012	TDS	Daily Maximum	mg/L	500	1,000
10/22/2012	TDS	Daily Maximum	mg/L	500	1,000
10/29/2012	TDS	Daily Maximum	mg/L	500	1,100
11/6/2012	TDS	Daily Maximum	mg/L	500	1,100
11/12/2012	TDS	Daily Maximum	mg/L	500	960
11/19/2012	TDS	Daily Maximum	mg/L	500	940
11/26/2012	TDS	Daily Maximum	mg/L	500	1,000
12/5/2012	TDS	Daily Maximum	mg/L	500	790
12/10/2012	TDS	Daily Maximum	mg/L	500	1,100
12/17/2012	TDS	Daily Maximum	mg/L	500	1,200
12/26/2012	TDS	Daily Maximum	mg/L	500	900
1/2/2013	TDS	Daily Maximum	mg/L	500	1,100
1/7/2013	TDS	Daily Maximum	mg/L	500	1,100
1/14/2013	TDS	Daily Maximum	mg/L	500	1,100
1/24/2013	TDS	Daily Maximum	mg/L	500	990
1/28/2013	TDS	Daily Maximum	mg/L	500	1,100
2/4/2013	TDS	Daily Maximum	mg/L	500	960
2/12/2013	TDS	Daily Maximum	mg/L	500	900
2/19/2013	TDS	Daily Maximum	mg/L	500	980
2/27/2013	TDS	Daily Maximum	mg/L	500	960
3/7/2013	TDS	Daily Maximum	mg/L	500	1,100
3/13/2013	TDS	Daily Maximum	mg/L	500	1,000
3/20/2013	TDS	Daily Maximum	mg/L	500	1,100
3/27/2013	TDS	Daily Maximum	mg/L	500	1,100
4/4/2013	TDS	Daily Maximum	mg/L	500	980
4/10/2013	TDS	Daily Maximum	mg/L	500	970
4/16/2013	TDS	Daily Maximum	mg/L	500	1,100
4/23/2013	TDS	Daily Maximum	mg/L	500	960
5/2/2013	TDS	Daily Maximum	mg/L	500	930
5/9/2013	TDS	Daily Maximum	mg/L	500	870
5/14/2013	TDS	Daily Maximum	mg/L	500	830

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
5/23/2013	TDS	Daily Maximum	mg/L	500	870
5/30/2013	TDS	Daily Maximum	mg/L	500	950
6/6/2013	TDS	Daily Maximum	mg/L	500	980
6/11/2013	TDS	Daily Maximum	mg/L	500	920
6/19/2013	TDS	Daily Maximum	mg/L	500	950
6/26/2013	TDS	Daily Maximum	mg/L	500	840
7/1/2013	TDS	Daily Maximum	mg/L	500	860
7/9/2013	TDS	Daily Maximum	mg/L	500	880
7/18/2013	TDS	Daily Maximum	mg/L	500	830
7/29/2013	TDS	Daily Maximum	mg/L	500	760
8/7/2013	TDS	Daily Maximum	mg/L	500	780
8/23/2013	TDS	Daily Maximum	mg/L	500	870
8/29/2013	TDS	Daily Maximum	mg/L	500	860
9/11/2013	TDS	Daily Maximum	mg/L	500	920
9/19/2013	TDS	Daily Maximum	mg/L	500	840
9/25/2013	TDS	Daily Maximum	mg/L	500	920
10/1/2013	TDS	Daily Maximum	mg/L	500	920
10/10/2013	TDS	Daily Maximum	mg/L	500	970
10/15/2013	TDS	Daily Maximum	mg/L	500	860
10/22/2013	TDS	Daily Maximum	mg/L	500	860
10/29/2013	TDS	Daily Maximum	mg/L	500	950
11/7/2013	TDS	Daily Maximum	mg/L	500	980
11/14/2013	TDS	Daily Maximum	mg/L	500	1,100
11/20/2013	TDS	Daily Maximum	mg/L	500	950
11/25/2013	TDS	Daily Maximum	mg/L	500	950
12/3/2013	TDS	Daily Maximum	mg/L	500	880
12/10/2013	TDS	Daily Maximum	mg/L	500	930
12/17/2013	TDS	Daily Maximum	mg/L	500	990
3/14/2013	TSS	Weekly Average	mg/L	45	60
1/21/2012	Turbidity	Daily Maximum	NTU	40	44
3/7/2013	Turbidity	Daily Maximum	NTU	40	60
3/28/2013	Turbidity	Daily Maximum	NTU	40	47
5/31/2013	Turbidity	Daily Maximum	NTU	40	64
Discharge Point No. 002 (Pond 13B)					
5/7/2012	Settleable Matter	Daily Maximum	mL/L-hr	0.2	0.5
5/31/2012	Settleable Matter	Monthly Average	mL/L-hr	0.1	0.2
6/11/2012	Settleable Matter	Daily Maximum	mL/L-hr	0.2	0.3
7/2/2012	Settleable Matter	Daily Maximum	mL/L-hr	0.2	0.4
8/20/2012	Settleable Matter	Daily Maximum	mL/L-hr	0.2	0.3
10/22/2012	Settleable Matter	Daily Maximum	mL/L-hr	0.2	0.8
10/31/2012	Settleable Matter	Monthly Average	mL/L-hr	0.1	0.8
2/14/2012	TDS	Daily Maximum	mg/L	500	690
4/2/2012	TDS	Daily Maximum	mg/L	500	640
4/9/2012	TDS	Daily Maximum	mg/L	500	1,000

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
4/16/2012	TDS	Daily Maximum	mg/L	500	860
4/23/2012	TDS	Daily Maximum	mg/L	500	940
4/30/2012	TDS	Daily Maximum	mg/L	500	1,000
5/7/2012	TDS	Daily Maximum	mg/L	500	760
5/14/2012	TDS	Daily Maximum	mg/L	500	1,100
5/21/2012	TDS	Daily Maximum	mg/L	500	1,100
5/29/2012	TDS	Daily Maximum	mg/L	500	1,100
6/4/2012	TDS	Daily Maximum	mg/L	500	630
6/11/2012	TDS	Daily Maximum	mg/L	500	570
6/18/2012	TDS	Daily Maximum	mg/L	500	1,200
7/2/2012	TDS	Daily Maximum	mg/L	500	680
7/9/2012	TDS	Daily Maximum	mg/L	500	650
8/13/2012	TDS	Daily Maximum	mg/L	500	790
8/20/2012	TDS	Daily Maximum	mg/L	500	610
8/27/2012	TDS	Daily Maximum	mg/L	500	1,200
10/22/2012	TDS	Daily Maximum	mg/L	500	1,500
11/28/2012	TDS	Daily Maximum	mg/L	500	910
12/6/2012	TDS	Daily Maximum	mg/L	500	780
12/10/2012	TDS	Daily Maximum	mg/L	500	1,300
12/17/2012	TDS	Daily Maximum	mg/L	500	920
12/26/2012	TDS	Daily Maximum	mg/L	500	890
1/3/2013	TDS	Daily Maximum	mg/L	500	1,200
1/7/2013	TDS	Daily Maximum	mg/L	500	980
1/14/2013	TDS	Daily Maximum	mg/L	500	1,100
1/24/2013	TDS	Daily Maximum	mg/L	500	1,100
1/28/2013	TDS	Daily Maximum	mg/L	500	1,200
2/4/2013	TDS	Daily Maximum	mg/L	500	1,200
2/12/2013	TDS	Daily Maximum	mg/L	500	1,100
2/19/2013	TDS	Daily Maximum	mg/L	500	1,100
2/27/2013	TDS	Daily Maximum	mg/L	500	1,100
3/7/2013	TDS	Daily Maximum	mg/L	500	980
3/13/2013	TDS	Daily Maximum	mg/L	500	1,100
3/20/2013	TDS	Daily Maximum	mg/L	500	1,100
3/27/2013	TDS	Daily Maximum	mg/L	500	1,200
4/4/2013	TDS	Daily Maximum	mg/L	500	1,200
4/10/2013	TDS	Daily Maximum	mg/L	500	920
4/16/2013	TDS	Daily Maximum	mg/L	500	1,200
4/23/2013	TDS	Daily Maximum	mg/L	500	1,200
5/3/2013	TDS	Daily Maximum	mg/L	500	1,300
5/9/2013	TDS	Daily Maximum	mg/L	500	1,200
5/14/2013	TDS	Daily Maximum	mg/L	500	1,200
5/23/2013	TDS	Daily Maximum	mg/L	500	1,300
5/30/2013	TDS	Daily Maximum	mg/L	500	1,300
6/6/2013	TDS	Daily Maximum	mg/L	500	1,300

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
6/11/2013	TDS	Daily Maximum	mg/L	500	1,200
6/19/2013	TDS	Daily Maximum	mg/L	500	1,300
6/26/2013	TDS	Daily Maximum	mg/L	500	1,300
7/1/2013	TDS	Daily Maximum	mg/L	500	1,200
7/9/2013	TDS	Daily Maximum	mg/L	500	1,200
7/18/2013	TDS	Daily Maximum	mg/L	500	1,400
7/25/2013	TDS	Daily Maximum	mg/L	500	1,200
7/29/2013	TDS	Daily Maximum	mg/L	500	1,300
8/7/2013	TDS	Daily Maximum	mg/L	500	1,300
8/14/2013	TDS	Daily Maximum	mg/L	500	1,400
8/22/2013	TDS	Daily Maximum	mg/L	500	1,400
8/28/2013	TDS	Daily Maximum	mg/L	500	1,300
9/4/2013	TDS	Daily Maximum	mg/L	500	1,400
9/10/2013	TDS	Daily Maximum	mg/L	500	1,400
9/18/2013	TDS	Daily Maximum	mg/L	500	1,600
9/24/2013	TDS	Daily Maximum	mg/L	500	1,500
10/1/2013	TDS	Daily Maximum	mg/L	500	1,600
10/10/2013	TDS	Daily Maximum	mg/L	500	1,300
10/15/2013	TDS	Daily Maximum	mg/L	500	1,500
10/22/2013	TDS	Daily Maximum	mg/L	500	1,300
10/29/2013	TDS	Daily Maximum	mg/L	500	1,400
11/7/2013	TDS	Daily Maximum	mg/L	500	1,600
11/14/2013	TDS	Daily Maximum	mg/L	500	1,400
1/23/2012	TSS	Weekly Average	mg/L	45	120
1/31/2012	TSS	Monthly Average	mg/L	30	120
2/29/2012	TSS	Monthly Average	mg/L	30	38
3/31/2012	TSS	Monthly Average	mg/L	30	45
5/7/2012	TSS	Weekly Average	mg/L	45	140
5/31/2012	TSS	Monthly Average	mg/L	30	47
6/4/2012	TSS	Weekly Average	mg/L	45	230
6/11/2012	TSS	Weekly Average	mg/L	45	210
6/18/2012	TSS	Weekly Average	mg/L	45	88
6/30/2012	TSS	Monthly Average	mg/L	30	132
7/2/2012	TSS	Weekly Average	mg/L	45	250
7/9/2012	TSS	Weekly Average	mg/L	45	70
7/31/2012	TSS	Monthly Average	mg/L	30	160
8/13/2012	TSS	Weekly Average	mg/L	45	160
8/20/2012	TSS	Weekly Average	mg/L	45	170
8/31/2012	TSS	Monthly Average	mg/L	30	113
10/22/2012	TSS	Weekly Average	mg/L	45	160
10/31/2012	TSS	Monthly Average	mg/L	30	160
11/28/2012	TSS	Weekly Average	mg/L	45	300
11/30/2012	TSS	Monthly Average	mg/L	30	158
12/5/2012	TSS	Weekly Average	mg/L	45	120

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
12/10/2012	TSS	Weekly Average	mg/L	45	56
12/17/2012	TSS	Weekly Average	mg/L	45	150
12/26/2012	TSS	Weekly Average	mg/L	45	82
12/31/2012	TSS	Monthly Average	mg/L	30	102
2/13/2013	TSS	Weekly Average	mg/L	45	61
2/20/2013	TSS	Weekly Average	mg/L	45	60
2/28/2013	TSS	Monthly Average	mg/L	30	34
3/8/2013	TSS	Weekly Average	mg/L	45	620
3/31/2013	TSS	Monthly Average	mg/L	30	159
5/15/2013	TSS	Weekly Average	mg/L	45	130
4/2/2012	Turbidity	Daily Maximum	NTU	40	45
4/4/2012	Turbidity	Daily Maximum	NTU	40	262
4/10/2012	Turbidity	Daily Maximum	NTU	40	44
4/12/2012	Turbidity	Daily Maximum	NTU	40	84
4/13/2012	Turbidity	Daily Maximum	NTU	40	239
5/7/2012	Turbidity	Daily Maximum	NTU	40	166
5/8/2012	Turbidity	Daily Maximum	NTU	40	42
5/17/2012	Turbidity	Daily Maximum	NTU	40	67
5/22/2012	Turbidity	Daily Maximum	NTU	40	194
5/23/2012	Turbidity	Daily Maximum	NTU	40	98
6/4/2012	Turbidity	Daily Maximum	NTU	40	308
6/11/2012	Turbidity	Daily Maximum	NTU	40	233
6/18/2012	Turbidity	Daily Maximum	NTU	40	71
6/19/2012	Turbidity	Daily Maximum	NTU	40	125
6/21/2012	Turbidity	Daily Maximum	NTU	40	142
6/22/2012	Turbidity	Daily Maximum	NTU	40	110
6/28/2012	Turbidity	Daily Maximum	NTU	40	142
7/2/2012	Turbidity	Daily Maximum	NTU	40	392
7/6/2012	Turbidity	Daily Maximum	NTU	40	98
7/9/2012	Turbidity	Daily Maximum	NTU	40	108
7/19/2012	Turbidity	Daily Maximum	NTU	40	273
7/20/2012	Turbidity	Daily Maximum	NTU	40	241
7/25/2012	Turbidity	Daily Maximum	NTU	40	374
8/13/2012	Turbidity	Daily Maximum	NTU	40	258
8/20/2012	Turbidity	Daily Maximum	NTU	40	302
8/21/2012	Turbidity	Daily Maximum	NTU	40	239
8/24/2012	Turbidity	Daily Maximum	NTU	40	223
8/29/2012	Turbidity	Daily Maximum	NTU	40	73
8/30/2012	Turbidity	Daily Maximum	NTU	40	78
8/31/2012	Turbidity	Daily Maximum	NTU	40	139
9/19/2012	Turbidity	Daily Maximum	NTU	40	105
10/3/2012	Turbidity	Daily Maximum	NTU	40	162
10/10/2012	Turbidity	Daily Maximum	NTU	40	179
10/22/2012	Turbidity	Daily Maximum	NTU	40	460

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
11/28/2012	Turbidity	Daily Maximum	NTU	40	390
11/30/2012	Turbidity	Daily Maximum	NTU	40	138
12/6/2012	Turbidity	Daily Maximum	NTU	40	268
2/12/2013	Turbidity	Daily Maximum	NTU	40	140
2/19/2013	Turbidity	Daily Maximum	NTU	40	110
3/8/2013	Turbidity	Daily Maximum	NTU	40	1,000
11/12/2013	Turbidity	Daily Maximum	NTU	40	>1,000
Discharge Point No. 003 (Pond 9)					
12/6/2011	pH	Daily Maximum	s.u.	8.50	8.58
12/7/2011	pH	Daily Maximum	s.u.	8.50	8.75
12/8/2011	pH	Daily Maximum	s.u.	8.50	8.87
12/9/2011	pH	Daily Maximum	s.u.	8.50	8.89
12/15/2011	pH	Daily Maximum	s.u.	8.50	9.30
3/29/2012	pH	Daily Maximum	s.u.	8.50	8.70
4/18/2012	pH	Daily Maximum	s.u.	8.50	8.58
4/19/2012	pH	Daily Maximum	s.u.	8.50	8.57
4/20/2012	pH	Daily Maximum	s.u.	8.50	8.57
9/7/2012	pH	Daily Maximum	s.u.	8.50	8.56
9/11/2012	pH	Daily Maximum	s.u.	8.50	8.66
9/12/2012	pH	Daily Maximum	s.u.	8.50	8.81
9/13/2012	pH	Daily Maximum	s.u.	8.50	8.92
9/14/2012	pH	Daily Maximum	s.u.	8.50	8.65
9/26/2012	pH	Daily Maximum	s.u.	8.50	8.69
9/27/2012	pH	Daily Maximum	s.u.	8.50	8.77
9/28/2012	pH	Daily Maximum	s.u.	8.50	8.72
10/2/2012	pH	Daily Maximum	s.u.	8.50	8.71
10/3/2012	pH	Daily Maximum	s.u.	8.50	8.79
10/4/2012	pH	Daily Maximum	s.u.	8.50	9.26
10/5/2012	pH	Daily Maximum	s.u.	8.50	9.30
10/8/2012	pH	Daily Maximum	s.u.	8.50	9.19
10/9/2012	pH	Daily Maximum	s.u.	8.50	9.27
10/10/2012	pH	Daily Maximum	s.u.	8.50	8.62
10/13/2012	pH	Daily Maximum	s.u.	8.50	9.14
10/14/2012	pH	Daily Maximum	s.u.	8.50	9.23
10/16/2012	pH	Daily Maximum	s.u.	8.50	8.61
10/19/2012	pH	Daily Maximum	s.u.	8.50	8.73
10/22/2012	pH	Daily Maximum	s.u.	8.50	9.03
10/29/2012	pH	Daily Maximum	s.u.	8.50	8.77
10/30/2012	pH	Daily Maximum	s.u.	8.50	8.73
10/31/2012	pH	Daily Maximum	s.u.	8.50	8.77
11/1/2012	pH	Daily Maximum	s.u.	8.50	8.66
11/2/2012	pH	Daily Maximum	s.u.	8.50	8.56
11/7/2012	pH	Daily Maximum	s.u.	8.50	8.60
11/9/2012	pH	Daily Maximum	s.u.	8.50	8.68

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
11/15/2012	pH	Daily Maximum	s.u.	8.50	8.68
11/16/2012	pH	Daily Maximum	s.u.	8.50	8.67
11/17/2012	pH	Daily Maximum	s.u.	8.50	8.59
11/18/2012	pH	Daily Maximum	s.u.	8.50	8.74
11/20/2012	pH	Daily Maximum	s.u.	8.50	8.64
11/23/2012	pH	Daily Maximum	s.u.	8.50	8.60
12/6/2012	pH	Daily Maximum	s.u.	8.50	8.60
1/14/2013	pH	Daily Maximum	s.u.	8.50	8.94
1/24/2013	pH	Daily Maximum	s.u.	8.50	8.57
2/6/2013	pH	Daily Maximum	s.u.	8.50	8.93
2/7/2013	pH	Daily Maximum	s.u.	8.50	8.72
2/10/2013	pH	Daily Maximum	s.u.	8.50	8.71
2/12/2013	pH	Daily Maximum	s.u.	8.50	8.92
2/13/2013	pH	Daily Maximum	s.u.	8.50	9.04
2/14/2013	pH	Daily Maximum	s.u.	8.50	9.11
2/17/2013	pH	Daily Maximum	s.u.	8.50	9.15
2/19/2013	pH	Daily Maximum	s.u.	8.50	9.03
2/20/2013	pH	Daily Maximum	s.u.	8.50	9.08
2/21/2013	pH	Daily Maximum	s.u.	8.50	9.01
2/24/2013	pH	Daily Maximum	s.u.	8.50	9.01
2/25/2013	pH	Daily Maximum	s.u.	8.50	9.00
2/26/2013	pH	Daily Maximum	s.u.	8.50	8.87
3/1/2013	pH	Daily Maximum	s.u.	8.50	8.81
3/2/2013	pH	Daily Maximum	s.u.	8.50	8.75
3/3/2013	pH	Daily Maximum	s.u.	8.50	8.58
3/4/2013	pH	Daily Maximum	s.u.	8.50	9.01
3/5/2013	pH	Daily Maximum	s.u.	8.50	8.90
3/6/2013	pH	Daily Maximum	s.u.	8.50	8.77
3/7/2013	pH	Daily Maximum	s.u.	8.50	8.90
3/9/2013	pH	Daily Maximum	s.u.	8.50	8.66
3/10/2013	pH	Daily Maximum	s.u.	8.50	8.85
3/13/2013	pH	Daily Maximum	s.u.	8.50	8.93
3/15/2013	pH	Daily Maximum	s.u.	8.50	9.17
3/16/2013	pH	Daily Maximum	s.u.	8.50	9.02
3/17/2013	pH	Daily Maximum	s.u.	8.50	8.99
3/18/2013	pH	Daily Maximum	s.u.	8.50	8.78
3/19/2013	pH	Daily Maximum	s.u.	8.50	8.98
3/24/2013	pH	Daily Maximum	s.u.	8.50	8.71
4/1/2013	pH	Daily Maximum	s.u.	8.50	8.86
11/16/2013	pH	Daily Maximum	s.u.	8.50	9.10
10/31/2011	TDS	Daily Maximum	mg/L	500	820
11/14/2011	TDS	Daily Maximum	mg/L	500	850
11/16/2011	TDS	Daily Maximum	mg/L	500	820
11/21/2011	TDS	Daily Maximum	mg/L	500	770

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
12/5/2011	TDS	Daily Maximum	mg/L	500	920
12/14/2011	TDS	Daily Maximum	mg/L	500	785
1/10/2012	TDS	Daily Maximum	mg/L	500	980
1/30/2012	TDS	Daily Maximum	mg/L	500	830
2/6/2012	TDS	Daily Maximum	mg/L	500	960
2/13/2012	TDS	Daily Maximum	mg/L	500	930
2/14/2012	TDS	Daily Maximum	mg/L	500	780
2/21/2012	TDS	Daily Maximum	mg/L	500	840
2/27/2012	TDS	Daily Maximum	mg/L	500	1,000
3/5/2012	TDS	Daily Maximum	mg/L	500	840
3/6/2012	TDS	Daily Maximum	mg/L	500	1,000
3/12/2012	TDS	Daily Maximum	mg/L	500	1,000
3/14/2012	TDS	Daily Maximum	mg/L	500	780
3/19/2012	TDS	Daily Maximum	mg/L	500	640
3/26/2012	TDS	Daily Maximum	mg/L	500	630
4/2/2012	TDS	Daily Maximum	mg/L	500	650
4/9/2012	TDS	Daily Maximum	mg/L	500	820
4/16/2012	TDS	Daily Maximum	mg/L	500	800
4/23/2012	TDS	Daily Maximum	mg/L	500	890
4/30/2012	TDS	Daily Maximum	mg/L	500	900
5/7/2012	TDS	Daily Maximum	mg/L	500	870
5/14/2012	TDS	Daily Maximum	mg/L	500	970
5/21/2012	TDS	Daily Maximum	mg/L	500	1,000
5/29/2012	TDS	Daily Maximum	mg/L	500	1,000
6/4/2012	TDS	Daily Maximum	mg/L	500	1,000
6/11/2012	TDS	Daily Maximum	mg/L	500	1,100
6/18/2012	TDS	Daily Maximum	mg/L	500	1,100
6/25/2012	TDS	Daily Maximum	mg/L	500	1,100
7/2/2012	TDS	Daily Maximum	mg/L	500	1,100
7/9/2012	TDS	Daily Maximum	mg/L	500	1,100
7/16/2012	TDS	Daily Maximum	mg/L	500	1,200
7/23/2012	TDS	Daily Maximum	mg/L	500	1,100
7/30/2012	TDS	Daily Maximum	mg/L	500	1,200
8/6/2012	TDS	Daily Maximum	mg/L	500	1,200
8/13/2012	TDS	Daily Maximum	mg/L	500	1,200
8/20/2012	TDS	Daily Maximum	mg/L	500	1,200
8/27/2012	TDS	Daily Maximum	mg/L	500	1,200
9/4/2012	TDS	Daily Maximum	mg/L	500	1,100
9/10/2012	TDS	Daily Maximum	mg/L	500	1,100
9/17/2012	TDS	Daily Maximum	mg/L	500	1,100
9/24/2012	TDS	Daily Maximum	mg/L	500	1,000
10/1/2012	TDS	Daily Maximum	mg/L	500	1,000
10/8/2012	TDS	Daily Maximum	mg/L	500	560
10/15/2012	TDS	Daily Maximum	mg/L	500	630

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
10/29/2012	TDS	Daily Maximum	mg/L	500	1,100
11/6/2012	TDS	Daily Maximum	mg/L	500	950
11/12/2012	TDS	Daily Maximum	mg/L	500	1,000
11/19/2012	TDS	Daily Maximum	mg/L	500	560
11/26/2012	TDS	Daily Maximum	mg/L	500	600
12/3/2012	TDS	Daily Maximum	mg/L	500	950
12/10/2012	TDS	Daily Maximum	mg/L	500	1,100
12/17/2012	TDS	Daily Maximum	mg/L	500	1,100
12/26/2012	TDS	Daily Maximum	mg/L	500	620
1/2/2013	TDS	Daily Maximum	mg/L	500	740
1/7/2013	TDS	Daily Maximum	mg/L	500	780
1/14/2013	TDS	Daily Maximum	mg/L	500	720
1/24/2013	TDS	Daily Maximum	mg/L	500	760
1/28/2013	TDS	Daily Maximum	mg/L	500	1,100
2/3/2013	TDS	Daily Maximum	mg/L	500	1,100
2/10/2013	TDS	Daily Maximum	mg/L	500	720
2/17/2013	TDS	Daily Maximum	mg/L	500	830
2/26/2013	TDS	Daily Maximum	mg/L	500	810
3/7/2013	TDS	Daily Maximum	mg/L	500	760
3/13/2013	TDS	Daily Maximum	mg/L	500	740
3/20/2013	TDS	Daily Maximum	mg/L	500	740
3/27/2013	TDS	Daily Maximum	mg/L	500	1,100
4/4/2013	TDS	Daily Maximum	mg/L	500	1,000
4/10/2013	TDS	Daily Maximum	mg/L	500	1,100
4/16/2013	TDS	Daily Maximum	mg/L	500	1,200
4/23/2013	TDS	Daily Maximum	mg/L	500	1,200
5/3/2013	TDS	Daily Maximum	mg/L	500	1,200
5/9/2013	TDS	Daily Maximum	mg/L	500	1,100
5/14/2013	TDS	Daily Maximum	mg/L	500	1,100
5/23/2013	TDS	Daily Maximum	mg/L	500	1,200
5/30/2013	TDS	Daily Maximum	mg/L	500	1,200
6/6/2013	TDS	Daily Maximum	mg/L	500	1,000
6/11/2013	TDS	Daily Maximum	mg/L	500	1,000
6/19/2013	TDS	Daily Maximum	mg/L	500	1,200
6/26/2013	TDS	Daily Maximum	mg/L	500	1,200
7/1/2013	TDS	Daily Maximum	mg/L	500	1,100
7/9/2013	TDS	Daily Maximum	mg/L	500	1,100
7/18/2013	TDS	Daily Maximum	mg/L	500	1,100
7/25/2013	TDS	Daily Maximum	mg/L	500	1,000
7/29/2013	TDS	Daily Maximum	mg/L	500	1,000
8/7/2013	TDS	Daily Maximum	mg/L	500	1,100
8/14/2013	TDS	Daily Maximum	mg/L	500	1,100
8/22/2013	TDS	Daily Maximum	mg/L	500	1,200
8/28/2013	TDS	Daily Maximum	mg/L	500	1,100

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
9/4/2013	TDS	Daily Maximum	mg/L	500	1,200
9/10/2013	TDS	Daily Maximum	mg/L	500	1,200
9/18/2013	TDS	Daily Maximum	mg/L	500	1,200
9/24/2013	TDS	Daily Maximum	mg/L	500	810
10/1/2013	TDS	Daily Maximum	mg/L	500	1,100
10/10/2013	TDS	Daily Maximum	mg/L	500	960
10/15/2013	TDS	Daily Maximum	mg/L	500	5,100
10/22/2013	TDS	Daily Maximum	mg/L	500	1,000
10/29/2013	TDS	Daily Maximum	mg/L	500	1,100
11/7/2013	TDS	Daily Maximum	mg/L	500	1,000
11/14/2013	TDS	Daily Maximum	mg/L	500	920
11/20/2013	TDS	Daily Maximum	mg/L	500	880
11/25/2013	TDS	Daily Maximum	mg/L	500	1,300
12/3/2013	TDS	Daily Maximum	mg/L	500	1,200
12/10/2013	TDS	Daily Maximum	mg/L	500	920
12/17/2013	TDS	Daily Maximum	mg/L	500	980
12/27/2013	TDS	Daily Maximum	mg/L	500	1,300
11/19/2011	TSS	Weekly Average	mg/L	45	199
11/30/2011	TSS	Monthly Average	mg/L	30	135
1/28/2012	TSS	Weekly Average	mg/L	45	110
1/31/2012	TSS	Monthly Average	mg/L	30	56
3/8/2013	TSS	Weekly Average	mg/L	45	61
3/14/2013	TSS	Weekly Average	mg/L	45	62
3/31/2013	TSS	Monthly Average	mg/L	30	33
11/11/2011	Turbidity	Daily Maximum	NTU	40	78
11/14/2011	Turbidity	Daily Maximum	NTU	40	59
11/15/2011	Turbidity	Daily Maximum	NTU	40	64
11/21/2011	Turbidity	Daily Maximum	NTU	40	127
1/22/2012	Turbidity	Daily Maximum	NTU	40	223
1/23/2012	Turbidity	Daily Maximum	NTU	40	223
3/29/2012	Turbidity	Daily Maximum	NTU	40	91
3/30/2012	Turbidity	Daily Maximum	NTU	40	71
4/13/2012	Turbidity	Daily Maximum	NTU	40	254
4/17/2012	Turbidity	Daily Maximum	NTU	40	94
10/3/2012	Turbidity	Daily Maximum	NTU	40	49
10/22/2012	Turbidity	Daily Maximum	NTU	40	220
10/23/2012	Turbidity	Daily Maximum	NTU	40	149
11/17/2012	Turbidity	Daily Maximum	NTU	40	173
11/18/2012	Turbidity	Daily Maximum	NTU	40	146
11/19/2012	Turbidity	Daily Maximum	NTU	40	70
11/21/2012	Turbidity	Daily Maximum	NTU	40	236
11/30/2012	Turbidity	Daily Maximum	NTU	40	926
12/3/2012	Turbidity	Daily Maximum	NTU	40	173
12/4/2012	Turbidity	Daily Maximum	NTU	40	125

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
12/5/2012	Turbidity	Daily Maximum	NTU	40	326
12/6/2012	Turbidity	Daily Maximum	NTU	40	184
12/7/2012	Turbidity	Daily Maximum	NTU	40	43
12/17/2012	Turbidity	Daily Maximum	NTU	40	71
12/19/2012	Turbidity	Daily Maximum	NTU	40	42
12/20/2012	Turbidity	Daily Maximum	NTU	40	49
12/26/2012	Turbidity	Daily Maximum	NTU	40	96
12/27/2012	Turbidity	Daily Maximum	NTU	40	76
12/28/2012	Turbidity	Daily Maximum	NTU	40	69
1/7/2013	Turbidity	Daily Maximum	NTU	40	68
2/18/2013	Turbidity	Daily Maximum	NTU	40	60
3/6/2013	Turbidity	Daily Maximum	NTU	40	51
3/8/2013	Turbidity	Daily Maximum	NTU	40	57
Discharge Point No. 004 (Pond 17)					
12/3/2013	Chloride	Daily Maximum	mg/L	250	450
11/30/2012	Settleable Matter	Daily Maximum	mL/L-hr	0.2	0.5
11/30/2012	Settleable Matter	Monthly Average	mL/L-hr	0.1	0.5
12/3/2012	TDS	Daily Maximum	mg/L	500	550
9/10/2013	TDS	Daily Maximum	mg/L	500	2,100
9/18/2013	TDS	Daily Maximum	mg/L	500	2,000
9/24/2013	TDS	Daily Maximum	mg/L	500	2,000
10/1/2013	TDS	Daily Maximum	mg/L	500	1,700
10/10/2013	TDS	Daily Maximum	mg/L	500	1,600
10/15/2013	TDS	Daily Maximum	mg/L	500	1,100
10/22/2013	TDS	Daily Maximum	mg/L	500	1,800
10/30/2013	TDS	Daily Maximum	mg/L	500	1,800
11/7/2013	TDS	Daily Maximum	mg/L	500	1,700
11/14/2013	TDS	Daily Maximum	mg/L	500	1,300
11/20/2013	TDS	Daily Maximum	mg/L	500	1,300
11/25/2013	TDS	Daily Maximum	mg/L	500	1,200
12/3/2013	TDS	Daily Maximum	mg/L	500	1,600
12/10/2013	TDS	Daily Maximum	mg/L	500	920
12/17/2013	TDS	Daily Maximum	mg/L	500	1,100
12/27/2013	TDS	Daily Maximum	mg/L	500	1,500
11/30/2012	TSS	Weekly Average	mg/L	45	140
11/30/2012	TSS	Monthly Average	mg/L	30	140
11/30/2012	Turbidity	Daily Maximum	NTU	40	220
Discharge Point No. 005 (Pond 20)					
2/19/2013	pH	Daily Maximum	s.u.	8.50	8.85
11/20/2013	pH	Daily Maximum	s.u.	8.50	11.56
1/23/2012	Settleable Matter	Daily Maximum	mL/L-hr	0.2	0.5
1/31/2012	Settleable Matter	Monthly Average	mL/L-hr	0.1	0.5
12/17/2012	Settleable Matter	Daily Maximum	mL/L-hr	0.2	1.1
11/20/2013	Settleable Matter	Daily Maximum	mL/L-hr	0.2	10

Date	Pollutant	Limit Description	Unit	Effluent Limit	Reported Value
11/30/2013	Settleable Matter	Monthly Average	mL/L-hr	0.1	10
1/23/2012	TDS	Daily Maximum	mg/L	500	700
11/28/2012	TDS	Daily Maximum	mg/L	500	1,200
12/3/2012	TDS	Daily Maximum	mg/L	500	980
12/10/2012	TDS	Daily Maximum	mg/L	500	1,200
12/17/2012	TDS	Daily Maximum	mg/L	500	980
12/26/2012	TDS	Daily Maximum	mg/L	500	960
2/19/2013	TDS	Daily Maximum	mg/L	500	570
11/20/2013	TDS	Daily Maximum	mg/L	500	2,100
1/23/2012	TSS	Weekly Average	mg/L	45	200
1/31/2012	TSS	Monthly Average	mg/L	30	200
11/20/2013	TSS	Weekly Average	mg/L	45	1,800
11/30/2013	TSS	Monthly Average	mg/L	30	1,800
11/28/2012	Turbidity	Daily Maximum	NTU	40	50
2/19/2013	Turbidity	Daily Maximum	NTU	40	94
11/20/2013	Trubidity	Daily Maximum	NTU	40	>1,000
Rock Plant Sump Discharge					
12/26/2012	TDS	Daily Maximum	mg/L	500	940

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ATTACHMENT G
REGIONAL STANDARD PROVISIONS, AND MONITORING AND REPORTING REQUIREMENTS
(SUPPLEMENT TO ATTACHMENT D)

For

NPDES WASTEWATER DISCHARGE PERMITS

March 2010

Contents

I. STANDARD PROVISIONS - PERMIT COMPLIANCE G-1
A. Duty to Comply G-1
B. Need to Halt or Reduce Activity Not a Defense G-1
C. Duty to Mitigate G-1
1. Contingency Plan G-1
2. Spill Prevention Plan G-2
D. Proper Operation & Maintenance G-2
1. Operation and Maintenance (O&M) Manual G-2
2. Wastewater Facilities Status Report G-2
3. Proper Supervision and Operation of Publicly Owned Treatment Works (POTWs) G-3
E. Property Rights G-3
F. Inspection and Entry G-3
G. Bypass G-3
H. Upset G-3
I. Other G-3
J. Stormwater G-3
1. Stormwater Pollution Prevention Plan (SWPP Plan) G-3
2. Source Identification G-4
3. Stormwater Management Controls G-5
4. Annual Verification of SWPP Plan G-6
K. Biosolids Management G-6
II. STANDARD PROVISIONS – PERMIT ACTION G-7
III. STANDARD PROVISIONS – MONITORING G-7
A. Sampling and Analyses G-7
1. Use of Certified Laboratories G-7
2. Use of Appropriate Minimum Levels G-7
3. Frequency of Monitoring G-7
B. Biosolids Monitoring G-10
1. Biosolids Monitoring Frequency G-10
2. Biosolids Pollutants to Monitor G-10
C. Standard Observations G-10
1. Receiving Water Observations G-10
2. Wastewater Effluent Observations G-11
3. Beach and Shoreline Observations G-11
4. Land Retention or Disposal Area Observations G-11
5. Periphery of Waste Treatment and/or Disposal Facilities Observations G-12
IV. STANDARD PROVISIONS – RECORDS G-12
A. Records to be Maintained G-12
B. Records of monitoring information G-12
1. Analytical Information G-12
2. Flow Monitoring Data G-12
3. Wastewater Treatment Process Solids G-13
4. Disinfection Process G-13
5. Treatment Process Bypasses G-13
6. Treatment Facility Overflows G-14
C. Claims of Confidentiality G-14
V. STANDARD PROVISIONS – REPORTING G-14

A. Duty to Provide Information G-14
B. Signatory and Certification Requirements G-14
C. Monitoring Reports G-14
1. Self Monitoring Reports G-14
D. Compliance Schedules G-18
E. Twenty-Four Hour Reporting G-18
1. Spill of Oil or Other Hazardous Material Reports G-18
2. Unauthorized Discharges from Municipal Wastewater Treatment Plants G-19
F. Planned Changes G-22
G. Anticipated Noncompliance G-22
H. Other Noncompliance G-22
I. Other Information G-22
VI. STANDARD PROVISION – ENFORCEMENT G-22
VII. ADDITIONAL PROVISIONS – NOTIFICATION LEVELS G-22
VIII. DEFINITIONS G-22

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

REGIONAL STANDARD PROVISIONS, AND MONITORING AND REPORTING REQUIREMENTS (SUPPLEMENT TO ATTACHMENT D)

FOR

NPDES WASTEWATER DISCHARGE PERMITS

APPLICABILITY

This document applies to dischargers covered by a National Pollutant Discharge Elimination System (NPDES) permit. This document does not apply to Municipal Separate Storm Sewer System (MS4) NPDES permits.

The purpose of this document is to supplement the requirements of Attachment D, Standard Provisions. The requirements in this supplemental document are designed to ensure permit compliance through preventative planning, monitoring, recordkeeping, and reporting. In addition, this document requires proper characterization of issues as they arise, and timely and full responses to problems encountered. To provide clarity on which sections of Attachment D this document supplements, this document is arranged in the same format as Attachment D.

I. STANDARD PROVISIONS - PERMIT COMPLIANCE

A. Duty to Comply – Not Supplemented

B. Need to Halt or Reduce Activity Not a Defense – Not Supplemented

C. Duty to Mitigate – This supplements I.C. of Standard Provisions (Attachment D)

1. Contingency Plan - The Discharger shall maintain a Contingency Plan as originally required by Regional Water Board Resolution 74-10 and as prudent in accordance with current municipal facility emergency planning. The Contingency Plan shall describe procedures to ensure that existing facilities remain in, or are rapidly returned to, operation in the event of a process failure or emergency incident, such as employee strike, strike by suppliers of chemicals or maintenance services, power outage, vandalism, earthquake, or fire. The Discharger may combine the Contingency Plan and Spill Prevention Plan into one document. Discharge in violation of the permit where the Discharger has failed to develop and implement a Contingency Plan as described below will be the basis for considering the discharge a willful and negligent violation of the permit pursuant to California Water Code Section 13387. The Contingency Plan shall, at a minimum, contain the provisions of a. through g. below.

    a. Provision of personnel for continued operation and maintenance of sewerage facilities during employee strikes or strikes against contractors providing services.

b. Maintenance of adequate chemicals or other supplies and spare parts necessary for continued operations of sewerage facilities.

c. Provisions of emergency standby power.

d. Protection against vandalism.

e. Expeditious action to repair failures of, or damage to, equipment and sewer lines.

f. Report of spills and discharges of untreated or inadequately treated wastes, including measures taken to clean up the effects of such discharges.

g. Programs for maintenance, replacement, and surveillance of physical condition of equipment, facilities, and sewer lines.

2. Spill Prevention Plan - The Discharger shall maintain a Spill Prevention Plan to prevent accidental discharges and minimize the effects of such events. The Spill Prevention Plan shall:

a. Identify the possible sources of accidental discharge, untreated or partially treated waste bypass, and polluted drainage;

b. Evaluate the effectiveness of present facilities and procedures, and state when they became operational; and

c. Predict the effectiveness of the proposed facilities and procedures, and provide an implementation schedule containing interim and final dates when they will be constructed, implemented, or operational.

This Regional Water Board, after review of the Contingency and Spill Prevention Plans or their updated revisions, may establish conditions it deems necessary to control accidental discharges and to minimize the effects of such events. Such conditions may be incorporated as part of the permit upon notice to the Discharger.

D. Proper Operation & Maintenance – This supplements I.D of Standard Provisions (Attachment D)

1. Operation and Maintenance (O&M) Manual - The Discharger shall maintain an O&M Manual to provide the plant and regulatory personnel with a source of information describing all equipment, recommended operational strategies, process control monitoring, and maintenance activities. To remain a useful and relevant document, the O&M Manual shall be kept updated to reflect significant changes in treatment facility equipment and operational practices. The O&M Manual shall be maintained in usable condition and be available for reference and use by all relevant personnel and Regional Water Board staff.

2. Wastewater Facilities Status Report - The Discharger shall regularly review, revise, or update, as necessary, its Wastewater Facilities Status Report. This report shall document how the Discharger operates and maintains its wastewater collection, treatment, and disposal facilities to ensure that all facilities are adequately staffed, supervised, financed, operated, maintained, repaired, and upgraded as necessary to provide adequate and reliable transport, treatment, and disposal of all wastewater from both existing and planned future wastewater sources under the Discharger's service responsibilities.

3. Proper Supervision and Operation of Publicly Owned Treatment Works (POTWs) - POTWs shall be supervised and operated by persons possessing certificates of appropriate grade pursuant to Division 4, Chapter 14, Title 23 of the California Code of Regulations.

E. Property Rights – Not Supplemented

F. Inspection and Entry – Not Supplemented

G. Bypass – Not Supplemented

H. Upset – Not Supplemented

I. Other – This section is an addition to Standard Provisions (Attachment D)

1. Neither the treatment nor the discharge of pollutants shall create pollution, contamination, or nuisance as defined by California Water Code Section 13050.

2. Collection, treatment, storage, and disposal systems shall be operated in a manner that precludes public contact with wastewater, except in cases where excluding the public is infeasible, such as private property. If public contact with wastewater could reasonably occur on public property, warning signs shall be posted.

3. If the Discharger submits a timely and complete Report of Waste Discharge for permit reissuance, this permit continues in force and effect until a new permit is issued or the Regional Water Board rescinds the permit.

J. Stormwater – This section is an addition to Standard Provisions (Attachment D)

These provisions apply to facilities that do not direct all stormwater flows from the facility to the wastewater treatment plant headworks.

1. Stormwater Pollution Prevention Plan (SWPP Plan)

The SWPP Plan shall be designed in accordance with good engineering practices and shall address the following objectives:

a. To identify pollutant sources that may affect the quality of stormwater discharges; and

b. To identify, assign, and implement control measures and management practices to reduce pollutants in stormwater discharges.

The SWPP Plan may be combined with the existing Spill Prevention Plan as required in accordance with Section C.2. The SWPP Plan shall be retained on-site and made available upon request of a representative of the Regional Water Board.

2. Source Identification

The SWPP Plan shall provide a description of potential sources that may be expected to add significant quantities of pollutants to stormwater discharges, or may result in non-stormwater discharges from the facility. The SWPP Plan shall include, at a minimum, the following items:

a. A topographical map (or other acceptable map if a topographical map is unavailable), extending one-quarter mile beyond the property boundaries of the facility, showing the wastewater treatment facility process areas, surface water bodies (including springs and wells), and discharge point(s) where the facility's stormwater discharges to a municipal storm drain system or other points of discharge to waters of the State. The requirements of this paragraph may be included in the site map required under the following paragraph if appropriate.

b. A site map showing the following:

1) Stormwater conveyance, drainage, and discharge structures;

2) An outline of the stormwater drainage areas for each stormwater discharge point;

3) Paved areas and buildings;

4) Areas of actual or potential pollutant contact with stormwater or release to stormwater, including but not limited to outdoor storage and process areas; material loading, unloading, and access areas; and waste treatment, storage, and disposal areas;

5) Location of existing stormwater structural control measures (i.e., berms, coverings, etc.);

6) Surface water locations, including springs and wetlands; and

7) Vehicle service areas.

c. A narrative description of the following:

1) Wastewater treatment process activity areas;

2) Materials, equipment, and vehicle management practices employed to minimize contact of significant materials of concern with stormwater discharges;

3) Material storage, loading, unloading, and access areas;

4) Existing structural and non-structural control measures (if any) to reduce pollutants in stormwater discharges; and

5) Methods of on-site storage and disposal of significant materials.

d. A list of pollutants that have a reasonable potential to be present in stormwater discharges in significant quantities.

3. Stormwater Management Controls

The SWPP Plan shall describe the stormwater management controls appropriate for the facility and a time schedule for fully implementing such controls. The appropriateness and priorities of controls in the SWPP Plan shall reflect identified potential sources of pollutants. The description of stormwater management controls to be implemented shall include, as appropriate:

a. Stormwater pollution prevention personnel

Identify specific individuals (and job titles) that are responsible for developing, implementing, and reviewing the SWPP Plan.

b. Good housekeeping

Good housekeeping requires the maintenance of clean, orderly facility areas that discharge stormwater. Material handling areas shall be inspected and cleaned to reduce the potential for pollutants to enter the storm drain conveyance system.

c. Spill prevention and response

Identify areas where significant materials can spill into or otherwise enter stormwater conveyance systems and their accompanying drainage points. Specific material handling procedures, storage requirements, and cleanup equipment and procedures shall be identified, as appropriate. The necessary equipment to implement a cleanup shall be available, and personnel shall be trained in proper response, containment, and cleanup of spills. Internal reporting procedures for spills of significant materials shall be established.

d. Source control

Source controls include, for example, elimination or reduction of the use of toxic pollutants, covering of pollutant source areas, sweeping of paved areas, containment of potential pollutants, labeling of all storm drain inlets with “No Dumping” signs, isolation or separation of industrial and non-industrial pollutant sources so that runoff from these areas does not mix, etc.

e. Stormwater management practices

Stormwater management practices are practices other than those that control the sources of pollutants. Such practices include treatment or conveyance structures, such as drop inlets, channels, retention and detention basins, treatment vaults, infiltration galleries, filters, oil/water separators, etc. Based on assessment of the potential of various sources to contribute pollutants to stormwater discharges in significant quantities, additional stormwater management practices to remove pollutants from stormwater discharges shall be implemented and design criteria shall be described.

f. Sediment and erosion control

Measures to minimize erosion around the stormwater drainage and discharge points, such as riprap, revegetation, slope stabilization, etc., shall be described.

g. Employee training

Employee training programs shall inform all personnel responsible for implementing the SWPP Plan. Training shall address spill response, good housekeeping, and material management practices. New employee and refresher training schedules shall be identified.

h. Inspections

All inspections shall be done by trained personnel. Material handling areas shall be inspected for evidence of, or the potential for, pollutants entering stormwater discharges. A tracking or follow up procedure shall be used to ensure appropriate response has been taken in response to an inspection. Inspections and maintenance activities shall be documented and recorded. Inspection records shall be retained for five years.

i. Records

A tracking and follow-up procedure shall be described to ensure that adequate response and corrective actions have been taken in response to inspections.

4. Annual Verification of SWPP Plan

An annual facility inspection shall be conducted to verify that all elements of the SWPP Plan are accurate and up-to-date. The results of this review shall be reported in the Annual Report to the Regional Water Board described in Section V.C.f.

K. Biosolids Management – This section is an addition to Standard Provisions (Attachment D)

Biosolids must meet the following requirements prior to land application. The Discharger must either demonstrate compliance or, if it sends the biosolids to another party for further treatment or distribution, must give the recipient the information necessary to ensure compliance.

1. Exceptional quality biosolids meet the pollutant concentration limits in Table III of 40 CFR Part 503.13, Class A pathogen limits, and one of the vector attraction reduction requirements in 503.33(b)(1)-(b)(8). Such biosolids do not have to be tracked further for compliance with general requirements (503.12) and management practices (503.14).

2. Biosolids used for agricultural land, forest, or reclamation shall meet the pollutant limits in Table I (ceiling concentrations) and Table II or Table III (cumulative loadings or pollutant concentration limits) of 503.13. They shall also meet the general requirements (503.12) and management practices (503.14) (if not exceptional quality biosolids) for Class A or Class B pathogen levels with associated access restrictions (503.32) and one of the 10 vector attraction reduction requirements in 503.33(b)(1)-(b)(10).

3. Biosolids used for lawn or home gardens must meet exceptional quality biosolids limits.

4. Biosolids sold or given away in a bag or other container must meet the pollutant limits in either Table III or Table IV (pollutant concentration limits or annual pollutant loading rate limits) of 503.13. If Table IV is used, a label or information sheet must be attached to the biosolids packing that explains Table IV (see 503.14). The biosolids must also meet the Class A pathogen limits and one of the vector attraction reduction requirements in 503.33(b)(1)-(b)(8).

II. STANDARD PROVISIONS – PERMIT ACTION – Not Supplemented

III. STANDARD PROVISIONS – MONITORING

A. **Sampling and Analyses** – This section is a supplement to III.A and III.B of Standard Provisions (Attachment D)

1. Use of Certified Laboratories

   Water and waste analyses shall be performed by a laboratory certified for these analyses in accordance with California Water Code Section 13176.

2. Use of Appropriate Minimum Levels

   Table C lists the suggested analytical methods for the 126 priority pollutants and other toxic pollutants that should be used, unless a particular method or minimum level (ML) is required in the MRP.

   For priority pollutant monitoring, when there is more than one ML value for a given substance, the Discharger may select any one of the analytical methods cited in Table C for compliance determination, or any other method described in 40 CFR part 136 or approved by U.S. EPA (such as the 1600 series) if authorized by the Regional Water Board. However, the ML must be below the effluent limitation and water quality objective. If no ML value is below the effluent limitation and water quality objective, then the method must achieve an ML no greater than the lowest ML value indicated in Table C. All monitoring instruments and equipment shall be properly calibrated and maintained to ensure accuracy of measurements.

3. Frequency of Monitoring

   The minimum schedule of sampling analysis is specified in the MRP portion of the permit.

   a. Timing of Sample Collection

      1) The Discharger shall collect samples of influent on varying days selected at random and shall not include any plant recirculation or other sidestream wastes, unless otherwise stipulated by the MRP.

      2) The Discharger shall collect samples of effluent on days coincident with influent sampling unless otherwise stipulated by the MRP or the Executive Officer. The Executive Officer may approve an alternative sampling plan if it is demonstrated to be representative of plant discharge flow and in compliance with all other permit requirements.

      3) The Discharger shall collect grab samples of effluent during periods of day-time maximum peak effluent flows (or peak flows through secondary treatment units for facilities that recycle effluent flows).

      4) Effluent sampling for conventional pollutants shall occur on at least one day of any multiple-day bioassay test the MRP requires. During the course of the test, on at least one day, the Discharger shall collect and retain samples of the discharge. In the event a bioassay test does

not comply with permit limits, the Discharger shall analyze these retained samples for pollutants that could be toxic to aquatic life and for which it has effluent limits.

i. The Discharger shall perform bioassay tests on final effluent samples; when chlorine is used for disinfection, bioassay tests shall be performed on effluent after chlorination-dechlorination; and

ii. The Discharger shall analyze for total ammonia nitrogen and calculate the amount of un-ionized ammonia whenever test results fail to meet the percent survival specified in the permit.

b. Conditions Triggering Accelerated Monitoring

1) If the results from two consecutive samples of a constituent monitored in a 30-day period exceed the monthly average limit for any parameter (or if the required sampling frequency is once per month and the monthly sample exceeds the monthly average limit), the Discharger shall, within 24 hours after the results are received, increase its sampling frequency to daily until the results from the additional sampling show that the parameter is in compliance with the monthly average limit.

2) If any maximum daily limit is exceeded, the Discharger shall increase its sampling frequency to daily within 24 hours after the results are received that indicate the exceedance of the maximum daily limit until two samples collected on consecutive days show compliance with the maximum daily limit.

3) If final or intermediate results of an acute bioassay test indicate a violation or threatened violation (e.g., the percentage of surviving test organisms of any single acute bioassay test is less than 70 percent), the Discharger shall initiate a new test as soon as practical, and the Discharger shall investigate the cause of the mortalities and report its findings in the next self monitoring report (SMR).

4) The Discharger shall calibrate chlorine residual analyzers against grab samples as frequently as necessary to maintain accurate control and reliable operation. If an effluent violation is detected, the Discharger shall collect grab samples at least every 30 minutes until compliance with the limit is achieved, unless the Discharger monitors chlorine residual continuously. In such cases, the Discharger shall continue to conduct continuous monitoring as required by its permit.

5) When a bypass occurs (except one subject to provision III.A.3.b.6 below), the Discharger shall monitor flows and collect samples on a daily basis for all constituents at affected discharge points that have effluent limits for the duration of the bypass (including acute toxicity using static renewals), except chronic toxicity, unless otherwise stipulated by the MRP.

6) Unless otherwise stipulated by the MRP, when a bypass approved pursuant to Attachment D, Standard Provisions, Sections I.G.2 or I.G.4, occurs, the Discharger shall monitor flows and, using appropriate procedures as specified in the MRP, collect and retain samples for affected discharge points on a daily basis for the duration of the bypass. The Discharger shall analyze for total suspended solids (TSS) using 24-hour composites (or more frequent increments) and for bacteria indicators with effluent limits using grab samples. If TSS exceeds 45 mg/L in any composite sample, the Discharger shall also analyze the retained samples for that discharge for all other constituents that have effluent limits, except oil and grease, mercury, dioxin-TEQ, and acute and chronic toxicity. Additionally, at least once each year, the Discharger

shall analyze the retained samples for one approved bypass discharge event for all other constituents that have effluent limits, except oil and grease, mercury, dioxin-TEQ, and acute and chronic toxicity. This monitoring shall be in addition to the minimum monitoring specified in the MRP.

c. Stormwater Monitoring

The requirements of this section only apply to facilities that are not covered by an NPDES permit for stormwater discharges and where not all site storm drainage from process areas (i.e., areas of the treatment facility where chemicals or wastewater could come in contact with stormwater) is directed to the headworks. For stormwater not directed to the headworks during the wet season (October 1 to April 30), the Discharger shall:

1) Conduct visual observations of the stormwater discharge locations during daylight hours at least once per month during a storm event that produces significant stormwater discharge to observe the presence of floating and suspended materials, oil and grease, discoloration, turbidity, and odor, etc.

2) Measure (or estimate) the total volume of stormwater discharge, collect grab samples of stormwater discharge from at least two storm events that produce significant stormwater discharge, and analyze the samples for oil and grease, pH, TSS, and specific conductance.

   The grab samples shall be taken during the first 30 minutes of the discharge. If collection of the grab samples during the first 30 minutes is impracticable, grab samples may be taken during the first hour of the discharge, and the Discharger shall explain in the Annual Report why the grab sample(s) could not be taken in the first 30 minutes.

3) Testing for the presence of non-stormwater discharges shall be conducted no less than twice during the dry season (May 1 to September 30) at all stormwater discharge locations. Tests may include visual observations of flows, stains, sludges, odors, and other abnormal conditions; dye tests; TV line surveys; or analysis and validation of accurate piping schematics. Records shall be maintained describing the method used, date of testing, locations observed, and test results.

4) Samples shall be collected from all locations where stormwater is discharged. Samples shall represent the quality and quantity of stormwater discharged from the facility. If a facility discharges stormwater at multiple locations, the Discharger may sample a reduced number of locations if it establishes and documents through the monitoring program that stormwater discharges from different locations are substantially identical.

5) Records of all stormwater monitoring information and copies of all reports required by the permit shall be retained for a period of at least three years from the date of sample, observation, or report.

d. Receiving Water Monitoring

The requirements of this section only apply when the MRP requires receiving water sampling.

1) Receiving water samples shall be collected on days coincident with effluent sampling for conventional pollutants.

2) Receiving water samples shall be collected at each station on each sampling day during the period within one hour following low slack water. Where sampling during lower slack water is impractical, sampling shall be performed during higher slack water. Samples shall be collected within the discharge plume and down current of the discharge point so as to be representative, unless otherwise stipulated in the MRP.

3) Samples shall be collected within one foot of the surface of the receiving water, unless otherwise stipulated in the MRP.

B. Biosolids Monitoring – This section supplements III.B of Standard Provisions (Attachment D)

When biosolids are sent to a landfill, sent to a surface disposal site, or applied to land as a soil amendment, they must be monitored as follows:

1. Biosolids Monitoring Frequency

Biosolids disposal must be monitored at the following frequency:

Metric tons biosolids/365 days	Frequency
0-290	Once per year
290-1500	Quarterly
1500-15,000	Six times per year
Over 15,000	Once per month

(Metric tons are on a dry weight basis)

2. Biosolids Pollutants to Monitor

Biosolids shall be monitored for the following constituents:

- Land Application: Arsenic, cadmium, copper, mercury, molybdenum, nickel, lead, selenium, and zinc

- Municipal Landfill: Paint filter test (pursuant to 40 CFR 258)

- Biosolids-only Landfill or Surface Disposal Site (if no liner and leachate system): arsenic, chromium, and nickel

C. **Standard Observations** – This section is an addition to III of Standard Provisions (AttachmentD)

1. Receiving Water Observations

The requirements of this section only apply when the MRP requires standard observations of the receiving water. Standard observations shall include the following:

a. *Floating and suspended materials* (e.g., oil, grease, algae, and other macroscopic particulate matter): presence or absence, source, and size of affected area.

b. *Discoloration and turbidity*: description of color, source, and size of affected area.

c. *Odor*: presence or absence, characterization, source, distance of travel, and wind direction.

d. *Beneficial water use*: presence of water-associated waterfowl or wildlife, fisherpeople, and other recreational activities in the vicinity of each sampling station.

e. *Hydrographic condition*: time and height of corrected high and low tides (corrected to nearest National Oceanic and Atmospheric Administration location for the sampling date and time of sample collection).

f. *Weather conditions*:

1) Air temperature; and

2) Total precipitation during the five days prior to observation.

2. Wastewater Effluent Observations

The requirements of this section only apply when the MRP requires wastewater effluent standard observations. Standard observations shall include the following:

a. *Floating and suspended material of wastewater origin* (e.g., oil, grease, algae, and other macroscopic particulate matter): presence or absence.

b. *Odor*: presence or absence, characterization, source, distance of travel, and wind direction.

3. Beach and Shoreline Observations

The requirements of this section only apply when the MRP requires beach and shoreline standard observations. Standard observations shall include the following:

a. *Material of wastewater origin*: presence or absence, description of material, estimated size of affected area, and source.

b. *Beneficial use*: estimate number of people participating in recreational water contact, non-water contact, or fishing activities.

4. Land Retention or Disposal Area Observations

The requirements of this section only apply to facilities with on-site surface impoundments or disposal areas that are in use. This section applies to both liquid and solid wastes, whether confined or unconfined. The Discharger shall conduct the following for each impoundment:

a. Determine the amount of freeboard at the lowest point of dikes confining liquid wastes.

b. Report evidence of leaching liquid from area of confinement and estimated size of affected area. Show affected area on a sketch and volume of flow (e.g., gallons per minute [gpm]).

c. Regarding odor, describe presence or absence, characterization, source, distance of travel, and wind direction.

d. Estimate number of waterfowl and other water-associated birds in the disposal area and vicinity.

5. Periphery of Waste Treatment and/or Disposal Facilities Observations

The requirements of this section only apply when the MRP specifies periphery standard observations. Standard observations shall include the following:

a. *Odor*: presence or absence, characterization, source, and distance of travel.

b. *Weather conditions*: wind direction and estimated velocity.

IV. STANDARD PROVISIONS – RECORDS

A. Records to be Maintained – This supplements IV.A of Standard Provisions (Attachment D)

The Discharger shall maintain records in a manner and at a location (e.g., wastewater treatment plant or Discharger offices) such that the records are accessible to Regional Water Board staff. The minimum period of retention specified in Section IV, Records, of the Federal Standard Provisions shall be extended during the course of any unresolved litigation regarding the subject discharge, or when requested by the Regional Water Board or Regional Administrator of U.S. EPA, Region IX.

A copy of the permit shall be maintained at the discharge facility and be available at all times to operating personnel.

B. Records of monitoring information shall include – This supplements IV.B of Standard Provision (Attachment D)

1. Analytical Information

Records shall include analytical method detection limits, minimum levels, reporting levels, and related quantification parameters.

2. Flow Monitoring Data

For all required flow monitoring (e.g., influent and effluent flows), the additional records shall include the following, unless otherwise stipulated by the MRP:

a. Total volume for each day; and

b. Maximum, minimum, and average daily flows for each calendar month.

3. Wastewater Treatment Process Solids

a. For each treatment unit process that involves solids removal from the wastewater stream, records shall include the following:

1) Total volume or mass of solids removed from each collection unit (e.g., grit, skimmings, undigested biosolids, or combination) for each calendar month or other time period as appropriate, but not to exceed annually; and

2) Final disposition of such solids (e.g., landfill, other subsequent treatment unit).

b. For final dewatered biosolids from the treatment plant as a whole, records shall include the following:

1) Total volume or mass of dewatered biosolids for each calendar month;

2) Solids content of the dewatered biosolids; and

3) Final disposition of dewatered biosolids (disposal location and disposal method).

4. Disinfection Process

For the disinfection process, these additional records shall be maintained documenting process operation and performance:

a. For bacteriological analyses:

1) Wastewater flow rate at the time of sample collection; and

2) Required statistical parameters for cumulative bacterial values (e.g., moving median or geometric mean for the number of samples or sampling period identified in this Order).

b. For the chlorination process, when chlorine is used for disinfection, at least daily average values for the following:

1) Chlorine residual of treated wastewater as it enters the contact basin (mg/L);

2) Chlorine dosage (kg/day); and

3) Dechlorination chemical dosage (kg/day).

5. Treatment Process Bypasses

A chronological log of all treatment process bypasses, including wet weather blending, shall include the following:

a. Identification of the treatment process bypassed;

b. Dates and times of bypass beginning and end;

c. Total bypass duration;

d. Estimated total bypass volume; and

e. Description of, or reference to other reports describing, the bypass event, the cause, the corrective actions taken (except for wet weather blending that is in compliance with permit conditions), and any additional monitoring conducted.

6. Treatment Facility Overflows

This section applies to records for overflows at the treatment facility. This includes the headworks and all units and appurtenances downstream. The Discharger shall retain a chronological log of overflows at the treatment facility and records supporting the information provided in section V.E.2.

C. Claims of Confidentiality – Not Supplemented

V. STANDARD PROVISIONS – REPORTING

A. Duty to Provide Information – Not Supplemented

B. Signatory and Certification Requirements – Not Supplemented

C. Monitoring Reports – This section supplements V.C of Standard Provisions (Attachment D)

1. Self Monitoring Reports

For each reporting period established in the MRP, the Discharger shall submit an SMR to the Regional Water Board in accordance with the requirements listed in this document and at the frequency the MRP specifies. The purpose of the SMR is to document treatment performance, effluent quality, and compliance with the waste discharge requirements of this Order.

a. Transmittal letter

Each SMR shall be submitted with a transmittal letter. This letter shall include the following:

1) Identification of all violations of effluent limits or other waste discharge requirements found during the reporting period;

2) Details regarding violations: parameters, magnitude, test results, frequency, and dates;

3) Causes of violations;

4) Discussion of corrective actions taken or planned to resolve violations and prevent recurrences, and dates or time schedule of action implementation (if previous reports have been submitted that address corrective actions, reference to the earlier reports is satisfactory);

5) Data invalidation (Data should not be submitted in an SMR if it does not meet quality assurance/quality control standards. However, if the Discharger wishes to invalidate any measurement after it was submitted in an SMR, a letter shall identify the measurement suspected to be invalid and state the Discharger's intent to submit, within 60 days, a formal request to invalidate the measurement. This request shall include the original measurement in question, the reason for invalidating the measurement, all relevant documentation that supports invalidation [e.g., laboratory sheet, log entry, test results, etc.], and discussion of the

corrective actions taken or planned [with a time schedule for completion] to prevent recurrence of the sampling or measurement problem.);

6) If the Discharger blends, the letter shall describe the duration of blending events and certify whether blended effluent was in compliance with the conditions for blending; and

7) Signature (The transmittal letter shall be signed according to Section V.B of this Order, Attachment D – Standard Provisions.).

b. Compliance evaluation summary

Each report shall include a compliance evaluation summary. This summary shall include each parameter for which the permit specifies effluent limits, the number of samples taken during the monitoring period, and the number of samples that exceed applicable effluent limits.

c. Results of analyses and observations

1) Tabulations of all required analyses and observations, including parameter, date, time, sample station, type of sample, test result, method detection limit, method minimum level, and method reporting level, if applicable, signed by the laboratory director or other responsible official.

2) When determining compliance with an average monthly effluent limitation and more than one sample result is available in a month, the Discharger shall compute the arithmetic mean unless the data set contains one or more reported determinations of detected but not quantified (DNQ) or nondetect (ND). In those cases, the Discharger shall compute the median in place of the arithmetic mean in accordance with the following procedure:

i. The data set shall be ranked from low to high, reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

ii. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

If a sample result, or the arithmetic mean or median of multiple sample results, is below the reporting limit, and there is evidence that the priority pollutant is present in the effluent above an effluent limitation and the Discharger conducts a Pollutant Minimization Program, the Discharger shall not be deemed out of compliance.

3) Dioxin-TEQ Reporting: The Discharger shall report for each dioxin and furan congener the analytical results of effluent monitoring, including the quantifiable limit (reporting level), the method detection limit, and the measured concentration. The Discharger shall report all measured values of individual congeners, including data qualifiers. When calculating dioxin-TEQ, the Discharger shall set congener concentrations below the minimum levels (ML) to zero. The Discharger shall calculate and report dioxin-TEQs using the following formula, where the MLs, toxicity equivalency factors (TEFs), and bioaccumulation equivalency factors (BEFs) are as provided in Table A:

$$\text{Dioxin-TEQ} = \Sigma\,(C_x \times TEF_x \times BEF_x)$$

where: C_x = measured or estimated concentration of congener x
TEF_x = toxicity equivalency factor for congener x
BEFx = bioaccumulation equivalency factor for congener x

Table A
Minimum Levels, Toxicity Equivalency Factors, and Bioaccumulation Equivalency Factors

Dioxin or Furan Congener	**Minimum Level (pg/L)**	**1998 Toxicity Equivalency Factor (TEF)**	**Bioaccumulation Equivalency Factor (BEF)**
2,3,7,8-TCDD	10	1.0	1.0
1,2,3,7,8-PeCDD	50	1.0	0.9
1,2,3,4,7,8-HxCDD	50	0.1	0.3
1,2,3,6,7,8-HxCDD	50	0.1	0.1
1,2,3,7,8,9-HxCDD	50	0.1	0.1
1,2,3,4,6,7,8-HpCDD	50	0.01	0.05
OCDD	100	0.0001	0.01
2,3,7,8-TCDF	10	0.1	0.8
1,2,3,7,8-PeCDF	50	0.05	0.2
2,3,4,7,8-PeCDF	50	0.5	1.6
1,2,3,4,7,8-HxCDF	50	0.1	0.08
1,2,3,6,7,8-HxCDF	50	0.1	0.2
1,2,3,7,8,9-HxCDF	50	0.1	0.6
2,3,4,6,7,8-HxCDF	50	0.1	0.7
1,2,3,4,6,7,8-HpCDF	50	0.01	0.01
1,2,3,4,7,8,9-HpCDF	50	0.01	0.4
OCDF	100	0.0001	0.02

d. Data reporting for results not yet available

The Discharger shall make all reasonable efforts to obtain analytical data for required parameter sampling in a timely manner. Certain analyses require additional time to complete analytical processes and report results. For cases where required monitoring parameters require additional time to complete analytical processes and reports, and results are not available in time to be included in the SMR for the subject monitoring period, the Discharger shall describe such circumstances in the SMR and include the data for these parameters and relevant discussions of any observed exceedances in the next SMR due after the results are available.

e. Flow data

The Discharger shall provide flow data tabulation pursuant to Section IV.B.2.

f. Annual self monitoring report requirements

By the date specified in the MRP, the Discharger shall submit an annual report to the Regional Water Board covering the previous calendar year. The report shall contain the following:

1) Annual compliance summary table of treatment plant performance, including documentation of any blending events;

2) Comprehensive discussion of treatment plant performance and compliance with the permit (This discussion shall include any corrective actions taken or planned, such as changes to facility equipment or operation practices that may be needed to achieve compliance, and any other actions taken or planned that are intended to improve performance and reliability of the Discharger's wastewater collection, treatment, or disposal practices.);

3) Both tabular and graphical summaries of the monitoring data for the previous year if parameters are monitored at a frequency of monthly or greater;

4) List of approved analyses, including the following:

   (i) List of analyses for which the Discharger is certified;

   (ii) List of analyses performed for the Discharger by a separate certified laboratory (copies of reports signed by the laboratory director of that laboratory shall not be submitted but be retained onsite); and

   (iii) List of "waived" analyses, as approved;

5) Plan view drawing or map showing the Discharger's facility, flow routing, and sampling and observation station locations;

6) Results of annual facility inspection to verify that all elements of the SWPP Plan are accurate and up to date (only required if the Discharger does not route all stormwater to the headworks of its wastewater treatment plant); and

7) Results of facility report reviews (The Discharger shall regularly review, revise, and update, as necessary, the O&M Manual, the Contingency Plan, the Spill Prevention Plan, and Wastewater Facilities Status Report so that these documents remain useful and relevant to current practices. At a minimum, reviews shall be conducted annually. The Discharger shall include, in each Annual Report, a description or summary of review and evaluation procedures, recommended or planned actions, and an estimated time schedule for implementing these actions. The Discharger shall complete changes to these documents to ensure they are up-to-date.).

g. Report submittal

The Discharger shall submit SMRs to:

California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612
Attn: NPDES Wastewater Division

h. Reporting data in electronic format

The Discharger has the option to submit all monitoring results in an electronic reporting format approved by the Executive Officer. If the Discharger chooses to submit SMRs electronically, the following shall apply:

1) *Reporting Method*: The Discharger shall submit SMRs electronically via a process approved by the Executive Officer (see, for example, the letter dated December 17, 1999, "Official Implementation of Electronic Reporting System [ERS]" and the progress report letter dated December 17, 2000).

2) *Monthly or Quarterly Reporting Requirements*: For each reporting period (monthly or quarterly as specified in the MRP), the Discharger shall submit an electronic SMR to the Regional Water Board in accordance with the provisions of Section V.C.1.a-e, except for requirements under Section V.C.1.c(1) where ERS does not have fields for dischargers to input certain information (e.g., sample time). However, until U.S. EPA approves the electronic signature or other signature technologies, Dischargers that use ERS shall submit a hard copy of the original transmittal letter, an ERS printout of the data sheet, and a violation report (a receipt of the electronic transmittal shall be retained by the Discharger). This electronic SMR submittal suffices for the signed tabulations specified under Section V.C.1.c(1).

3) *Annual Reporting Requirements*: Dischargers who have submitted data using the ERS for at least one calendar year are exempt from submitting the portion of the annual report required under Section V.C.1.f(1) and (3).

D. **Compliance Schedules** – Not supplemented

E. **Twenty-Four Hour Reporting** – This section supplements V.E of Standard Provision (Attachment D)

1. Spill of Oil or Other Hazardous Material Reports

a. Within 24 hours of becoming aware of a spill of oil or other hazardous material that is not contained onsite and completely cleaned up, the Discharger shall report by telephone to the Regional Water Board at (510) 622-2369.

b. The Discharger shall also report such spills to the State Office of Emergency Services [telephone (800) 852-7550] only when the spills are in accordance with applicable reporting quantities for hazardous materials.

c. The Discharger shall submit a written report to the Regional Water Board within five working days following telephone notification unless directed otherwise by Regional Water Board staff. A report submitted electronically is acceptable. The written report shall include the following:

1) Date and time of spill, and duration if known;

2) Location of spill (street address or description of location);

3) Nature of material spilled;

4) Quantity of material involved;

5) Receiving water body affected, if any;

6) Cause of spill;

7) Estimated size of affected area;

8) Observed impacts to receiving waters (e.g., oil sheen, fish kill, water discoloration);

9) Corrective actions taken to contain, minimize, or clean up the spill;

10) Future corrective actions planned to be taken to prevent recurrence, and schedule of implementation; and

11) Persons or agencies notified.

2. Unauthorized Discharges from Municipal Wastewater Treatment Plants[1]

The following requirements apply to municipal wastewater treatment plants that experience an unauthorized discharge at their treatment facilities and are consistent with and supercede requirements imposed on the Discharger by the Executive Officer by letter of May 1, 2008, issued pursuant to California Water Code Section 13383.

a. Two (2)-Hour Notification

For any unauthorized discharges that result in a discharge to a drainage channel or a surface water, the Discharger shall, as soon as possible, but not later than two (2) hours after becoming aware of the discharge, notify the State Office of Emergency Services (telephone 800-852-7550), the local health officers or directors of environmental health with jurisdiction over the affected water bodies, and the Regional Water Board. The notification to the Regional Water Board shall be via the Regional Water Board's online reporting system at www.wbers.net, and shall include the following:

1) Incident description and cause;

2) Location of threatened or involved waterway(s) or storm drains;

3) Date and time the unauthorized discharge started;

4) Estimated quantity and duration of the unauthorized discharge (to the extent known), and the estimated amount recovered;

5) Level of treatment prior to discharge (e.g., raw wastewater, primary treated, undisinfected secondary treated, and so on); and

6) Identity of the person reporting the unauthorized discharge.

[1] California Code of Regulations, Title 23, Section 2250(b), defines an unauthorized discharge to be a discharge, not regulated by waste discharge requirements, of treated, partially treated, or untreated wastewater resulting from the intentional or unintentional diversion of wastewater from a collection, treatment or disposal system.

b. 24-hour Certification

Within 24 hours, the Discharger shall certify to the Regional Water Board, at www.wbers.net, that the State Office of Emergency Services and the local health officers or directors of environmental health with jurisdiction over the affected water bodies have been notified of the unauthorized discharge.

c. 5-Day Written Report

Within five business days, the Discharger shall submit a written report, via the Regional Water Board's online reporting system at www.wbers.net, that includes, in addition to the information required above, the following:

1) Methods used to delineate the geographical extent of the unauthorized discharge within receiving waters;

2) Efforts implemented to minimize public exposure to the unauthorized discharge;

3) Visual observations of the impacts (if any) noted in the receiving waters (e.g., fish kill, discoloration of water) and the extent of sampling if conducted;

4) Corrective measures taken to minimize the impact of the unauthorized discharge;

5) Measures to be taken to minimize the chances of a similar unauthorized discharge occurring in the future;

6) Summary of Spill Prevention Plan or O&M Manual modifications to be made, if necessary, to minimize the chances of future unauthorized discharges; and

7) Quantity and duration of the unauthorized discharge, and the amount recovered.

d. Communication Protocol

To clarify the multiple levels of notification, certification, and reporting, the current communication requirements for unauthorized discharges from municipal wastewater treatment plants are summarized in Table B that follows.

Table B

Summary of Communication Requirements for Unauthorized Discharges[1] from Municipal Wastewater Treatment Plants

Discharger is required to:	Agency Receiving Information	Time frame	Method for Contact
1. Notify	California Emergency Management Agency (Cal EMA)	As soon as possible, but not later than **2 hours** after becoming aware of the unauthorized discharge.	Telephone – (800) 852-7550 (obtain a control number from Cal EMA)
	Local health department	As soon as possible, but not later than **2 hours** after becoming aware of the unauthorized discharge.	Depends on local health department
	Regional Water Board	As soon as possible, but not later than **2 hours** after becoming aware of the unauthorized discharge.	Electronic[2] www.wbers.net
2. Certify	Regional Water Board	As soon as possible, but not later than **24 hours** after becoming aware of the unauthorized discharge.	Electronic[3] www.wbers.net
3. Report	Regional Water Board	Within **5 business days** of becoming aware of the unauthorized discharge.	Electronic[4] www.wbers.net

[1] California Code of Regulations, Title 23, Section 2250(b), defines an unauthorized discharge to be a discharge, not regulated by waste discharge requirements, of treated, partially treated, or untreated wastewater resulting from the intentional or unintentional diversion of wastewater from a collection, treatment or disposal system.

[2] In the event that the Discharger is unable to provide online notification within 2 hours of becoming aware of an unauthorized discharge, it shall phone the Regional Water Board's spill hotline at (510) 622-2369 and convey the same information contained in the notification form. In addition, within 3 business days of becoming aware of the unauthorized discharge, the Discharger shall enter the notification information into the Regional Water Board's online system in electronic format.

[3] In most instances, the 2-hour notification will also satisfy 24-hour certification requirements. This is because the notification form includes fields for documenting that OES and the local health department have been contacted. In other words, if the Discharger is able to complete all the fields in the notification form within 2 hours, certification requirements are also satisfied. In the event that the Discharger is unable to provide online certification within 24 hours of becoming aware of an unauthorized discharge, it shall phone the Regional Water Board's spill hotline at (510) 622-2369 and convey the same information contained in the certification form. In addition, within 3 business days of becoming aware of the unauthorized discharge, the Discharger shall enter the certification information into the Regional Water Board's online system in electronic format.

[4] If the Discharger cannot satisfy the 5-day reporting requirements via the Regional Water Board's online reporting system, it shall submit a written report (preferably electronically in pdf) to the appropriate Regional Water Board case manager. In cases where the Discharger cannot satisfy the 5-day reporting requirements via the online reporting system, it must still complete the Regional Water Board's online reporting requirements within 15 calendar days of becoming aware of the unauthorized discharge.

F. Planned Changes – Not supplemented

G. Anticipated Noncompliance – Not supplemented

H. Other Noncompliance – Not supplemented

I. Other Information – Not supplemented

VI. STANDARD PROVISION – ENFORCEMENT – Not Supplemented

VII. ADDITIONAL PROVISIONS – NOTIFICATION LEVELS – Not Supplemented

VIII. DEFINITIONS – This section is an addition to Standard Provisions (Attachment D)

More definitions can be found in Attachment A of this NPDES Permit.

1. Arithmetic Calculations

   a. Geometric mean is the antilog of the log mean or the back-transformed mean of the logarithmically transformed variables, which is equivalent to the multiplication of the antilogarithms. The geometric mean can be calculated with either of the following equations:

$$\text{Geometric Mean} = Anti\ \log\left(\frac{1}{N}\sum_{i=1}^{N} Log\left(C_i\right)\right)$$

or

$$\text{Geometric Mean} = (C_1 * C_2 * \ldots * C_N)^{1/N}$$

   Where "N" is the number of data points for the period analyzed and "C" is the concentration for each of the "N" data points.

   b. Mass emission rate is obtained from the following calculation for any calendar day:

$$\text{Mass emission rate (lb/day)} = \frac{8.345}{N}\sum_{i=1}^{N} Q_i C_i$$

$$\text{Mass emission rate (kg/day)} = \frac{3.785}{N}\sum_{i=1}^{N} Q_i C_i$$

   In which "N" is the number of samples analyzed in any calendar day and "Q_i" and "C_i" are the flow rate (MGD) and the constituent concentration (mg/L) associated with each of the "N" grab samples that may be taken in any calendar day. If a composite sample is taken, "C_i" is the concentration measured in the composite sample and "Q_i" is the average flow rate occurring during the period over which the samples are composited. The daily concentration of a constituent measured over any calendar day shall be determined from the flow-weighted average of the same constituent in the combined waste streams as follows:

$$\text{Cd} = \text{Average daily concentration} = \frac{1}{Q_t}\sum_{i=1}^{N} Q_i C_i$$

In which "N" is the number of component waste streams and "Q" and "C" are the flow rate (MGD) and the constituent concentration (mg/L) associated with each of the "N" waste streams. "Q_t" is the total flow rate of the combined waste streams.

c. Maximum allowable mass emission rate, whether for a 24-hour, weekly 7-day, monthly 30-day, or 6-month period, is a limitation expressed as a daily rate determined with the formulas in the paragraph above, using the effluent concentration limit specified in the permit for the period and the specified allowable flow.

d. POTW removal efficiency is the ratio of pollutants removed by the treatment facilities to pollutants entering the treatment facilities (expressed as a percentage). The Discharger shall determine removal efficiencies using monthly averages (by calendar month unless otherwise specified) of pollutant concentration of influent and effluent samples collected at about the same time and using the following equation (or its equivalent):

Removal Efficiency (%) = 100 × [1-(Effluent Concentration/Influent Concentration)]

2. Biosolids means the solids, semi-liquid suspensions of solids, residues, screenings, grit, scum, and precipitates separated from or created in wastewater by the unit processes of a treatment system. It also includes, but is not limited to, all supernatant, filtrate, centrate, decantate, and thickener overflow and underflow in the solids handling parts of the wastewater treatment system.

3. Blending is the practice of recombining wastewater that has been biologically treated with wastewater that has bypassed around biological treatment units.

4. Bottom sediment sample is (1) a separate grab sample taken at each sampling station for the determination of selected physical-chemical parameters, or (2) four grab samples collected from different locations in the immediate vicinity of a sampling station while the boat is anchored and analyzed separately for macroinvertebrates.

5. Composite sample is a sample composed of individual grab samples collected manually or by an automatic sampling device on the basis of time or flow as specified in the MRP. For flow-based composites, the proportion of each grab sample included in the composite sample shall be within plus or minus five percent (+/-5%) of the representative flow rate of the waste stream being measured at the time of grab sample collection. Alternatively, equal volume grab samples may be individually analyzed with the flow-weighted average calculated by averaging flow-weighted ratios of each grab sample analytical result. Grab samples comprising time-based composite samples shall be collected at intervals not greater than those specified in the MRP. The quantity of each grab sample comprising a time-based composite sample shall be a set of flow proportional volumes as specified in the MRP. If a particular time-based or flow-based composite sampling protocol is not specified in the MRP, the Discharger shall determine and implement the most representative sampling protocol for the given parameter subject to Executive Officer approval.

6. Depth-integrated sample is defined as a water or waste sample collected by allowing a sampling device to fill during a vertical traverse in the waste or receiving water body being sampled. The Discharger shall collect depth-integrated samples in such a manner that the collected sample will be representative of the waste or water body at that sampling point.

7. Flow sample is an accurate measurement of the average daily flow volume using a properly calibrated and maintained flow measuring device.

8. Grab sample is an individual sample collected in a short period of time not exceeding 15 minutes. Grab samples represent only the condition that exists at the time the wastewater is collected.

9. Initial dilution is the process that results in the rapid and irreversible turbulent mixing of wastewater with receiving water around the point of discharge.

10. Overflow is the intentional or unintentional spilling or forcing out of untreated or partially treated wastes from a transport system (e.g., through manholes, at pump stations, and at collection points) upstream from the treatment plant headworks or from any part of a treatment plant facility.

11. Priority pollutants are those constituents referred to in 40 CFR Part 122 as promulgated in the Federal Register, Vol. 65, No. 97, Thursday, May 18, 2000, also known as the California Toxics Rule, the presence or discharge of which could reasonably be expected to interfere with maintaining designated uses.

12. Stormwater means stormwater runoff, snow melt runoff, and surface runoff and drainage. It excludes infiltration and runoff from agricultural land.

13. Toxic pollutant means any pollutant listed as toxic under federal Clean Water Act section 307(a)(1) or under 40 CFR 401.15.

14. Untreated waste is raw wastewater.

15. Waste, waste discharge, discharge of waste, and discharge are used interchangeably in the permit. The requirements of the permit apply to the entire volume of water, and the material therein, that is disposed of to surface and ground waters of the State of California.

Table C

List of Monitoring Parameters and Analytical Methods

CTR No.	Pollutant/Parameter	Analytical Method[5]	Minimum Levels[6] (µg/l)											
			GC	GCMS	LC	Color	FAA	GFAA	ICP	ICP MS	SPGFAA	HYD RIDE	CVAA	DCP
1.	Antimony	204.2					10	5	50	0.5	5	0.5		1000
2.	Arsenic	206.3				20		2	10	2	2	1		1000
3.	Beryllium						20	0.5	2	0.5	1			1000
4.	Cadmium	200 or 213					10	0.5	10	0.25	0.5			1000
5a.	Chromium (III)	SM 3500												
5b.	Chromium (VI)	SM 3500				10	5							1000
	Chromium (total)[7]	SM 3500					50	2	10	0.5	1			1000
6.	Copper	200.9					25	5	10	0.5	2			1000
7.	Lead	200.9					20	5	5	0.5	2			10,000
8.	Mercury	1631 (note)[8]												
9.	Nickel	249.2					50	5	20	1	5			1000
10.	Selenium	200.8 or SM 3114B or C						5	10	2	5	1		1000
11.	Silver	272.2					10	1	10	0.25	2			1000
12.	Thallium	279.2					10	2	10	1	5			1000
13.	Zinc	200 or 289					20		20	1	10			
14.	Cyanide	SM 4500 CN^- C or I				5								
15.	Asbestos (only required for dischargers to MUN waters)[9]	0100.2 [10]												
16.	2,3,7,8-TCDD and 17 congeners (Dioxin)	1613												
17.	Acrolein	603	2.0	5										
18.	Acrylonitrile	603	2.0	2										
19.	Benzene	602	0.5	2										
33.	Ethylbenzene	602	0.5	2										
39.	Toluene	602	0.5	2										
20.	Bromoform	601	0.5	2										
21.	Carbon Tetrachloride	601	0.5	2										
22.	Chlorobenzene	601	0.5	2										
23.	Chlorodibromomethane	601	0.5	2										

5 The suggested method is the U.S. EPA Method unless otherwise specified (SM = Standard Methods). The Discharger may use another U.S. EPA-approved or recognized method if that method has a level of quantification below the applicable water quality objective. Where no method is suggested, the Discharger has the discretion to use any standard method.

6 Minimum levels are from the *State Implementation Policy*. They are the concentration of the lowest calibration standard for that technique based on a survey of contract laboratories. Laboratory techniques are defined as follows: GC = Gas Chromatography; GCMS = Gas Chromatography/Mass Spectrometry; LC = High Pressure Liquid Chromatography; Color = Colorimetric; FAA = Flame Atomic Absorption; GFAA = Graphite Furnace Atomic Absorption; ICP = Inductively Coupled Plasma; ICPMS = Inductively Coupled Plasma/Mass Spectrometry; SPGFAA = Stabilized Platform Graphite Furnace Atomic Absorption (i.e., U.S. EPA 200.9); Hydride = Gaseous Hydride Atomic Absorption; CVAA = Cold Vapor Atomic Absorption; DCP = Direct Current Plasma.

7 Analysis for total chromium may be substituted for analysis of chromium (III) and chromium (VI) if the concentration measured is below the lowest chromium (VI) criterion (11 ug/l).

8 The Discharger shall use ultra-clean sampling (U.S. EPA Method 1669) and ultra-clean analytical methods (U.S. EPA Method 1631) for mercury monitoring. The minimum level for mercury is 2 ng/l (or 0.002 ug/l).

9 MUN = Municipal and Domestic Supply. This designation, if applicable, is in the Findings of the permit.

10 Determination of Asbestos Structures over 10 [micrometers] in Length in Drinking Water Using MCE Filters, U.S. EPA 600/R-94-134, June 1994.

CTR No.	Pollutant/Parameter	Analytical Method[5]	Minimum Levels[6] (µg/l)											
			GC	GCMS	LC	Color	FAA	GFAA	ICP	ICP MS	SPGFAA	HYD RIDE	CVAA	DCP
24.	Chloroethane	601	0.5	2										
25.	2-Chloroethylvinyl Ether	601	1	1										
26.	Chloroform	601	0.5	2										
75.	1,2-Dichlorobenzene	601	0.5	2										
76.	1,3-Dichlorobenzene	601	0.5	2										
77.	1,4-Dichlorobenzene	601	0.5	2										
27.	Dichlorobromomethane	601	0.5	2										
28.	1,1-Dichloroethane	601	0.5	1										
29.	1,2-Dichloroethane	601	0.5	2										
30.	1,1-Dichloroethylene or 1,1-Dichloroethene	601	0.5	2										
31.	1,2-Dichloropropane	601	0.5	1										
32.	1,3-Dichloropropylene or 1,3-Dichloropropene	601	0.5	2										
34.	Methyl Bromide or Bromomethane	601	1.0	2										
35.	Methyl Chloride or Chloromethane	601	0.5	2										
36.	Methylene Chloride or Dichlorormethane	601	0.5	2										
37.	1,1,2,2-Tetrachloroethane	601	0.5	1										
38.	Tetrachloroethylene	601	0.5	2										
40.	1,2-Trans-Dichloroethylene	601	0.5	1										
41.	1,1,1-Trichloroethane	601	0.5	2										
42.	1,1,2-Trichloroethane	601	0.5	2										
43.	Trichloroethene	601	0.5	2										
44.	Vinyl Chloride	601	0.5	2										
45.	2-Chlorophenol	604	2	5										
46.	2,4-Dichlorophenol	604	1	5										
47.	2,4-Dimethylphenol	604	1	2										
48.	2-Methyl-4,6-Dinitrophenol or Dinitro-2-methylphenol	604	10	5										
49.	2,4-Dinitrophenol	604	5	5										
50.	2-Nitrophenol	604		10										
51.	4-Nitrophenol	604	5	10										
52.	3-Methyl-4-Chlorophenol	604	5	1										
53.	Pentachlorophenol	604	1	5										
54.	Phenol	604	1	1		50								
55.	2,4,6-Trichlorophenol	604	10	10										
56.	Acenaphthene	610 HPLC	1	1	0.5									
57.	Acenaphthylene	610 HPLC		10	0.2									
58.	Anthracene	610 HPLC		10	2									
60.	Benzo(a)Anthracene or 1,2 Benzanthracene	610 HPLC	10	5										
61.	Benzo(a)Pyrene	610 HPLC		10	2									
62.	Benzo(b)Fluoranthene or 3,4 Benzofluoranthene	610 HPLC		10	10									
63.	Benzo(ghi)Perylene	610 HPLC		5	0.1									
64.	Benzo(k)Fluoranthene	610 HPLC		10	2									
74.	Dibenzo(a,h)Anthracene	610 HPLC		10	0.1									
86.	Fluoranthene	610 HPLC	10	1	0.05									
87.	Fluorene	610 HPLC		10	0.1									

CTR No.	Pollutant/Parameter	Analytical Method[5]	Minimum Levels[6] (µg/l)											
			GC	GCMS	LC	Color	FAA	GFAA	ICP	ICP MS	SPGFAA	HYD RIDE	CVAA	DCP
92.	Indeno(1,2,3-cd) Pyrene	610 HPLC		10	0.05									
100.	Pyrene	610 HPLC		10	0.05									
68.	Bis(2-Ethylhexyl)Phthalate	606 or 625	10	5										
70.	Butylbenzyl Phthalate	606 or 625	10	10										
79.	Diethyl Phthalate	606 or 625	10	2										
80.	Dimethyl Phthalate	606 or 625	10	2										
81.	Di-n-Butyl Phthalate	606 or 625		10										
84.	Di-n-Octyl Phthalate	606 or 625		10										
59.	Benzidine	625		5										
65.	Bis(2-Chloroethoxy)Methane	625		5										
66.	Bis(2-Chloroethyl)Ether	625	10	1										
67.	Bis(2-Chloroisopropyl)Ether	625	10	2										
69.	4-Bromophenyl Phenyl Ether	625	10	5										
71.	2-Chloronaphthalene	625		10										
72.	4-Chlorophenyl Phenyl Ether	625		5										
73.	Chrysene	625		10	5									
78.	3,3'-Dichlorobenzidine	625		5										
82.	2,4-Dinitrotoluene	625	10	5										
83.	2,6-Dinitrotoluene	625		5										
85.	1,2-Diphenylhydrazine (note)[11]	625		1										
88.	Hexachlorobenzene	625	5	1										
89.	Hexachlorobutadiene	625	5	1										
90.	Hexachlorocyclopentadiene	625	5	5										
91.	Hexachloroethane	625	5	1										
93.	Isophorone	625	10	1										
94.	Naphthalene	625	10	1	0.2									
95.	Nitrobenzene	625	10	1										
96.	N-Nitrosodimethylamine	625	10	5										
97.	N-Nitrosodi-n-Propylamine	625	10	5										
98.	N-Nitrosodiphenylamine	625	10	1										
99.	Phenanthrene	625		5	0.05									
101.	1,2,4-Trichlorobenzene	625	1	5										
102.	Aldrin	608	0.005											
103.	α-BHC	608	0.01											
104.	β-BHC	608	0.005											
105.	γ-BHC (Lindane)	608	0.02											
106.	δ-BHC	608	0.005											
107.	Chlordane	608	0.1											
108.	4,4'-DDT	608	0.01											
109.	4,4'-DDE	608	0.05											
110.	4,4'-DDD	608	0.05											
111.	Dieldrin	608	0.01											
112.	Endosulfan (alpha)	608	0.02											
113.	Endosulfan (beta)	608	0.01											
114.	Endosulfan Sulfate	608	0.05											

[11] Measurement for 1,2-Diphenylhydrazine may use azobenzene as a screen: if azobenzene is measured at >1 ug/l, then the Discharger shall analyze for 1,2-Diphenylhydrazine.

CTR No.	Pollutant/Parameter	Analytical Method[5]	Minimum Levels[6] (µg/l)											
			GC	GCMS	LC	Color	FAA	GFAA	ICP	ICP MS	SPGFAA	HYD RIDE	CVAA	DCP
115.	Endrin	608	0.01											
116.	Endrin Aldehyde	608	0.01											
117.	Heptachlor	608	0.01											
118.	Heptachlor Epoxide	608	0.01											
119-125	PCBs: Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260	608	0.5											
126.	Toxaphene	608	0.5											

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

CEASE AND DESIST ORDER No. R2-2014-0011

LEHIGH SOUTHWEST CEMENT COMPANY AND HANSON PERMANENTE CEMENT, INC., PERMANENTE PLANT

WHEREAS the California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter "Regional Water Board"), finds the following:

Background

1. The Lehigh Southwest Cement Company and Hanson Permanente Cement, Inc., (hereinafter "Discharger") together own and operate the Permanente Plant (hereinafter "Facility"), located at 24001 Stevens Creek Blvd., Cupertino, Santa Clara County. The Facility is a limestone quarry and cement production facility that also produces construction aggregate. Hanson Permanente Cement, Inc., owns the property on which the Facility is located.

2. The Facility's discharges to surface waters had been regulated by waste discharge requirements in the *General Waste Discharge Requirements for Discharges of Process Wastewaters from Aggregate Mining, Sand Washing, and Sand Offloading Facilities to Surface Waters*, NPDES Permit No. CAG982001, and the *Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities,* NPDES General Permit No. CAS000001.

3. The Regional Water Board adopted Order No. R2-2014-0010 (hereinafter "Permit") on March 12, 2014, issuing new waste discharge requirements as NPDES Permit No. CA0030210. This Permit contains prohibitions, limitations, and provisions regulating the same discharges as those covered under NPDES Permit Nos. CAG982001 and CAS000001.

4. The Facility discharges process wastewater from cement manufacturing, quarry dewatering, aggregate materials processing, truck washing, and dust control. The Facility also discharges industrial stormwater. These discharges occur at six discharge points as described in Table 2 and the Permit (Fact Sheet section II, Facility Description). The discharge points and their locations are shown in Attachment A (Attachment B, page B-2, of the Permit). The existing wastewater flow configuration is shown in Attachment B, page B-1 (Attachment C, page C-1, of the Permit).

5. The Facility's discharges currently exceed Permit discharge prohibitions and effluent limitations as described in findings 6 through 11 below; therefore, the Discharger will construct and operate an interim treatment system, followed by a final treatment system. The interim treatment system will be operated to select and refine a treatment technology to be used in the final treatment system. The interim treatment system will treat up to 400 gallons of process wastewater per minute. The final treatment system will be constructed and operational by September 30, 2017, and will treat all process wastewater from the Facility prior to discharge at Discharge Point No. 001. The Facility will be re-plumbed to direct all process wastewater to the final treatment system. Discharges from other points will be precipitation-driven and will consist mainly of stormwater. The final wastewater flow configuration is shown in Attachment B, page B-3 (Attachment C, page C-3, of the Permit).

Discharge Prohibition Violations

6. Discharge Prohibition III.A of the Permit prohibits discharges other than those shown in Attachment B, page B-3 (Attachment C, page C-3, of the Permit), which shows the Facility's final flow configuration after installation of the final treatment system and re-plumbing to direct all process wastewater to the final treatment system for treatment. Specifically, Discharge Prohibition III.A states the following:

> Discharge of treated or untreated wastewater at a location or in a manner different from that described in this Order for the final treatment and controls configuration shown in Attachment C, Schematic C-3, is prohibited.

Discharge Prohibition III.C of the Permit prohibits discharges other than stormwater from Discharge Point Nos. 002 through 006. Specifically, Discharge Prohibition III.C states the following:

> Discharge from Discharge Point Nos. 002 through 006 is prohibited except as a result of precipitation or to discharge retained stormwater.

7. The Discharger threatens to violate Discharge Prohibition III.A by discharging according to the existing flow configuration shown in Attachment B, page B-1 (Attachment C, page C-1, of the Permit) and the interim flow configuration shown in Attachment B, page B-2 (Attachment C, page C-2, of the Permit). These flow configurations differ from the final flow configuration shown in Attachment B, page B-3 (Attachment C, page C-3, of the Permit), which is the only flow configuration the Permit authorizes.

The Discharger also threatens to violate Discharge Prohibition III.C by discharging non-stormwater from Discharge Point No. 003. Due to ongoing work on Pond 11, Cement Plant Reclaim Water System water is currently discharged through Discharge Point No. 003.

Effluent Limitation Violations

8. The Permit contains effluent limitations, including among others those listed in Table 1 below (see Permit Tables 4 and 5):

Table 1: Permit Effluent Limits

Parameter	Average Monthly Effluent Limit	Maximum Daily Effluent Limit
Discharge Point No. 001		
Chromium (VI) [1]	8.0 µg/L	16 µg/L
Mercury	0.020 µg/L	0.041 µg/L
Nickel [1]	82 µg/L	160 µg/L
Selenium	4.1 µg/L	8.2 µg/L

Parameter	Average Monthly Effluent Limit	Maximum Daily Effluent Limit
Total Dissolved Solids	1,000 mg/L	2,000 mg/L
Total Suspended Solids	---	58 lbs/d
Settleable Matter	0.1 mL/L-hr	0.2 mL/L-hr
Turbidity	5.0 NTU	10 NTU
Discharge Point Nos. 002 through 005		
Turbidity	--	40 NTU
Total Suspended Solids	--	50 mg/L
Settleable Matter	0.1 mL/L-hr	0.2 mL/L-hr
pH	6.5 – 8.5 s.u. [2]	
Discharge Point No. 006		
Total Suspended Solids	--	50 mg/L

Unit Abbreviations:

µg/L = micrograms per liter
mg/L = milligrams per liter
mL/L-hr = milliliters per liter - hour
NTU = nephelometric turbidity units
s.u. = standard units

Footnote:

[1] Compliance with the average monthly effluent limit shall be determined by the flow-weighted average effluent concentration, defined as the sum of the products of all concentration-based results and their corresponding volumetric flow rates, measured at the time the sample was collected during the calendar month, divided by the sum of those flow rates. Non-detect results shall be treated as zero.

[2] Instantaneous, within the range from 6.5 through 8.5.

9. The Discharger threatens to violate some Permit effluent limitations in Table 1 at Discharge Point No. 001. This finding is based on a statistical analysis of data collected at Discharge Point Nos. 001 (Pond 4A), 002 (Pond 13B), and 003 (Pond 9) from July 2011 through March 2013. Data from Discharge Point Nos. 002 and 003 are included in this analysis because they represent non-stormwater discharges at those points that the Permit requires to be redirected for final treatment before discharge at Discharge Point No. 001. (Process wastewater has since been directed away from Discharge Point No. 002, which now discharges only stormwater.) When the 95th percentile of the data exceeds the Average Monthly Effluent Limitation (AMEL) or the 99th percentile of the data exceeds the Maximum Daily Effluent Limitation (MDEL), consistent compliance is considered unlikely. The results of this analysis conclude that consistent compliance with the mercury, nickel, selenium, total suspended solids, settleable matter, and turbidity AMELs and MDELs, and the chromium (VI) and total dissolved solids AMELs is unlikely, as explained below:

a. Chromium (VI): The 95th percentile of the data (12 µg/L) is greater than the AMEL (8.0 µg/L). However, the 99th percentile of the data set (12 µg/L) less than the MDEL (16 µg/L). Therefore, consistent compliance with the AMEL is unlikely; compliance with the MDEL is likely.

b. Mercury: The 95th percentile of the data (0.026 µg/L) is greater than the AMEL (0.020 µg/L), and the 99th percentile (0.051 µg/L) is greater than the MDEL (0.041 µg/L). Therefore, consistent compliance with the AMEL and MDEL is unlikely.

c. **Nickel:** The 95th percentile of the data (330 μg/L) is greater than the AMEL (82 μg/L), and the 99th percentile (350 μg/L) is greater than the MDEL (160 μg/L). Therefore, consistent compliance with the AMEL and MDEL is unlikely.

d. **Selenium:** The 95th percentile of the data (75 μg/L) is greater than the AMEL (4.1 μg/L), and the 99th percentile (75 μg/L) is greater than the MDEL (8.2 μg/L). Therefore, consistent compliance with the AMEL and MDEL is unlikely.

e. **Total Suspended Solids (TSS):** The potential mass discharge calculated from the flow the Permit authorizes (167,000 gallons per hour) and the 99th percentile of the total suspended solids concentration data (230 mg/L) is 7,700 lbs/day, which is greater than the MDEL (58 lbs/day). Therefore, consistent compliance with the MDEL is unlikely.

f. **Settleable Matter:** The 95th percentile of the data (0.5 mL/L-hr) is greater than the AMEL (0.1 mL/L-hr), and the 99th percentile (0.5 mL/L-hr) is greater than the MDEL (0.2 mL/L-hr). Therefore, consistent compliance with the AMEL and MDEL is unlikely.

g. **Total Dissolved Solids (TDS):** The 95th percentile of the data (1,200 mg/L) is greater than the AMEL (1,000 mg/L). However, the 99th percentile of the data set (1,334 mg/L) is less than the MDEL (2,000 μg/L). Therefore, consistent compliance with the AMEL is unlikely; compliance with the MDEL is likely.

h. **Turbidity:** The 95th percentile of the data (270 NTU) is greater than the AMEL (5.0 NTU), and the 99th percentile (600 NTU) is greater than the MDEL (10 NTU). Therefore, consistent compliance with the AMEL and MDEL is unlikely.

10. The Discharger threatens to violate the Permit effluent limitations for turbidity, total suspended solids, settleable matter, and pH in Table 1 at Discharge Point Nos. 002, 004, and 005. This finding is based on the maximum concentration of each pollutant observed among data collected from November 2011 through March 2013 at Discharge Point Nos. 002, 004, and 005. A statistical analysis could not be performed because there were insufficient data for a meaningful analysis. In 2013, the Discharger installed treatment at Discharge Point No. 003 and expects to comply with the effluent limitations in Table 1.

11. The Discharger threatens to violate the Permit effluent limitation for total suspended solids in Table 1 at Discharge Point No. 006. This conclusion is based on the maximum concentration of total suspended solids observed among data collected from November 2011 through March 2013 at Discharge Point No. 006. A statistical analysis could not be performed because there were insufficient data for a meaningful analysis.

Cease and Desist Order Authority

12. Water Code section 13301 authorizes the Regional Water Board to issue a Cease and Desist Order when it finds that a waste discharge is taking place, or threatening to take place, in violation of Regional Water Board requirements.

13. Pursuant to Water Code section 13385(j)(3), mandatory minimum penalties required by Water Code sections 13385(h) and (i) do not apply when a discharger complies with a cease and desist order issued pursuant to Water Code section 13301 if the following conditions are met:

a. The cease and desist order specifies actions the discharger must take to correct the violations that would otherwise be subject to mandatory minimum penalties;

b. The discharger is unable to consistently comply with effluent limitations because the effluent limitations are new, more stringent, or modified regulatory requirements; new or modified control measures are necessary to comply with the effluent limitations; and the new or modified control measures cannot be designed, installed, and put into operation within 30 calendar days;

c. The Regional Water Board establishes a time schedule of no more than five years for bringing the discharge into compliance (The time schedule must be as short as possible, taking into account the technological, operational, and economic factors that affect the design, development, and implementation of the control measures necessary to comply with the effluent limitations. If the time schedule exceeds one year, it must include interim requirements and the dates for their achievement. The interim requirements must include effluent limitations for the pollutants of concern, and actions and milestones leading to compliance with the limitations.); and

d. The discharger has prepared and is implementing in a timely and proper manner a pollution prevention plan pursuant to Water Code section 13263.3.

14. Because the Discharger will violate or threatens to violate new and more stringent Permit requirements, including Prohibition III.A and certain effluent limits shown in Table 1, this Cease and Desist Order is necessary to ensure that the Discharger achieves compliance. This Order establishes time schedules of no more than five years for the Discharger to complete necessary actions to address its imminent and threatened violations.

15. The time schedules are as short as possible, accounting for the uncertainty in determining effective treatment measures necessary to achieve compliance. Selenium treatment, in particular, to the levels the Permit requires is complex and will require a treatment system specifically tailored to this discharge. The time schedule for Discharge Point No. 001 is based on reasonably expected times needed to test and select from among alternatives and to construct and start up treatment. The Regional Water Board may revisit these assumptions as more information becomes available.

16. This Cease and Desist Order requires the Discharger to comply with interim effluent limits for the pollutants listed in Table 1. The interim limits consist of numeric limits for total suspended solids, settleable matter, and turbidity, and narrative effluent limits for all pollutants listed in Table 1 expressed as prescribed actions and deadlines. Total suspended solids, settleable matter, and turbidity are controllable with current best management practices. These numeric effluent limits also serve as proxies for the metals in Table 1 because metals often adhere to solids. The numeric interim effluent limits are intended to ensure that the Discharger maintains at least its existing performance for currently controllable parameters while completing all tasks required during the time schedule.

This Cease and Desist Order also limits the Portland cement clinker production rate until all required tasks are complete. Discharge rates from the Facility are partly related to production. The production rate is limited to ensure that the Discharger does not increase production-related discharges of pollutants until it can comply with the Permit.

17. The numeric interim effluent limits for total suspended solids, settleable matter, and turbidity are based on past performance. For total suspended solids at Discharge Point Nos. 001 through 005, and turbidity at Discharge Point No. 001, they are the 99th percentile of the available data. In all other cases, because the available data sets are small (less than 10 data points or less than 10 detections), they are based on the statistical approach described in *Technical Support Document for Water Quality-Based Toxics Control, EPA 505-2-90-001* (U.S. EPA, March 1991, section 3.3.2). Using this method, the maximum observed effluent concentration was multiplied by a reasonable potential multiplying factor for the 95 percent confidence level and 95 percent probability basis based on the number of data available.

18. This Cease and Desist Order requires the Discharger to prepare and implement a pollution prevention plan in accordance with Water Code section 13263.3 because the Discharger is likely to violate its Permit effluent limitations and pollution prevention could facilitate compliance.

19. This Cease and Desist Order is an enforcement action and, as such, is exempt from the provisions of the California Environmental Quality Act (Public Resources Code § 21000 et seq.) in accordance with Title 14 of the California Code of Regulations, section 15321. Construction of the interim and final treatment systems are actions to prevent, minimize, stabilize, mitigate, and eliminate the release, and threat of release, of hazardous substances, an activity exempt from CEQA pursuant to Title 14 of the California Code of Regulations, section 15330. The Cease and Desist Order is an action taken by a regulatory agency as authorized by State law to ensure the maintenance, restoration, and enhancement of a natural resource and the environment (Cal. Code of Regs., tit. 14, §§ 15307 and 15308). There are no exceptions to these categorical exemptions; there is no reasonable possibility that this action will have a significant effect on the environment due to unusual circumstances (Cal. Code of Regs., tit. 14, § 15300.2).

20. The Regional Water Board notified the Discharger and interested persons of its intent to consider adoption of this Cease and Desist Order, and provided an opportunity to submit written comments and appear at a public hearing. The Regional Water Board, in a public hearing, heard and considered all comments.

IT IS HEREBY ORDERED, in accordance with Water Code section 13301, that the Discharger shall cease and desist from discharging and threatening to discharge wastes in violation of the Permit by complying with the following provisions:

1. <u>Interim Effluent Limitations and Requirements</u>

a. The Discharger shall not exceed a production rate of 1.6 million tons of Portland cement clinker per year while this Cease and Desist Order is in effect. The Discharger shall report its Portland cement clinker production in its routine monthly and annual self-monitoring reports while this Cease and Desist Order is in effect.

b. Immediately upon the effective date of this Cease and Desist Order, the Discharger shall comply with the numeric interim effluent limitations in Table 2 at the discharge points specified therein:

Table 2: Numeric Interim Effluent Limitations

Parameter	Maximum Daily Effluent Limit
Discharge Point No. 001	
Settleable Matter	1.3 mL/L-hr
Total Suspended Solids	230 mg/L
Turbidity	600 NTU
Discharge Point Nos. 002, 004, and 005	
Settleable Matter	2.6 mL/L-hr
Total Suspended Solids	340 mg/L
Turbidity	920 NTU
Discharge Point No. 006	
Total Suspended Solids	240 mg/L

Unit Abbreviations:

mg/L = milligrams per liter
mL/L-hr = milliliters per liter - hour
NTU = nephelometric turbidity units

c. The Discharger shall complete the actions listed in Tables 3 and 4 in accordance with the time schedules provided therein to comply with all Permit requirements. The Discharger shall implement all actions set forth for each deliverable. The Discharger shall revise deliverables to incorporate comments the Executive Officer may make to ensure that deliverables are adequate and acceptably comply with Table 3 and 4 requirements.

Table 3: Time Schedule and Prescribed Actions for Discharge Point No. 001

Task	Deadline
a. Begin constructing an interim wastewater treatment system to treat at least 400 gallons per minute of quarry pit and primary crusher washdown wastewater prior to discharge at Discharge Point No. 001. (Report in May 2014 self-monitoring report.)	May 1, 2014
b. Prepare, submit, and begin implementing a pollution prevention plan that includes the following elements consistent with Water Code section 13263.3: i. Analysis of the pollutants listed in Table 1, including their sources and the processes that result in their generation and discharge; ii. Analysis of the potential for pollution prevention to reduce the generation of these pollutants, including the application of innovative and alternative technologies and any adverse environmental impacts resulting from such methods; iii. Description of the tasks and time schedules needed to investigate and implement planned pollution prevention techniques; iv. Statement of pollution prevention goals and strategies, including priorities for short-term and long-term actions; v. Description of intended activities for the immediate future; vi. Description of existing pollution prevention methods; vii. Statement that existing and planned pollution prevention strategies do not constitute cross-media pollution transfers, and information that supports the statement; and	May 15, 2014

Task		Deadline
	viii. Analysis of the relative costs and benefits of possible pollution prevention activities.	
c.	Commence discharge according to interim flow configuration shown in Attachment B, page B-2 (Attachment C, page C-2, of the Permit), and operation of the interim wastewater treatment system described in Task a. Direct all flows up to 400 gallons per minute of quarry water currently discharged at Discharge Point No. 001 to the interim wastewater treatment system (flows above 400 gallons per minute may not necessarily flow through the interim treatment system). (Report in October 2014 self-monitoring report.)	October 1, 2014
d.	For all pollutants listed in Table 1 for Discharge Point No. 001, begin at least weekly monitoring at the inlet to the interim treatment system (at a point at which all wastewater to be treated is tributary) and at the outlet of the interim treatment system (before commingling with any untreated wastewater). (Report results in routine monthly self-monitoring reports, starting with the October 2014 report.)	October 1, 2014
e.	Begin achieving reduction in selenium concentrations discharged from the interim treatment system by at least 50 percent from influent concentrations, or to less than or equal to 10 µg/L when the influent selenium concentration is 20 µg/L or less. Determine selenium reduction by comparing samples collected at the inlet to the interim treatment system to samples collected roughly simultaneously at the outlet of the interim treatment system. (Report selenium removal effectiveness in routine monthly self-monitoring reports, starting with the December 2014 report.)	December 1, 2014
f.	Provide a report evaluating and describing the effectiveness of the interim treatment system at reducing effluent concentrations of the pollutants listed in Table 1 for Discharge Point No. 001. In the evaluation of treatment effectiveness, compare pollutant concentrations in the interim treatment system effluent to those in the influent and to Permit effluent limitations.	March 31, 2015
g.	If the conclusion from Task f indicates that additional treatment or operational changes are needed to comply with the effluent limitations in Table 1, provide a report describing the additional treatment or operational changes. If the discharge from the interim treatment system consistently complies with the effluent limitations in Table 1, maintain compliance with those effluent limitations. (Report results in routine monthly self-monitoring reports.)	June 30, 2015
h.	Complete installation and commence additional treatment and operations changes determined to be necessary through Task g, if any. (Report in December 2015 self-monitoring report.)	December 31, 2015
i.	Fully comply with the effluent limits in Table 1 at the outlet of the interim treatment system before mixing with untreated wastewater. (Report results in routine monthly self-monitoring reports.)	March 31, 2016
j.	Commence construction of final treatment system designed to treat all Facility process wastewater and non-stormwater prior to discharge to surface water to comply with all Permit effluent limitations. Process wastewater and non-stormwater to be treated include quarry pit and primary crusher wastewater currently discharged at Discharge Point No. 001; cement plant process wastewater currently discharged at Discharge Point No. 003; truck wash wastewater currently discharged at Discharge Point No. 005; and, if necessary, any non-stormwater discharged at Discharge Point No. 002. (Report in February 2017 self-monitoring report.)	February 1, 2017
k.	Concurrent with Task j, commence re-plumbing Facility non-stormwater flows to comply with Permit Discharge Prohibition III.A. (Report in February 2017 self-monitoring report.)	February 1, 2017

Task		Deadline
l.	Commence discharge according to final flow configuration shown in Attachment B, page B-3 (Attachment C, page C-3, of the Permit), and operation of final treatment system described in Task j. Fully comply with all Permit requirements.	October 1, 2017

Table 4: Time Schedule and Prescribed Actions for Discharge Point Nos. 002 through 006

Task		Deadline
a.	Identify measures to ensure compliance with Permit prohibitions and effluent limitations applicable to Discharge Point Nos. 002 through 006. Report these measures with updated Stormwater Pollution Prevention Plan required by Permit Provision VI.C.6.a.ii. Measures to comply with Permit prohibitions shall include completing work on Pond 11 to terminate discharges of Cement Plant Reclaim Water System water through Discharge Point No. 003.	May 16, 2014
b.	Begin implementing measures identified in Task a. Report progress in Annual Stormwater Report required by Permit Provision VI.C.6.a.iii.	July 1, 2014
c.	Commence discharge according to interim flow configuration shown in Attachment B, page B-2 (Attachment C, page C-2, of the Permit), and terminate discharges of Cement Plant Reclaim Water System water through Discharge Point No. 003. Report in October 2014 self-monitoring report.	October 1, 2014
d.	Provide annual status reports evaluating and describing effectiveness of measures identified in Task a in terms of reducing effluent concentrations of pollutants in Table 1 for Discharge Point Nos. 002 through 006.	With Annual Stormwater Report due July 1 each year
e.	Commence discharge according to final flow configuration shown in Attachment B, page B-3 (Attachment C, page C-3, of the Permit), and fully comply with all Permit requirements.	October 1, 2017

2. **Accelerated Monitoring.** If any numeric interim effluent limit listed in Table 2 is exceeded, the Discharger shall increase its sampling frequency for that pollutant to daily within 24 hours of receiving the results indicating the violation of this Cease and Desist Order. The Discharger shall continue accelerated monitoring until two samples collected on consecutive days indicate compliance with the numeric interim effluent limit.

3. **Consequences of Non-Compliance.** If the Discharger fails to comply with the provisions of this Cease and Desist Order, the Executive Officer is hereby authorized to take enforcement action or to request the Attorney General to take appropriate actions against the Discharger in accordance with Water Code sections 13331, 13350, 13385, and 13386. Such actions may include injunctive and civil remedies, if appropriate, or the issuance of an Administrative Civil Liability Complaint for Regional Water Board consideration.

4. **Force Majeure.**[*] If the Discharger is delayed, interrupted, or prevented from meeting the provisions and time schedules of this Cease and Desist Order due to a force majeure, the Discharger shall notify the Executive Officer in writing within ten days of the date the Discharger first knows of the force majeure. The Discharger shall demonstrate that timely compliance with the Cease and Desist Order or any affected deadlines will be actually and necessarily delayed, and that it has taken measures to avoid or mitigate the delay by exercising all reasonable precautions and efforts, whether before or after the occurrence of the force majeure.

5. **Mandatory Minimum Penalties.** Permit effluent limitation violations shall not be subject to the mandatory minimum penalties required by Water Code sections 13385(h) and (i) as long as the Discharger complies with this Cease and Desist Order. If the Discharger fails to comply with this Cease and Desist Order, including but not limited to any numeric interim effluent limitation in Table 2 or any requirement of Tables 3 or 4, the Discharger shall be subject to mandatory minimum penalties for Permit violations for the entire calendar month during which the non-compliance occurs. This could include a daily, weekly, or monthly mandatory minimum penalty for the same exceedance. If the Discharger returns to compliance, Permit violations shall again not be subject to mandatory minimum penalties as of the first day of the month following the return to full compliance.

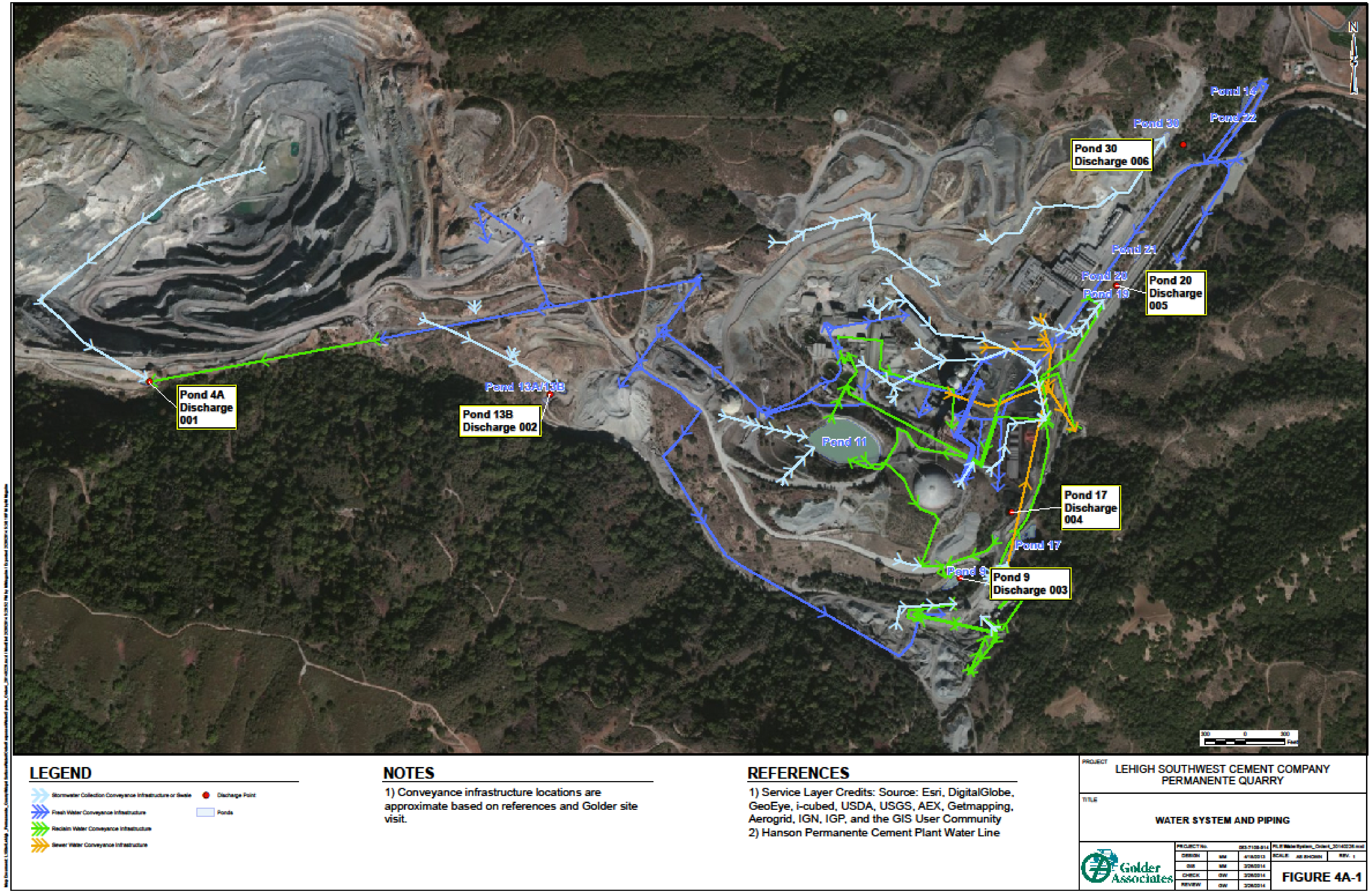
6. **Effective Date.** This Cease and Desist Order shall be effective on May 1, 2014.

I, Bruce H. Wolfe, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of a Cease and Desist Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on March 12, 2014.

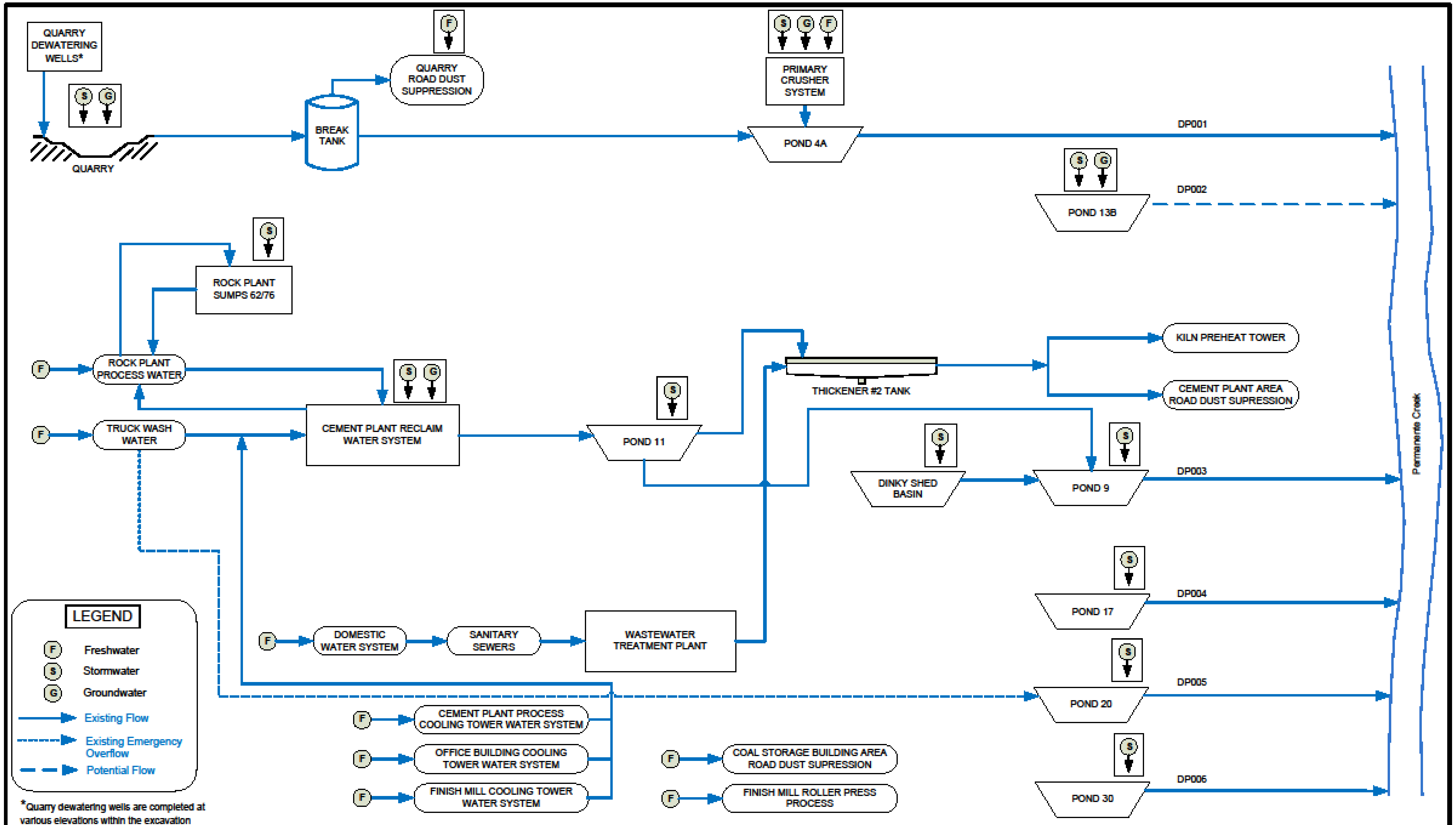
Bruce H. Wolfe
Executive Officer

[*] A "force majeure" is an event that could not have been anticipated by and is beyond the control of the Discharger, including an act of God; earthquake, flood, or other natural disaster; civil disturbance or strike; fire or explosion; declared war within the United States; embargo; or other event of similar import and character. "Force majeure" does not include delays caused by funding, contractor performance, equipment delivery and quality, weather, permitting, other construction-related issues, CEQA challenges, initiative litigation, adverse legislation, or legal matters (with the exception of an injunction issued by a court of law specifically preventing construction from occurring).

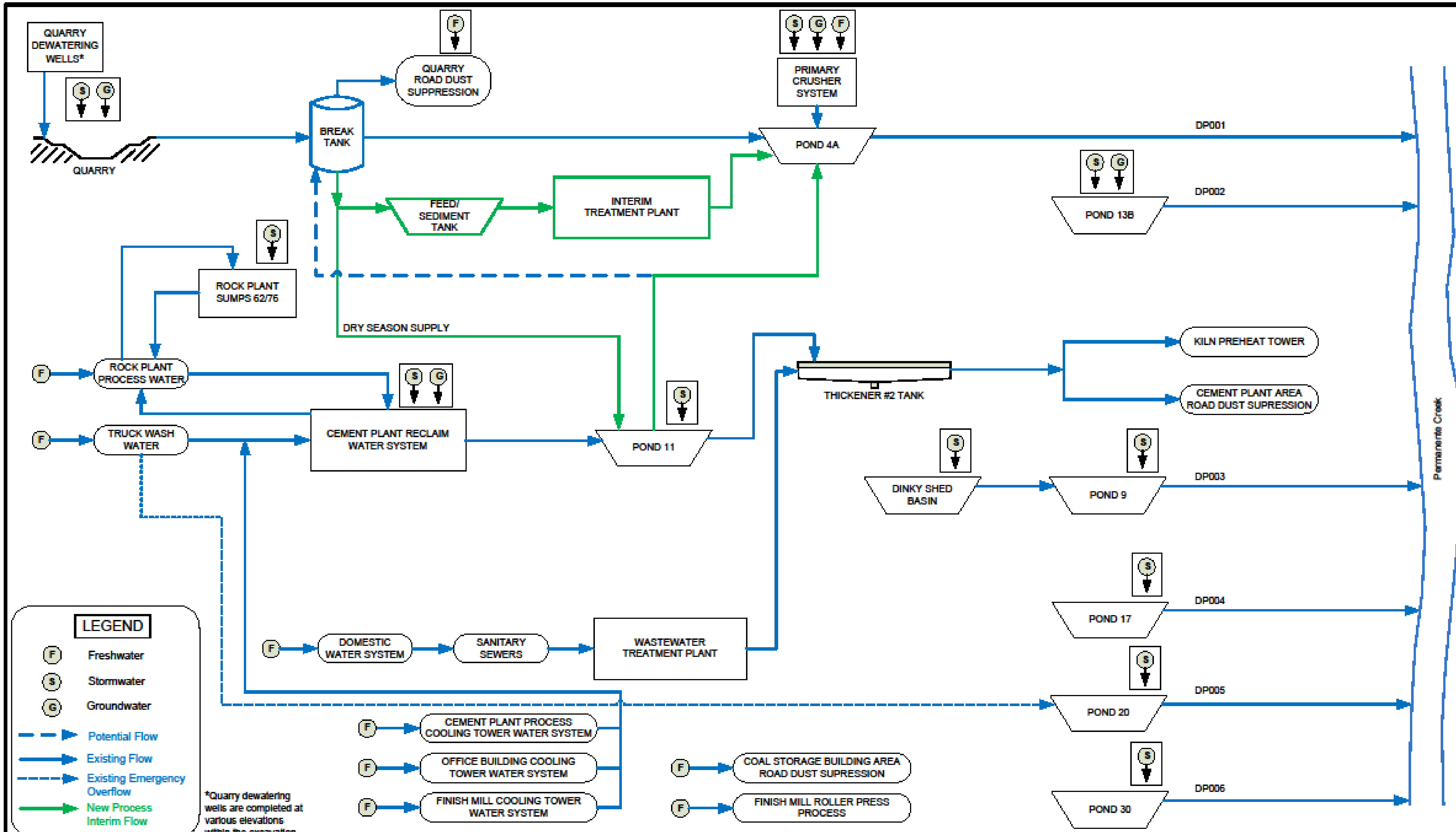
ATTACHMENT A – FACILITY MAP



ATTACHMENT B – FLOW SCHEMATICS

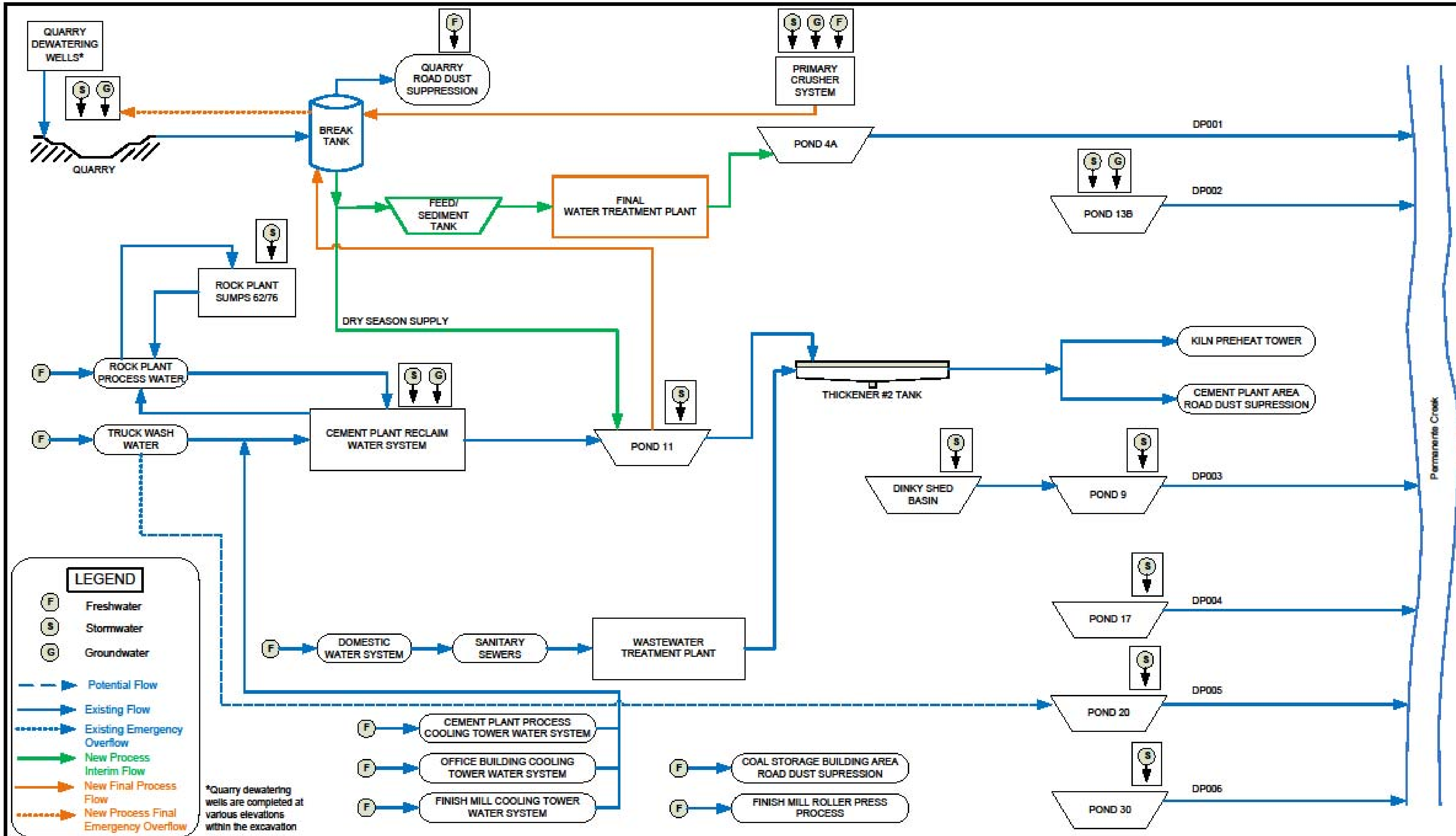


Golder Associates	PROJECT/REPORT LEHIGH SOUTHWEST CEMENT COMPANY PERMANENTE QUARRY AND CEMENT PLANT	PROJECT NO 063-7109-914	DATE MARCH 3, 2014
	TITLE FINAL LINE DRAWING OF FLOWS; CURRENT FLOW CONFIGURATION	FIGURE 3.1	R8



Golder Associates

PROJECT/REPORT	PROJECT NO	DATE
LEHIGH SOUTHWEST CEMENT COMPANY PERMANENTE QUARRY AND CEMENT PLANT	063-7109-914	MARCH 3, 2014
TITLE	FIGURE	
FINAL LINE DRAWINGS OF FLOWS; INTERIM TREATMENT FLOW CONFIGURATION	3.2	R8



Golder Associates	PROJECT/REPORT LEHIGH SOUTHWEST CEMENT COMPANY PERMANENTE QUARRY AND CEMENT PLANT	PROJECT NO 063-7109-914	DATE MARCH 3, 2014
	TITLE FINAL LINE DRAWING OF FLOWS; FINAL TREATMENT FLOW CONFIGURATION	FIGURE 3.3	R8

APPENDIX I:

NON-LIMESTONE COVER MATERIAL VERIFICATION MEMO

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TECHNICAL MEMORANDUM

Date: 9/23/14 **Project No.:** 0637109914

To: Greg Knapp **Company:** Lehigh Southwest Cement Company

From: George Wegmann, PG
Bill Fowler, CEG

cc: Sean Avant **Email:** Greg.Knapp@hanson.biz

RE: **COA 74 ANNUAL SUMMARY, LEHIGH PERMANENTE QUARRY**

Golder Associates (Golder) has prepared this technical memorandum to document the activities completed at the Lehigh Permanente Quarry from July 1, 2013 through June 30, 2014 related to the Reclamation Plan Condition of Approval (COA) 74. COA 74 states the following:

> 74 Certified Geologist Verification of Non-Limestone-Containing Material Use.
>
> A California Certified Engineering Geologist shall be onsite during reclamation to verify that non-limestone run-of-mine rock is used as cover on the EMSA and WMSA. In addition, the Geologist shall observe and document activities associated with placing the final overburden on the Quarry Pit (i.e., ensuring that organic material is mixed to specifications). Using visual and field testing methods, with occasional bulk sampling and laboratory analysis, the geologist shall observe and document the type of rock placed over the limestone-containing material during reclamation activities. The geologist shall inspect and document whether limestone is present at the source area (Quarry Pit and WMSA), whether limestone rock is transported from the source area to segregation stockpiles, and whether limestone is present within the lifts of the proposed 1-foot layer of run-of-mine cover rock (in the EMSA, WMSA, and Quarry Pit). Inspection involves observing the excavation, hauling, stockpiling, and placement of the non-limestone cover material, performing a visual assessment of the rock, and conducting random spot sampling and field testing of suspect rock fragments. If observation, field-testing, or laboratory analysis indicates that significant amounts of limestone are intermixed with the supposed non-limestone cover material, the geologist shall document its presence, temporarily halt fill operations, and notify the Planning Manager and field superintendent. Once notified, the Mine Operator shall remove the limestone-containing materials and then perform verification field sampling in addition to laboratory verification. (Implements Mitigation Measure 4.10-1a)
>
> Within ninety (90) days of final RPA Approval, the Mine Operator shall submit to the Planning Manager a copy of a contract or an employee resume employed by the Mine Operation that is a California-certified Engineering Geologist responsible to conduct monitoring as described above. Quarterly reports shall be submitted from the Geologist to the Planning Manager describing effectiveness of mitigation and monitoring during final reclamation as described above.

In June 2014, a Golder geologist under the direct supervision of a Certified Engineering Geologist inspected overburden material encountered during mining activities along the southeast portion of the quarry. Based on the inspection, Golder determined the material consisted of a clayey, sandy gravel that resembled the Santa Clara Formation and weathered greenstone and graywacke. No significant

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quantities of limestone were observed in the material. Three samples were collected by Golder and WRA and analyzed for TTLC and STLC selenium by a California-certified laboratory. The results are summarized below:

Sample Type	Selenium TTLC (mg/kg)	Selenium STLC (mg/L)
Santa Clara Formation	ND	ND
Greenstone	ND	0.00062
Graywacke	ND	0.00150
Method Detection Limit	0.022	0.00026
ND = Not detected above the laboratory method detection limit; TTLC = total threshold limit concentration; STLC = soluble threshold limit concentration.		

Golder concluded that the overburden material was suitable to be used as cover material. Therefore, as it was mined, Lehigh transported the material to the EMSA and segregated it for later use as cover material by stockpiling at two designated areas. After Lehigh completed mining and stockpiling this material, Golder performed another inspection of the stockpiled material at the two designated areas. The inspection revealed no significant quantities of limestone and that the material was consistent with our observations from the first inspection.

As the final grading is completed at the EMSA, Golder will perform inspections to ensure that only non-limestone cover material is placed as the final one foot cover material. WMSA and Quarry reclamation activities are not anticipated to be completed within the upcoming year.

APPENDIX J:

ANNUAL GREENHOUSE GAS INVENTORY REPORT

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September 29, 2014

Mr. Gregory Knapp
Lehigh Hanson
Director Environmental Region West
12667 Alcosta Blvd Suite 400
San Ramon, CA 94583

Re: Annual Reclamation Plan Amendment Activities Greenhouse Gas Inventory

Dear Mr. Knapp:

This letter is an annual analysis of the Greenhouse Gas Emissions (GHG) associated with Reclamation Plan Amendment activities at the Lehigh Southwest Cement Company's Permanente Quarry ("Quarry") in Santa Clara County, California. This inventory is pursuant to Conditions of Approval (COA) 71, 72, and 73 of the 2012 Reclamation Plan Amendment, for the reporting period of July 31, 2013 through June 30, 2014.

Methods and Thresholds

The methodology used in this memo to analyze the project's contribution to global climate change includes a calculation of GHG emissions associated with Reclamation Plan Amendment Activities, beyond baseline levels as described in the EIR[1], and a comparison of GHG emissions with the thresholds set forth in the COA. GHG emission would be considered significant and require mitigation if they exceed 1,100 metric tons of Carbon Dioxide equivalent ($CO2_e$) within a year. Reclamation Plan Amendment activities included, but not limited to, the following:

- Reclamation of slope, grading, and hauling of materials
- maintenance of erosion control features
- hydro seeding activities
- sediment basin maintenance

BAAQMD recommends CalEEMod to estimate GHG emissions associated with construction of individual development projects and operational GHG emissions.[2] CalEEMod is a statewide

1 Activities that are within the baseline, mining activities, ongoing before the 2012 Reclamation Plan Amendment are not included in these GHG calculations.
2 BAAQMD CEQA Guidelines: Available at *http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES.aspx*

land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant and greenhouse gas (GHG) emissions associated with both construction and operations from a variety of land use projects.[3] The model quantifies direct emissions from construction and operations (including vehicle use), as well as indirect emissions, such as GHG emissions from energy use, solid waste disposal, vegetation planting and/or removal, and water use. The mobile source emission factors used in the model (EMFAC2011) includes the Pavley standards and Low Carbon Fuel standards into the mobile source emission factors. The model was developed in collaboration with the air districts of California. Default data (e.g., emission factors, trip lengths, meteorology, source inventory, etc.) have been provided by the various California air districts to account for local requirements and conditions.

GHG emissions associated with the projects were modeled using CalEEMod version 2013.2.2 using general project information provided to WRA. Project inputs and assumptions are summarized in the Table 1 below.

Table 1. Off-Road Reclamation Activities Diesel Equipment

Model	Equipment Type	Total Hours	HP*
Cat D10	Dozer	320	661
John Deere 460 E	Off-Highway Truck	2,795	481
John Deere 870	Excavator	165	532
Volvo 460	Excavator	165	320
Cat D8T	Dozer	642	322
Volvo A40	Off-Highway Truck	59	464
John Deere 872GP	Grader	144	287
Cat 740B	Off-Highway Truck	39	474
Cat 950	Small Loader	39	213
Caterpillar 777D	Off-Highway Truck	12	1000
Caterpillar 992G	Loader	68	800
Gradeall 5200	Excavator	74	173
Finn T330 / John Deere 4045T	Other General Industrial Equipment	56	125
Freightliner Series 60 diesel truck	Off-Highway Truck	40	430
Kenworth 10-wheel Dump Truck	Off-Highway Truck	64	350
**Horsepower (HP) figures are based on available information from equipment manufacturer specification sheets. Not all manufacturers listed gross HP figures; therefore net HP was utilized for calculations.*			

[3] http://www.caleemod.com/

Greenhouse Gas Inventory Results

Reclamation Plan Amendment Activates calculated for the period of July 1^{st} 2013 to June 30^{th} 2014. Appendix A shows the results of this inventory. Total emissions for the study period were 427.9374 metric tons of $CO2_e$. Emissions were below the threshold of 1,100 metric tons of $CO2_e$ as set in the COA. Therefore, no offset or additional actions are required to mitigate for GHG emissions.

Sincerely,

Sean Avent
Scientist / Environmental Planner

Appendix A: CalEEMod GHG Inventory Results

Model	Equipment Type	CO2e Metric Tons
Cat D10	Dozer	
Cat D8T	Dozer	
	Total Dozers	86.5702
John Deere 872GP	**Grader**	8.7931
Cat 950	Small Loader	
Caterpillar 992G	Loader	
	Total Loaders	12.4004
Finn T330 / John Deere 4045T	**Other General Industrial Equipment**	1.2429
John Deere 870	Excavator	
Volvo 460	Excavator	
Gradeall 5200	Excavator	
	Total Excavators	30.7002
Freightliner series 60 diesel truck	Off-Highway Truck	
Kenworth 10-wheel Dump Truck	Off-Highway Truck	
Caterpillar 777D	Off-Highway Truck	
Cat 740B	Off-Highway Truck	
John Deere 460 E	Off-Highway Truck	
Volvo A40	Off-Highway Truck	
	Total Off-Highway Trucks	288.2306
Total Emissions		**427.9374**

Reclamation Plan GHG Inventory
Santa Clara County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
	0.00		0.00		0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	4			**Operational Year**	2014
Utility Company					
CO2 Intensity (lb/MWhr)	0	**CH4 Intensity (lb/MWhr)**	0	**N2O Intensity (lb/MWhr)**	0

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Operational Off-Road Equipment - Updated Per Project Information

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	150.00	250.00
tblArchitecturalCoating	EF_Nonresidential_Interior	100.00	250.00
tblArchitecturalCoating	EF_Residential_Exterior	150.00	250.00
tblArchitecturalCoating	EF_Residential_Interior	100.00	250.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	21.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	21.00

tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	9.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	18.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	116.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	7.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	5.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	2.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	5.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	8.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	7.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	40.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	80.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	5.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	9.00
tblOperationalOffRoadEquipment	OperHorsePower	162.00	532.00
tblOperationalOffRoadEquipment	OperHorsePower	162.00	320.00
tblOperationalOffRoadEquipment	OperHorsePower	162.00	173.00
tblOperationalOffRoadEquipment	OperHorsePower	174.00	287.00
tblOperationalOffRoadEquipment	OperHorsePower	400.00	481.00
tblOperationalOffRoadEquipment	OperHorsePower	400.00	464.00
tblOperationalOffRoadEquipment	OperHorsePower	400.00	474.00
tblOperationalOffRoadEquipment	OperHorsePower	400.00	1,000.00
tblOperationalOffRoadEquipment	OperHorsePower	400.00	430.00
tblOperationalOffRoadEquipment	OperHorsePower	400.00	350.00
tblOperationalOffRoadEquipment	OperHorsePower	87.00	125.00
tblOperationalOffRoadEquipment	OperHorsePower	255.00	661.00
tblOperationalOffRoadEquipment	OperHorsePower	255.00	322.00
tblOperationalOffRoadEquipment	OperHorsePower	199.00	213.00
tblOperationalOffRoadEquipment	OperHorsePower	199.00	800.00

tblOperationalOffRoadEquipment	OperHoursPerDay	8.00	24.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	1.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural

2.0 Emissions Summary

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Offroad	0.3838	4.7242	2.2443	4.4100e-003		0.1830	0.1830		0.1683	0.1683	0.0000	424.7045	424.7045	0.1255	0.0000	427.3401
Total	**0.3838**	**4.7242**	**2.2443**	**4.4100e-003**		**0.1830**	**0.1830**		**0.1683**	**0.1683**	**0.0000**	**424.7045**	**424.7045**	**0.1255**	**0.0000**	**427.3401**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Offroad	0.3838	4.7242	2.2443	4.4100e-003		0.1830	0.1830		0.1683	0.1683	0.0000	424.7045	424.7045	0.1255	0.0000	427.3401
Total	**0.3838**	**4.7242**	**2.2443**	**4.4100e-003**		**0.1830**	**0.1830**		**0.1683**	**0.1683**	**0.0000**	**424.7045**	**424.7045**	**0.1255**	**0.0000**	**427.3401**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	100.00	100.00	100.00	100.00	0.00	100.00	100.00	0.00	100.00	100.00	0.00	100.00	100.00	100.00	0.00	100.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2015	12/31/2014	5	0	
2	Site Preparation	Site Preparation	1/1/2015	12/31/2014	5	0	
3	Grading	Grading	1/1/2015	12/31/2014	5	0	
4	Building Construction	Building Construction	1/1/2015	12/31/2014	5	0	
5	Paving	Paving	1/1/2015	12/31/2014	5	0	
6	Architectural Coating	Architectural Coating	1/1/2015	12/31/2014	5	0	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Rubber Tired Dozers	1	1.00	255	0.40
Demolition	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Site Preparation	Graders	1	8.00	174	0.41
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Grading	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Rubber Tired Dozers	1	1.00	255	0.40
Grading	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Building Construction	Cranes	1	4.00	226	0.29
Building Construction	Forklifts	2	6.00	89	0.20
Building Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Cement and Mortar Mixers	4	6.00	9	0.56
Paving	Pavers	1	7.00	125	0.42
Paving	Rollers	1	7.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	4	10.00	0.00	0.00	12.40	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	2	5.00	0.00	0.00	12.40	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Grading	4	10.00	0.00	0.00	12.40	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	5	0.00	0.00	0.00	12.40	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Paving	7	18.00	0.00	0.00	12.40	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	0.00	0.00	0.00	12.40	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Total					

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by

4.4 Fleet Mix

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.552333	0.058138	0.185246	0.125281	0.029961	0.004506	0.012317	0.020953	0.001764	0.001280	0.005920	0.000536	0.001765

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type
Excavators	1	8.00	21	532	0.38	Diesel
Excavators	1	8.00	21	320	0.38	Diesel
Excavators	1	8.00	9	173	0.38	Diesel
Graders	1	8.00	18	287	0.41	Diesel
Off-Highway Trucks	1	24.00	116	481	0.38	Diesel
Off-Highway Trucks	1	8.00	7	464	0.38	Diesel
Off-Highway Trucks	1	8.00	5	474	0.38	Diesel
Off-Highway Trucks	1	8.00	2	1000	0.38	Diesel
Off-Highway Trucks	1	8.00	5	430	0.38	Diesel
Off-Highway Trucks	1	8.00	8	350	0.38	Diesel
Other General Industrial Equipment	1	8.00	7	125	0.34	Diesel
Rubber Tired Dozers	1	8.00	40	661	0.40	Diesel
Rubber Tired Dozers	1	8.00	80	322	0.40	Diesel
Rubber Tired Loaders	1	8.00	5	213	0.36	Diesel
Rubber Tired Loaders	1	8.00	9	800	0.36	Diesel

UnMitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Excavators	0.0162	0.2324	0.0968	3.2000e-004		7.9100e-003	7.9100e-003		7.2700e-003	7.2700e-003	0.0000	30.3590	30.3590	8.9700e-003	0.0000	30.5474
Graders	5.8700e-003	0.0694	0.0335	9.0000e-005		2.6700e-003	2.6700e-003		2.4500e-003	2.4500e-003	0.0000	8.7667	8.7667	2.5900e-003	0.0000	8.8211
Off-Highway Trucks	0.2374	2.8369	1.2494	2.9600e-003		0.1083	0.1083		0.0997	0.0997	0.0000	285.0278	285.0278	0.0842	0.0000	286.7966
Other General Industrial Equipment	1.3700e-003	0.0152	9.1000e-003	1.0000e-005		8.2000e-004	8.2000e-004		7.5000e-004	7.5000e-004	0.0000	1.2291	1.2291	3.6000e-004	0.0000	1.2367
Rubber Tired Dozers	0.1121	1.3988	0.8172	9.0000e-004		0.0582	0.0582		0.0535	0.0535	0.0000	87.0593	87.0593	0.0257	0.0000	87.5995
Rubber Tired Loaders	0.0108	0.1716	0.0383	1.3000e-004		5.0900e-003	5.0900e-003		4.6800e-003	4.6800e-003	0.0000	12.2626	12.2626	3.6200e-003	0.0000	12.3387
Total	**0.3838**	**4.7242**	**2.2443**	**4.4100e-003**		**0.1830**	**0.1830**		**0.1683**	**0.1683**	**0.0000**	**424.7045**	**424.7045**	**0.1255**	**0.0000**	**427.3401**

10.0 Vegetation

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APPENDIX K:

IMPROVED RECLAMATION PLAN BOUNDARY DEMARCATION MEMO

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Memorandum

To: Greg Knapp, Lehigh Hanson

Cc: Cliff Maddocks, Lehigh Hanson Dan Zacharisen, Lehigh Hanson

From: Sean Avent
avent@wra-ca.com, x112

Date: May 8, 2014

Subject: Improved Reclamation Plan Boundary Demarcation

In order to maintain compliance with Santa Clara County Final Conditions of Approval number 22, the wooden lathe stakes that served to demarcate the EMSA, WMSA, and Rock Plant Reclamation Plan Amendment (RPA) Boundaries were replaced with high visibility permanent metal T-posts. This was done to improve the durability and visibility of the demarcation boundary (see Demarcation Maps, Figures 1-3).

Conditions of Approval Requirements

Conditions of Approval (COA) number 22 of the Santa Clara County Final Conditions of Approval specify the measures to be taken to maintain the demarcation of the EMSA, WMSA, and Rock Plant Reclamation Plan Amendment Boundary.

The relevant COA is summarized below:

> **COA 22. Maintain Demarcation of EMSA, Rock Plant, and WMSA RPA Boundaries.**
> Within 60 days of RPA approval, the RPA limit of disturbed area surrounding the northern and eastern edges of the EMSA, the northern and western edges of the WMSA, and the perimeter of the Rock Plant area shall be clearly demarcated in the field and shall remain in place until final reclamation has been completed. On an annual basis, demarcation shall be modified to encompass the RPA boundaries nearest the areas subject to surface mining and reclamation, as shown on aerials submitted per Condition number 23. Demarcated areas shall be located and marked in the field by a licensed land surveyor or registered civil engineer authorized to practice land surveying. Demarcation shall use orange construction fencing or other brightly colored material acceptable to the Planning Manager.

EMSA, Rock Plant, and WMSA RPA Boundary Demarcation Improvements

On April 9 and 14, 2014 a WRA, Inc. (WRA) biologist and technicians from Ecological Concerns Incorporated (ECI) identified and replaced the existing wooden lathe markers, which demarcated the EMSA, Rock Plant, and WMSA RPA boundaries, with metal T-posts. The newly installed T-posts were colored with high visibility pink paint and topped with OSHA-approved T-post caps. The areas in which the wooden lathes were replaced with T-posts were the same as the from the 2012 and 2013 demarcation survey. The placement of the T-posts occurred in the same positions as the pre-existing wood markers and the RPA boundary remained the same. The demarcation boundary did not move as quarry activities are not planned in or near those areas and there are no plans in place to go beyond the demarcation line. Additional markers were not needed in other areas because future quarry activities are not scheduled to be located near other portions of the RPA boundary.

Summary

In order to maintain compliance with COA 22, improvements to the durability and visibility of the RPA Boundary were made by installing high visibility pink T-posts. These T-posts were installed in the exact locations where the wooden lathes from the 2012 and 2013 demarcation survey had been placed.

Per the Final Conditions of Approval, all requirements for maintaining the demarcation of the EMSA, Rock Plant, and WMSA RPA Boundaries have been met.

Figure 1. Location of RPA Boundary Demarcation in the EMSA.

Figure 2. Location of RPA Boundary Demarcation in the WMSA.

Figure 3. Location of RPA Boundary Demarcation in the Rock Plant.

Above: RPA demarcation T-post installation in the EMSA.

Below: RPA demarcation T-post installation in the WMSA

Photographs taken April 9 and 17, 2014.

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Above: T-post replacement for temporary
wooden survey marker at RPA boundary.

Photograph taken April 9, 2014.

Above: RPA demarcation marker T-post at rock plant

Photograph taken April 17, 2014.

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Above: RPA Demarcation lathe to be replaced
at the rock plant.

Photograph taken April 9, 2014.

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Above: RPA Demarcation T-post installation at rock plant.

Photographs taken April 9, 2014.

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APPENDIX L:

2014-2015 MAP OF EXISTING AND PROPOSED STOCKPILES

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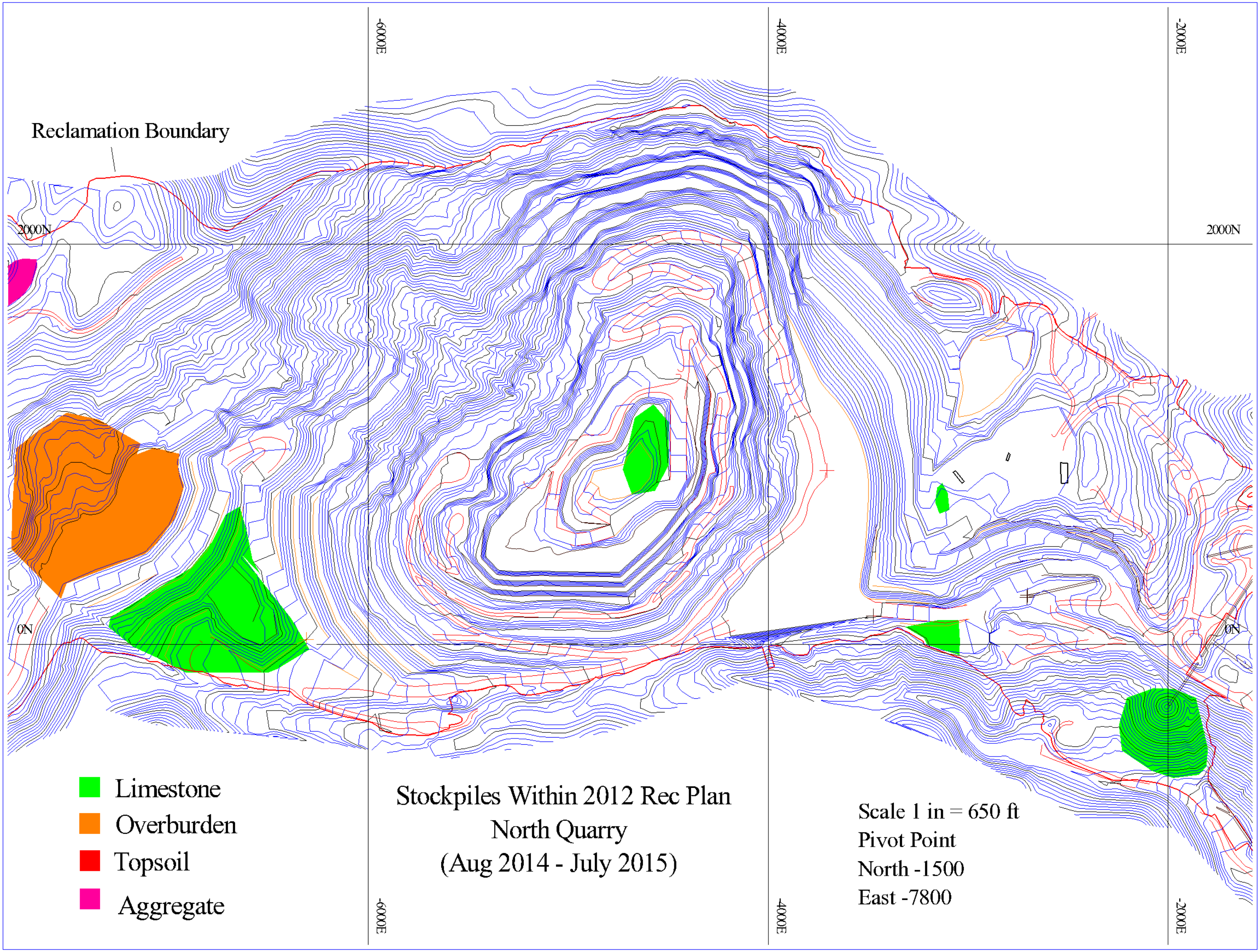
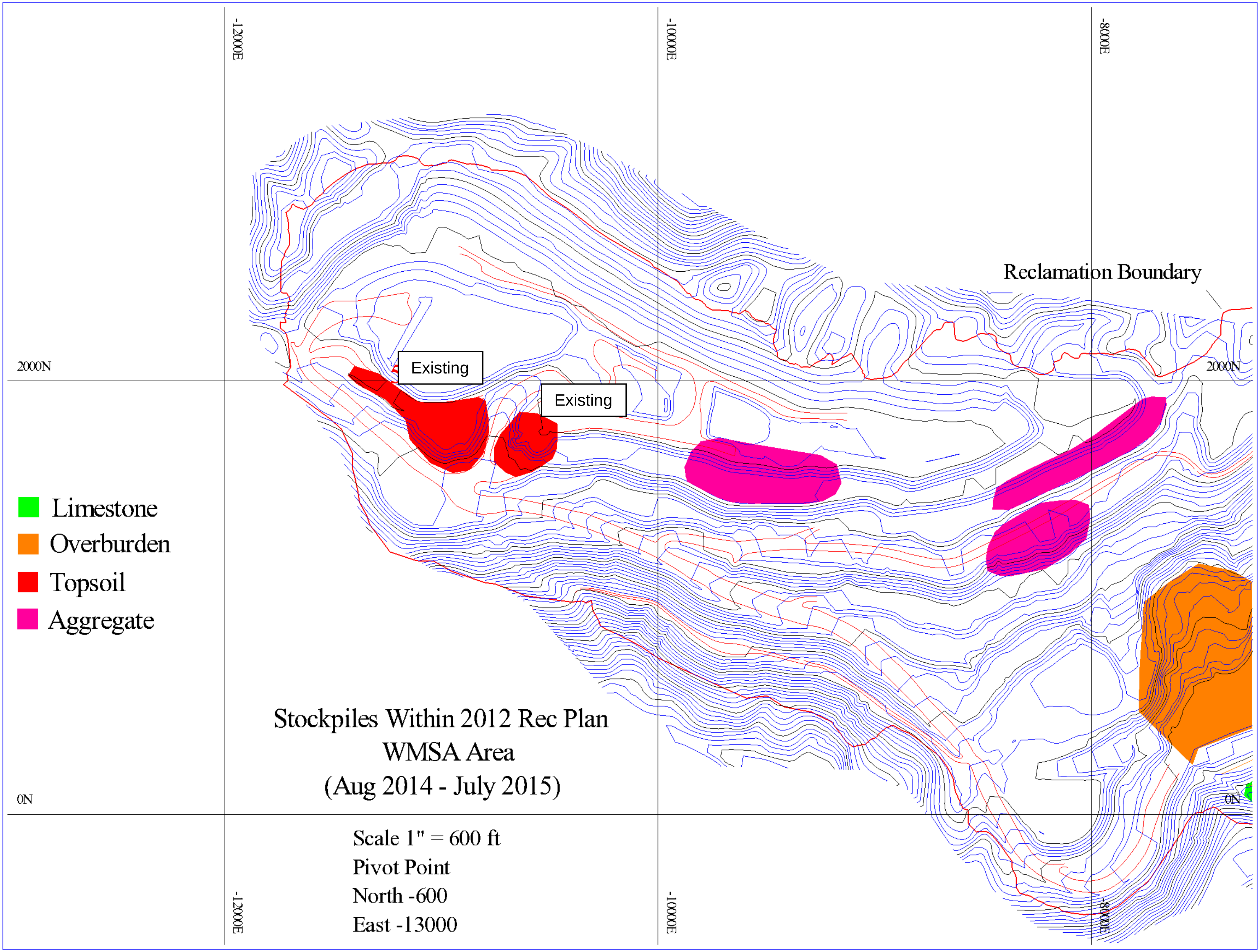
HANSON PERMANENTE

Potential and Existing Stockpiles Within 2012 Rec Plan
(August 2014 – July 2015)

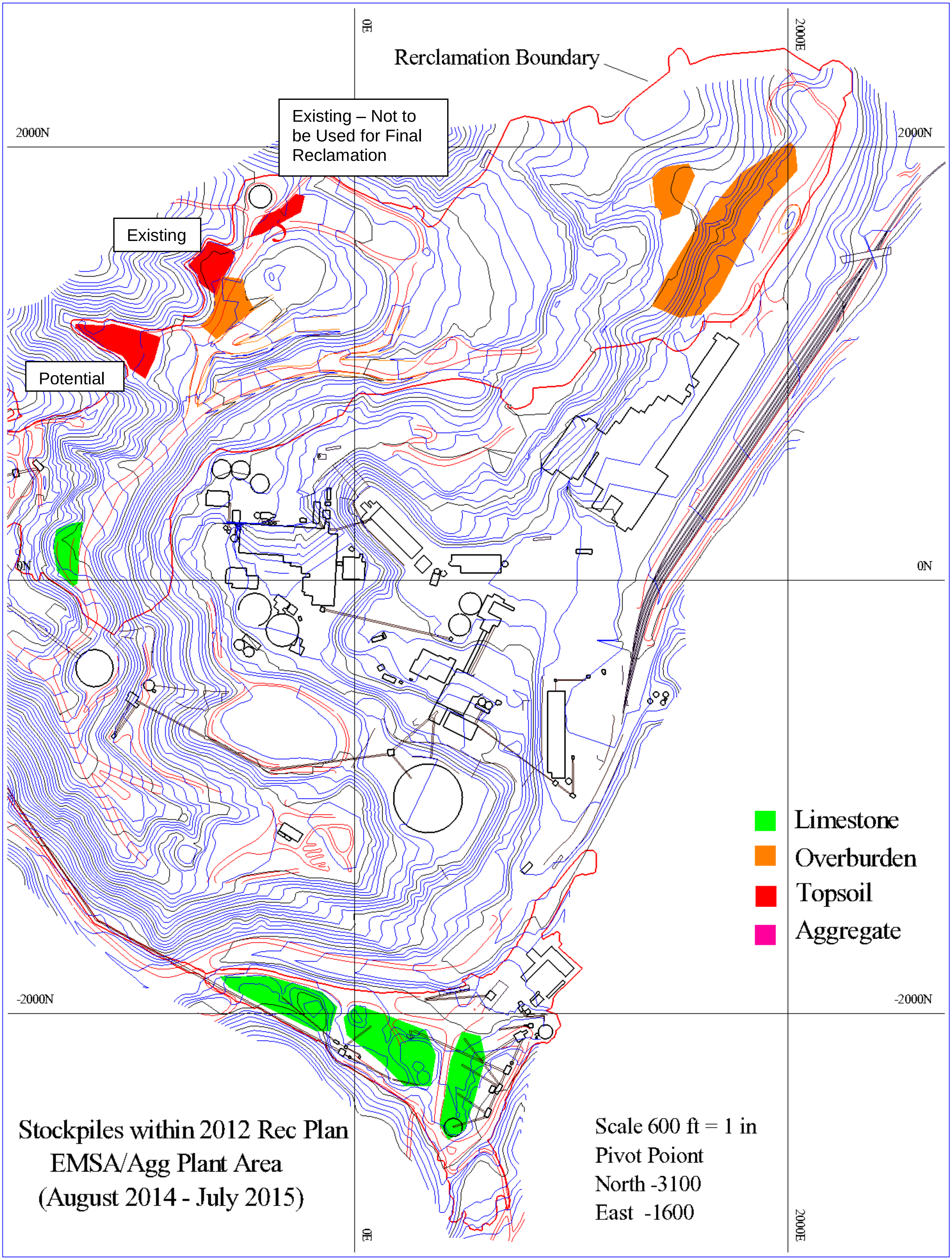
C. Maddocks

August 20, 2014


Reclamation Boundary
-6000E
-4000E
-2000E
2000N
2000N
0N
0N
Limestone
Overburden
Topsoil
Aggregate
Stockpiles Within 2012 Rec Plan
North Quarry
(Aug 2014 - July 2015)
Scale 1 in = 650 ft
Pivot Point
North -1500
East -7800



-12000E
-10000E
-8000E
2000N
0N
Reclamation Boundary
Existing
Existing
Limestone
Overburden
Topsoil
Aggregate
Stockpiles Within 2012 Rec Plan
WMSA Area
(Aug 2014 - July 2015)
Scale 1" = 600 ft
Pivot Point
North -600
East -13000



Rerclamation Boundary
Existing – Not to be Used for Final Reclamation
Existing
Potential
2000N
2000N
0N
0N
-2000N
-2000N
0E
0E
2000E
2000E
Limestone
Overburden
Topsoil
Aggregate
Stockpiles within 2012 Rec Plan
EMSA/Agg Plant Area
(August 2014 - July 2015)
Scale 600 ft = 1 in
Pivot Poiont
North -3100
East -1600

APPENDIX M:

MAPS OF PAST 24 MONTHS SURFACE MINING AND RECLAMATION ACTIVITY AND FUTURE 24 MONTHS ESTIMATED ACTIVITY

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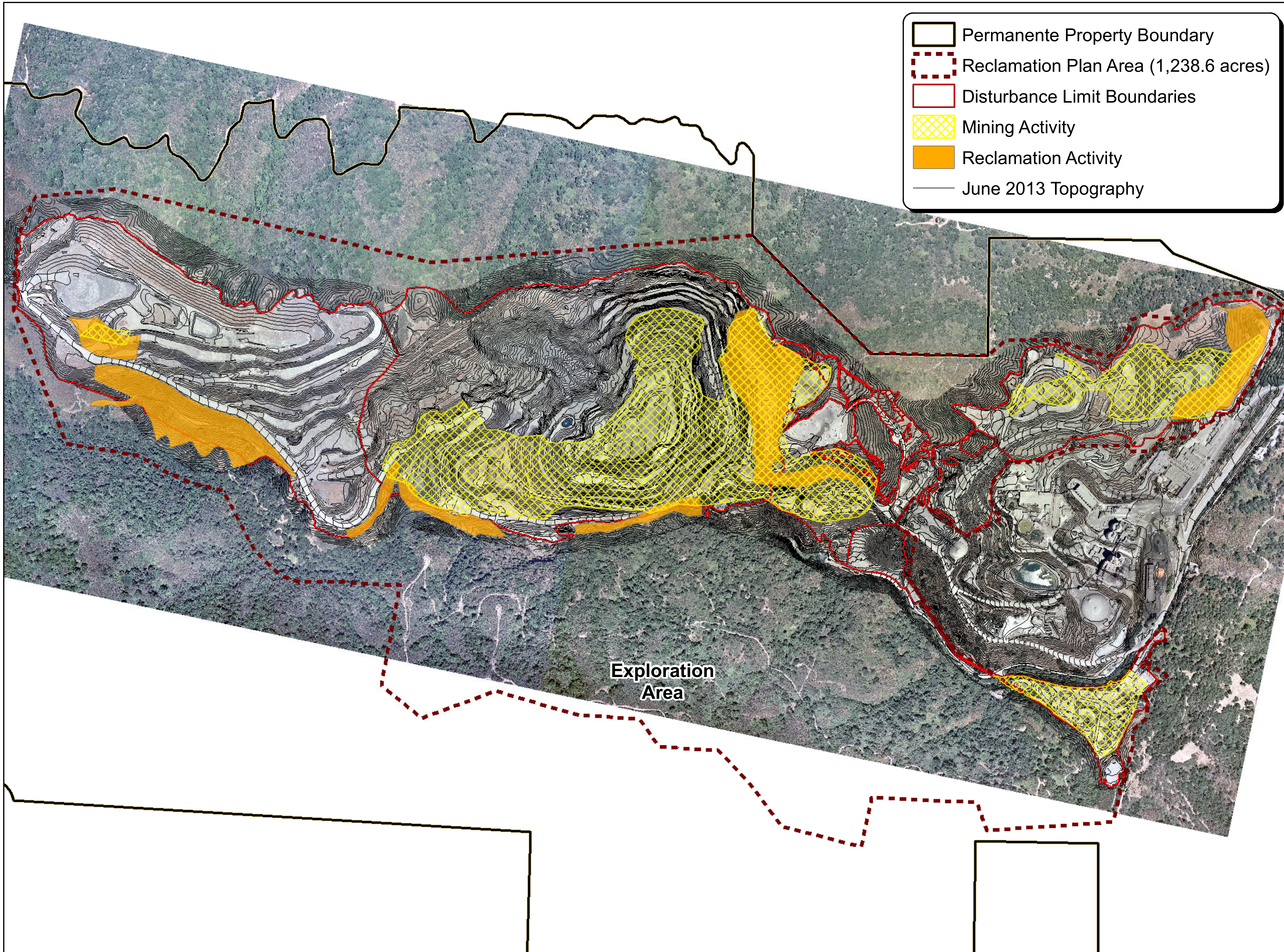

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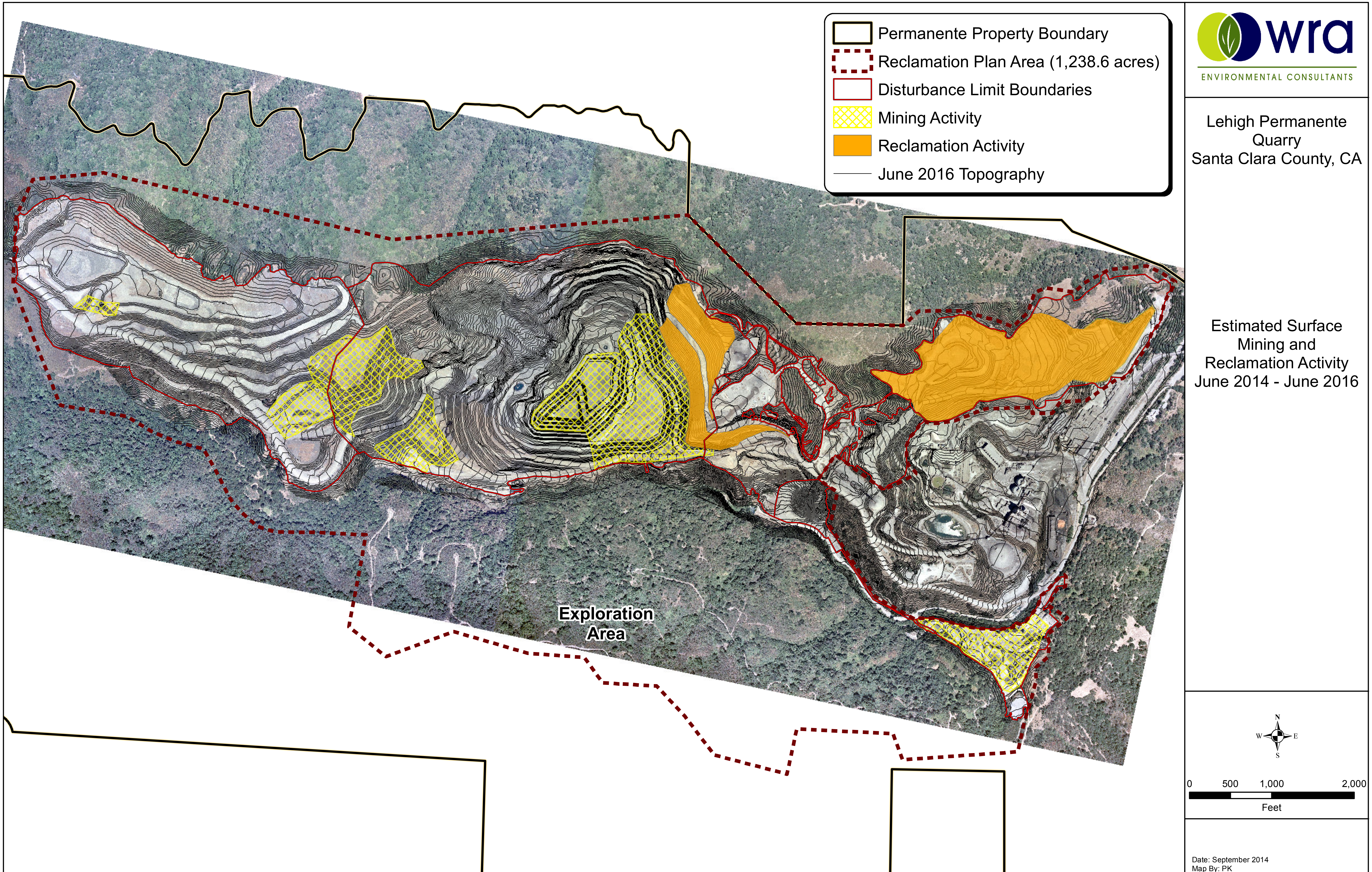
Lehigh Permanente Quarry
Santa Clara County, CA

Surface Mining and Reclamation Activity
June 2012 - June 2014

Date: September 2014
Map By: PK

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2014\Figure 2 Reclamation Map 2014.mxd



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Lehigh Permanente Quarry
Santa Clara County, CA

Estimated Surface Mining and Reclamation Activity June 2014 - June 2016

Date: September 2014
Map By: PK

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\2014\Figure 2 Reclamation Map 2016.mxd

APPENDIX N:

REVEGETATION TEST PLOT PROGRAM - FINAL MONITORING REPORT

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Revegetation Test Plot Program
Final Monitoring Report

PERMANENTE QUARRY
CUPERTINO, SANTA CLARA COUNTY, CALIFORNIA

Prepared For:

Lehigh Southwest Cement Company
24001 Stevens Creek Blvd.
Cupertino, CA 95014

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Date:

October 2014

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TABLE OF CONTENTS

1.0 INTRODUCTION 1
- 1.1 Revegetation Performance Standards 1
- 1.2 Test Plot Design and Installation.. 2
- 1.3 Variations from Test Plot Design and Specifications 3
- 1.4 Maintenance 7

2.0 METHODS..7
- 2.1 Seed Monitoring.. 8
- 2.2 Container Plant Monitoring.. 8

3.0 RESULTS AND DISCUSSION...8
- 3.1 Seeds and Soil Treatments.. 8
- 3.2 Container Plants 19

4.0 CONCLUSION AND RECOMMENDATIONS 21
- 4.1 Seeds and Soil Treatments..21
- 4.2 Container Plants 23

5.0 REFERENCES 25

LIST OF APPENDICES

APPENDIX A – Monitoring Photographs

APPENDIX B – Shrub Density Comparison Between Straw Bales and Center-Plots

LIST OF FIGURES

Figure 1. Test Plot Location Map 4

Figure 2. Yeager Yard Test Plot Layout 5

Figure 3. EMSA Test Plot Layout 6

Figure 5. Stem Density and Species Richness Graphs Year 5..................................13

LIST OF TABLES

Table 1. Proposed five-year performance standards for RPA Project Area revegetation........... 2

Table 2. Summary of vegetation cover based on soil treatment in Year 5. 9

Table 3. Summary of test plots in Year 5 based on proposed monitoring metrics in the Revegetation Plan (Sorted by stem density per acre)..12

Table 4. Seed performance in test plots – Year 5..14

Table 5. Non-native species in test plots – Year 5...15

Table 6. Tree and Shrub Container Plant Survival by Species 20

Table 7. Tree and Shrub Container Plant Survival by Plant Care Treatment 20

Table 8. Tree and Shrub Container Plant Survival by Soil Treatment.......................................21

1.0 INTRODUCTION

The purpose of this report is to summarize the results of monitoring visits and maintenance activities in Year 5 (2013) and the overall Revegetation Test Plot Program at the Permanente Quarry (Quarry) in Cupertino, Santa Clara County, California (Figure 1). The data collected over the past five years is being analyzed to evaluate the efficacy of different revegetation (i.e. seeding, soil amendment) treatments in meeting revegetation performance criteria set forth in the Permanente Quarry Revegetation Plan (WRA 2011a). The Revegetation Plan was prepared in support of the updated Reclamation Plan for the Quarry (Santa Clara County 2012). Year 5 test plot results and analysis are presented in this report. Year 5 results are also compared to Years 1, 2, 3, and 4 (WRA 2009, 2011b, 2012a, 2012b) test plot results to examine potential trends in revegetation efforts. Final test plot program results will inform a final revegetation plan for the Quarry.

1.1 Revegetation Performance Standards

Performance standards have been developed for the Permanente Quarry Revegetation Plan based on a study of reference sites in the vicinity of the Quarry conducted by WRA and preliminary test plot results from Years 1 and 2. A final revegetation plan will incorporate final results from this five-year revegetation monitoring program. Performance standards represent anticipated conditions five years after final installation of revegetation seeds and plantings. Revegetation of the Reclamation Plan Area (RPA) is intended to create approximately 40 percent coverage of native tree and shrub habitat interspersed among grasses within five years of final revegetation. Planting areas on south-facing benches of the RPA are anticipated to be dominated by shrubs, while planting areas on north- and east-facing benches are anticipated to eventually be dominated by trees and shrubs (WRA 2011a)

Reference site data were used to create a science-based and achievable set of performance standards (Table 1). Native species richness targets have been chosen to reflect data collected from the reference sites and preliminary test plot results. These densities and percent cover values reflect the expected growth of trees and shrubs in the first five years of the revegetation areas.

Reference data values for percent cover and density of trees and shrubs describe mature woody communities that have not seen significant disturbance in decades. While the target plant communities of the revegetation areas should eventually blend with these mature communities, they cannot be expected to achieve similar characteristics over only five years of growth. Instead, shrub and tree planting areas are designed to mimic pioneering plant communities that will continue to develop and dominate the benches and slopes over several decades through tree growth and natural regeneration.

Table 1. Proposed Five-Year Performance Standards for RPA Project Area Revegetation								
	Oak Woodland (north- and northeast-facing benches)		Pine Woodland (east-facing benches)		Hydroseed Areas* shrub/grassland mix		Riparian Areas	
	Woody Plants	Herbs	Woody Plants	Herbs	Woody Plants	Herbs	Woody Plants	Herbs
Richness *(avg. native species per plot)***	5	3	4	3	3*	3*	4	3
Density *(avg. native individuals per acre)*	470	-	345	-	-	-	470	-
Canopy Cover	40%		40%		40%*		40%	

* Performance standards for hydroseed areas may need to be adjusted to reflect feasible five-year results of the species mix ultimately selected based on the final test plot program results and early revegetation efforts during the reclamation period. In particular, the balance between shrub and herbaceous species cover may vary.
** Richness standards are based on plot sizes used in reference data collection and described in this Plan: 10m-radius plots for trees, 5m-radius plots for shrubs, and 1m-radius plots for herbs/grasses.

1.2 Test Plot Design and Installation

The *Revegetation Test Plot Program As-Built Report* (WRA 2010) provides details on the test plot program design and installation, which is summarized here. Test plots were installed in the fall of 2008, including 13 plots (plots 1-12 and 16) at a flat site within the Yeager Yard and 3 plots (plots 13, 14, and 15) on a slope in the East Materials Storage Area (EMSA) (Figures 2 and 3). Each plot was demarcated with straw bales and further divided into four quadrants using straw wattles. Installation included various “soil treatments” (i.e. application of multiple combinations and depths of quarry materials and compost) to test potential materials to use for soil and vegetation establishment on top of bare graded overburden rock. The components of these soil treatments are listed in Table 2.

Each plot soil treatment was then seeded using one of four different herbaceous seed mixes in each of the quadrants (labeled by colors: red, yellow, blue, and green), and all quadrants were also seeded with a shrub mix. Following seeding, straw mulch and a hydroslurry consisting of fertilizers and a tackifier were applied to all of the plots. At the EMSA site only, mycorrhizal inoculants were included in the hydroslurry.

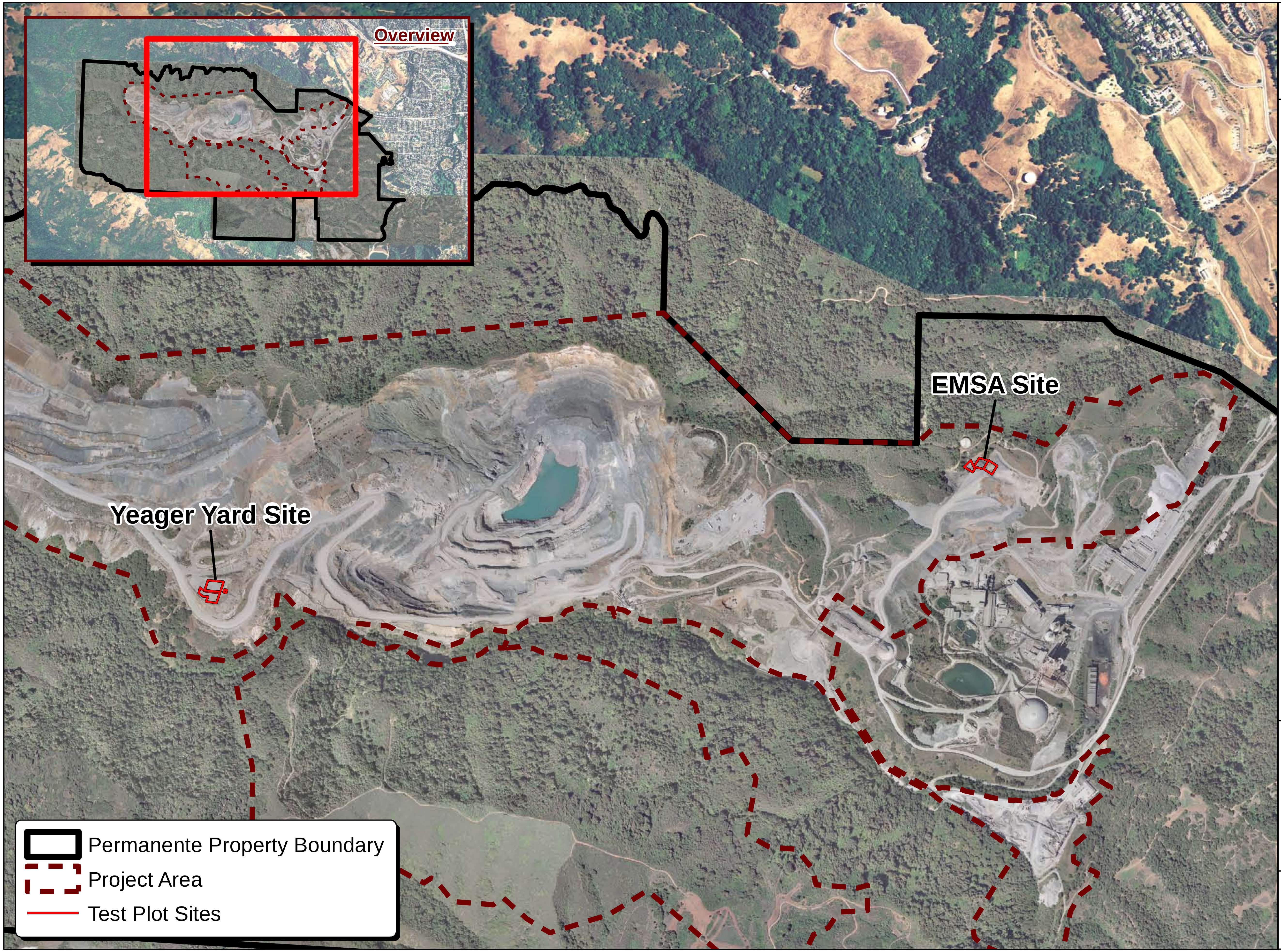
Containerized native shrubs and trees were installed in the deepest soil treatments (Plots 11, 12, and 16) by Central Coast Wilds, a division of Ecological Concerns, Inc., in November 2009. Nine species were tested, as shown in Table 6, with eight individuals of each species planted in both plots 11 and 12, and three of each in plot 16. Plantings were laid out by WRA at a minimum spacing of 3 feet, and the final installation was mapped by species to assist future monitoring efforts. In each plot, an equal number of each species was installed per quadrant, and each quadrant’s plantings were tested with various plant care treatments. DriWater gel pacs, a biodegradable silica-based product that is buried next to the plants and slowly releases water into the soil, were installed next to all plants in the green quadrants. In the yellow quadrants, plantings were mulched (with approximately 1-foot radius circle of 2-inch deep wood chip mulch). Plantings in the blue quadrants were installed with both DriWater and mulch, and plantings in the red quadrants were installed without DriWater or mulch.

1.3 Variations from Test Plot Design and Specifications

The test plots were built according to the Test Plot Program specifications developed by Lehigh Permanente (2008) with the following exceptions:

- Due to space limitations, the dimensions of plot 15 are approximately 40' x 100' x 100' x 100' rather than a 100' square.
- Compost in plot 10 was not blended with overburden rock into a 24" mixture per the specifications. As a result, this plot is testing the placement of 6" of compost on top of overburden rock with no mixing.
- The Lehigh Permanente native erosion control mix was accidentally applied to the blue quadrant of plot 14. Plot 14 also did not receive a shrub seed mix treatment. The amount of Seed Mix #4 designated for plot 14 was instead applied evenly to plots 13 and 15 by the contractor (a study design change not approved by WRA).
- Seed Mix #3 was not applied to plot 16 as it was not included in the delivery from the seed company.

It should also be noted that conditions are significantly different between the Yeager Yard and EMSA test plots. Differences include plot size, slope, and aspect (the EMSA planting area is a north-facing slope while Yeager Yard is flat and completely exposed), which may impact soil moisture and suitability for various species, including weeds. Mycorrhizal inoculants were applied to EMSA plots but not to Yeager Yard plots. In addition, deer browse, deer bedding, and rodent burrows have also been observed at significant levels in Yeager Yard test plots, but wildlife use does not appear to be significant at EMSA test plots.



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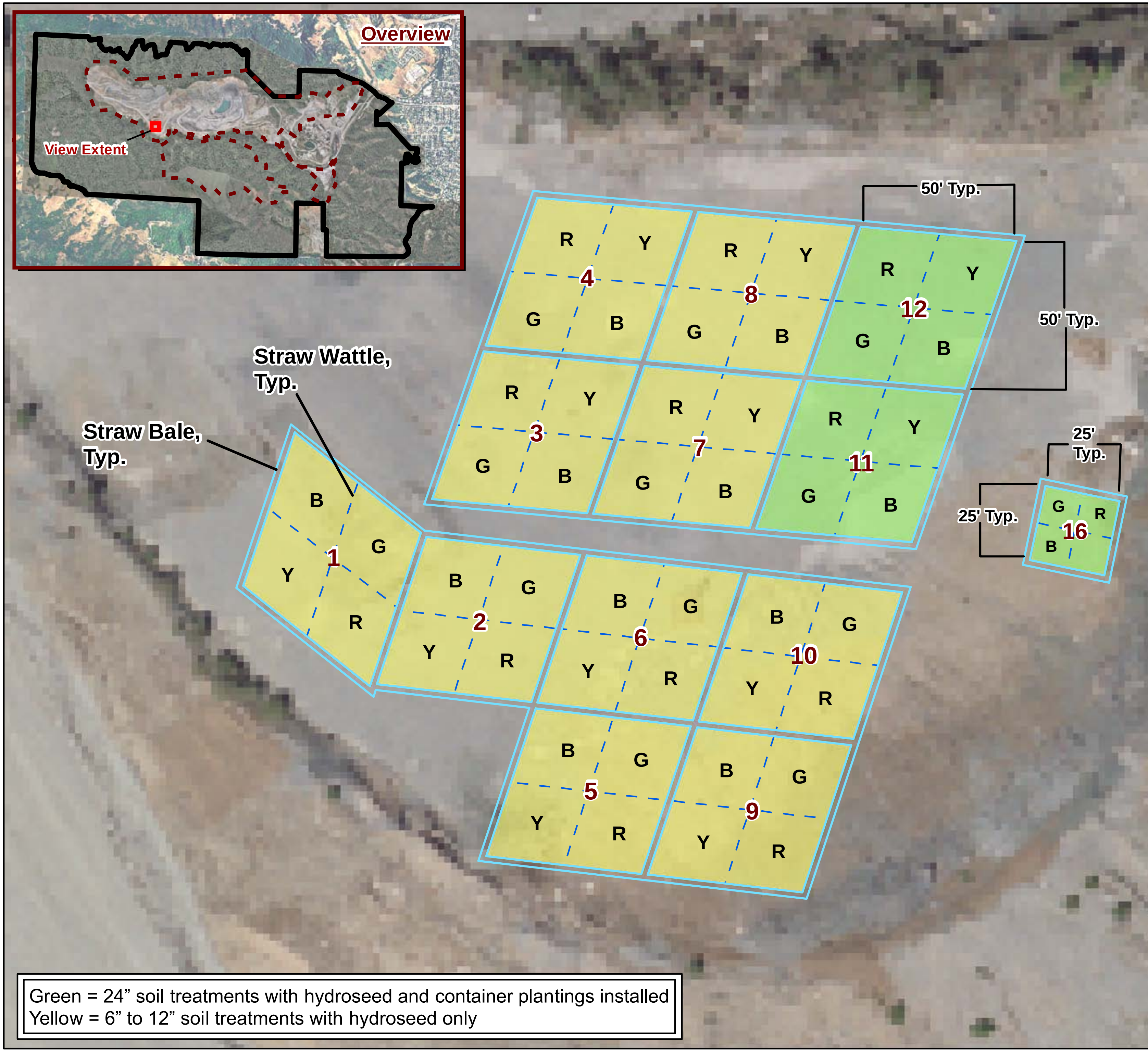
Lehigh Permanente Quarry, Santa Clara County, California

Figure 1.

Test Plot Location Map

Date: January 2011
Map by: Michael Rochelle
Image Date: April 2007

Path: L:\Acad 2000 Files\16000\16143\gis\arcmap\2010 Report\Test Plot Report January 2011\Figure 1_Test Plot Location.mxd



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Lehigh Permanente Quarry, Santa Clara County, California

Figure 2.

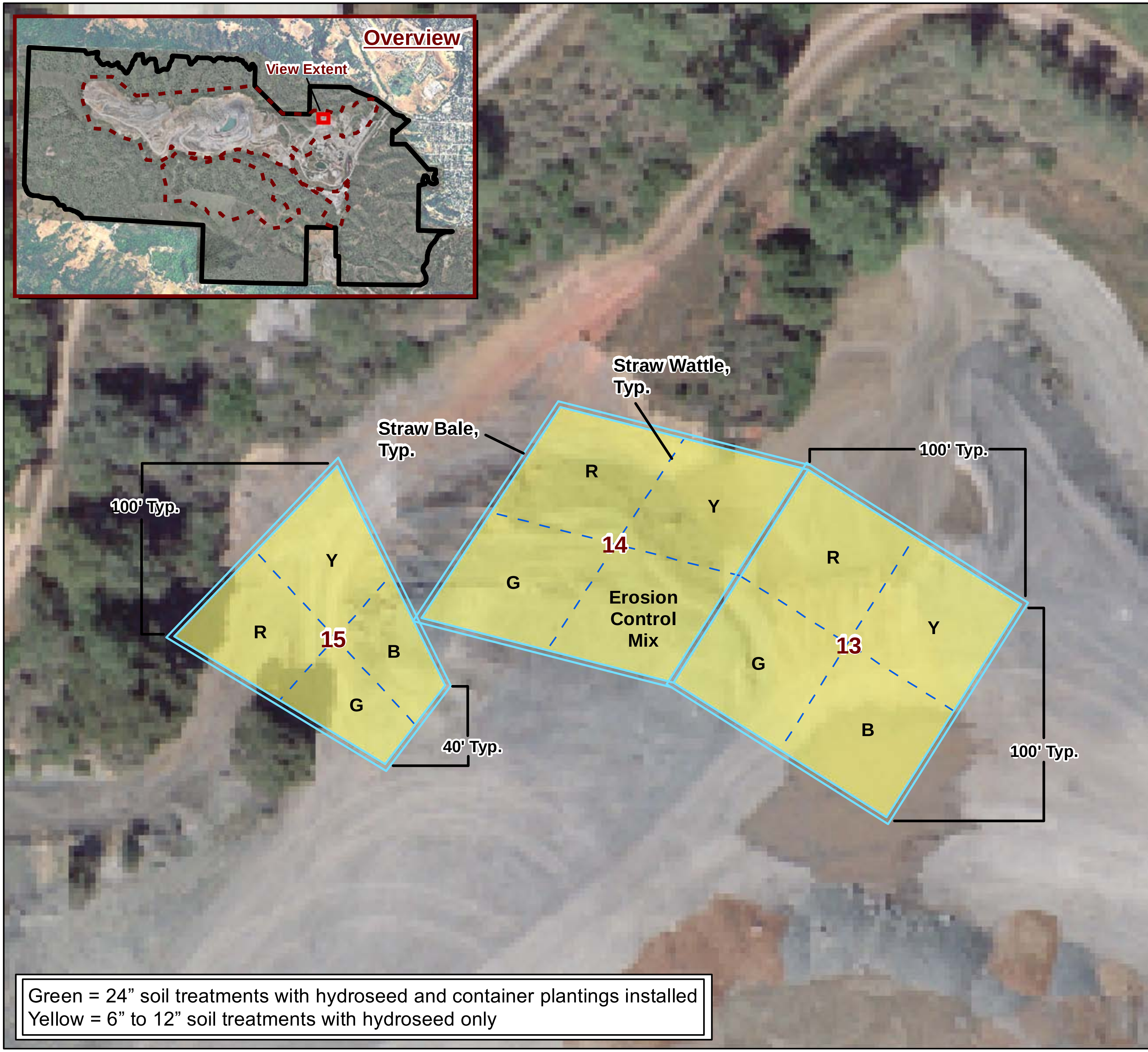
Test Plot Layout at Yeager Yard Site

N W E S

0 25 50 Feet

Date: January 2011
Map by: Michael Rochelle
Image Date: April 2007

Path: L:\Acad 2000 Files\16000\16143\gis\arcmap\2010 Report\Test Plot Report January 2011\Figure 2_Yeager_Site.mxd



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Lehigh Permanente Quarry,
Santa Clara County,
California

Figure 3.

Test Plot Layout
at EMSA Site

N W E S

0 15 30 60 Feet

Date: January 2011
Map by: Michael Rochelle
Image Date: April 2007

Path: L:\Acad 2000 Files\16000\16143\gis\arcmap\2010 Report\Test Plot Report January 2011\Figure3_EMSA_Site.mxd

1.4 Maintenance

Maintenance at the Permanente test plots has included weeding and DriWater gel pac replacement. In summer 2009, bare rock areas adjacent to the test plots were scraped to remove weeds, predominantly the invasive species stinkwort (*Dittrichia graveolens*), summer mustard (*Hirschfeldia incana*), yellow star thistle (*Centaurea solstitialis*), and foxtail brome (*Bromus madritensis* ssp. *rubens*). In June 2010, black mustard (*Brassica nigra*) and yellow star thistle were removed from all Yeager Yard plots (plots 1-12 and 16) using hand picks and soil knives. Dense populations in Plots 12 and 16 were not completely removed. Plots 13-15 at the EMSA were notably infested by black mustard in and around the test plots in 2011.

In November 2011, all plots at both the Yeager Yard and EMSA sites were weeded by hand, and plant materials were bagged and removed from the sites. The primary plants removed from the Yeager Yard plots were stinkwort, black mustard, yellow star thistle, fennel (*Foeniculum vulgare*), and Italian thistle (*Carduus pycnocephalus*). The Yeager Yard plots were once again invaded by stinkwort at the time of 2011 maintenance activities. However in the EMSA plots, black mustard was the predominant weed observed and subsequently removed in 2011 (other weeds existed and were removed from the EMSA site, but to a much lesser extent) (Laslett, pers. comm., 2011).

No weeding was performed in 2012 or 2013. By the time of monitoring in June 2012 and June 2013, most weeds had already set seed for the year, and WRA biologists determined that weeding would not be a useful effort at this time given the potential for disturbing the test plot and potentially introducing new weeds through personnel access. Weeds were less prevalent across test plots in 2013 with the exception of Italian thistle at the Yeager Yard site and summer mustard at the EMSA site. These weeds should be the target of weed treatment efforts across the test plots in the future. Foxtail brome and rattail fescue (*Vulpia myuros*) were the most prevalent weeds observed in monitoring quadrats, but it is unlikely that these herbaceous, annual grasses, which are naturalized in grasslands throughout the region and produce prolific amounts of seed, could be controlled effectively.

Only a few individuals of stinkwort were observed in a single plot, and yellow star thistle was not as prevalent as in past monitoring visits, showing that treatment for these two species has been effective. These two species should continue to be treated if observed during future weed management visits.

DriWater gel pacs were replenished for all live plantings with DriWater tubes in June and September 2010. Gel pacs were only replaced for surviving plantings, including those that were severely stressed but still had some live bark or any slightly green leaves (including 43 plantings in June and 4 in September). Empty tubes next to dead plantings were removed in September 2010. Gel pacs were not replenished in 2011, 2012, or 2013.

2.0 METHODS

Year 5 revegetation test plot monitoring was conducted by WRA on June 6, 2013. Monitoring methodology is described in the following sections.

2.1 Seed Monitoring

Monitors divided each plot quadrant into nine equal sections; each plot quadrant was numbered consistently from one through nine. A random list of numbers between one and nine was generated prior to the site visit, and this list was utilized to select two of the nine sections for sampling in each consecutive quadrant. One 0.25-square-meter quadrat was randomly dropped in each of the two selected sections to sample vegetation data. As a result, approximately 0.9 percent of each plot and quadrant was sampled, with a lower sampling intensity in the larger (100-foot x 100-foot) plots, and higher intensity in the 25-foot x 25-foot plot (plot number 16).

WRA identified all plants present in each sampling quadrat to the species level when possible. In each sampling quadrat, monitors estimated absolute percent cover of each species, and an overall percent cover of vegetation, bare ground, and thatch/litter (thatch is defined as dead grasses, while litter is defined as dead leaves and stems from non-grasses). Monitors also walked through each plot quadrant and noted any additional species present that were not observed within the sampling quadrats.

Monitoring was scheduled for June, assuming it would be the height of the growing season and a time when the most species, including both annual grasses and perennial shrubs, were readily identifiable. Plant cover and distribution should also be most representative during the height of the growing season when plants have achieved their maximum growth and cover for the year. Although the 2012 – 2013 rainfall season was drier than average and most plants accordingly senesced and desiccated earlier than during a typical rainfall year, almost all plants were still readily identifiable during the June monitoring visit. All future monitoring visits should be performed during the window of May to June to observe plants when they are most identifiable and capture representative conditions at the height of the growing season.

2.2 Container Plant Monitoring

Container plants were originally installed in plots 11, 12, and 16 in a grid pattern with each species mapped during final plant layout. Each planting was located using the map, counted for survival, and assessed for health during the June and September 2010 monitoring visits. Container plantings were revisited in November 2011, June 2012, and June 2013 and counted for survival.

3.0 RESULTS AND DISCUSSION

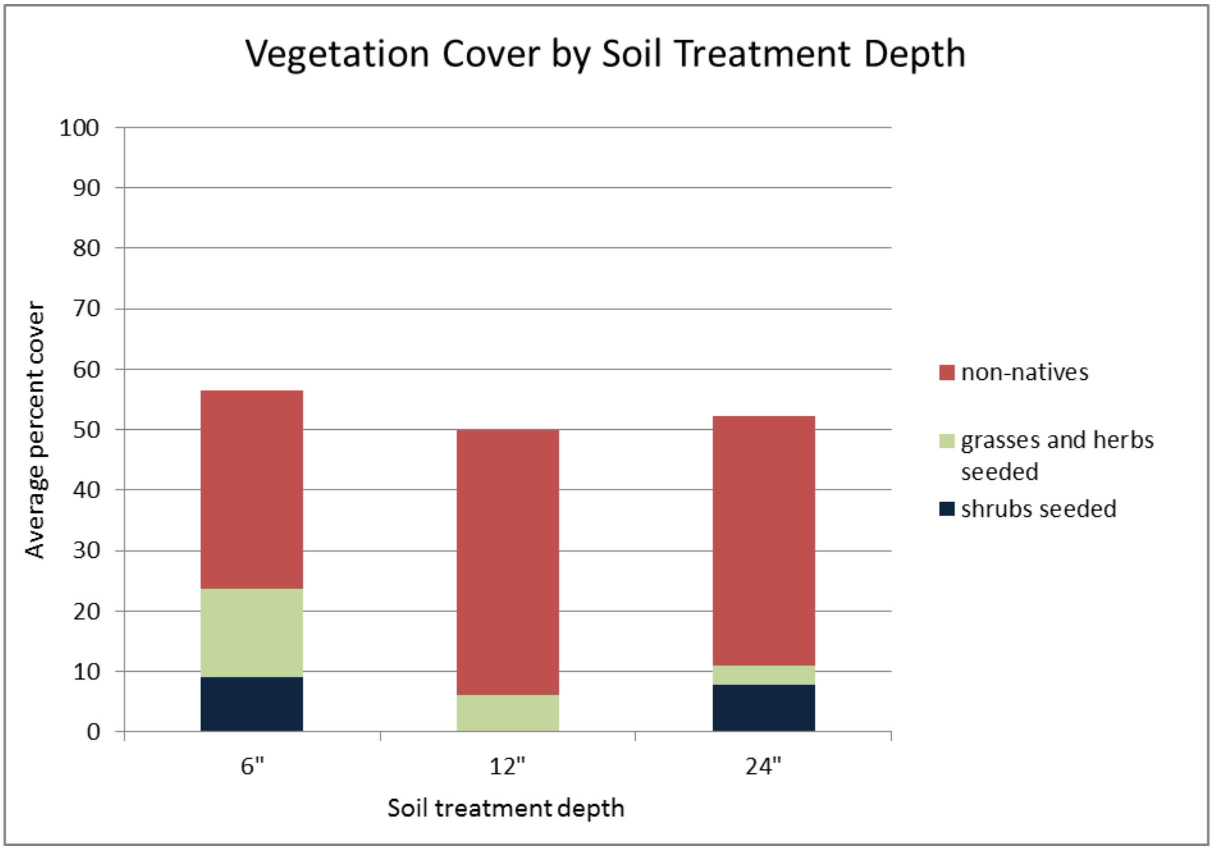
3.1 Seeds and Soil Treatments

Data collected during the June 6, 2013, monitoring visit for vegetation cover across the various soil treatments is summarized in Tables 2-5 and graphs in Figures 4 and 5. Table 2 shows the average vegetation cover, performance of the native seed mixes, cover of non-native species, and thatch/litter in each plot. Table 3 summarizes plot data taken in terms of the metrics proposed in the Revegetation Plan for monitoring future Quarry reclamation efforts (total cover, stem density, and species richness) in the RPA. Table 4 is a summary of the performance of individual species in the seed mixes. Table 5 summarizes cover of non-native species observed in the plots.

Table 2. Summary of vegetation cover based on soil treatment in Year 5.
(Sorted by total cover of native shrubs)

PLOT #	Soil treatment depth	SOIL COMPONENTS (%)				AVERAGE PERCENT COVER (%)				
		Overburden Rock	Compost	Pit 1 Fine Greenstone	Rock Plant Fines	Seeded species (incl. shrubs)	Native shrubs	Non-native species	Thatch/ litter	Bare ground
13	6"	75	25			49	33	20	29	13
15	6"		25	75		46	27	22	25	4
16	24”	37.5	25	37.5		19	14	37	18	17
14	6"	35	25		40	56	11	19	32	3
1	6”	100				20	7	7	3	79
12	24”	25	25	25	25	8	5	54	18	6
5	6”		25	75		11	5	33	36	7
11	24”		25	75		6	4	33	31	6
6	6”	33	25	25	17	8	3	47	35	3
3	6”	50	50			10	3	41	22	16
2	6”	75	25			27	2	37	33	9
4	6”	35	25		40	7	2	35	21	41
8	12”	37.5	25	37.5		9	0	46	31	7
9	12”	25	25	25	25	6	0	49	30	15
7	12”	75	25			4	0	37	34	6
10	6"		100			2	0	70	15	3

Figure 4. Soil Treatment Summary Graphs



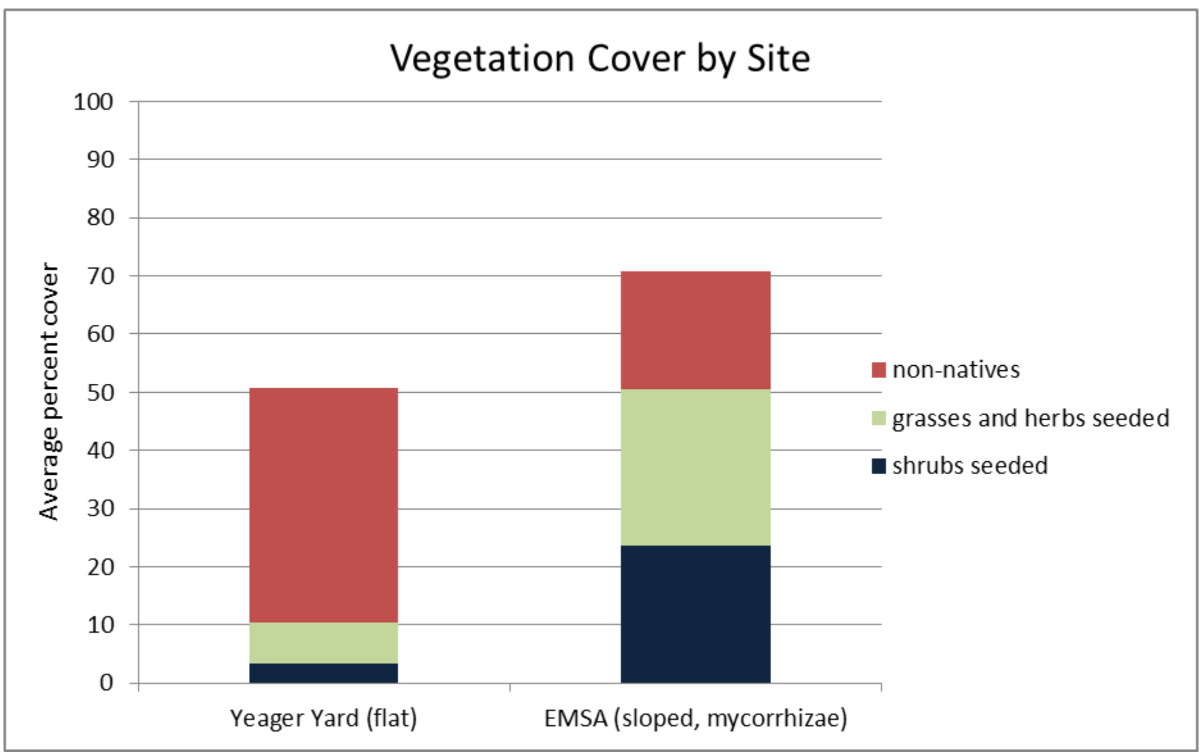


Figure 4 (cont.). Soil Treatment Summary Graphs

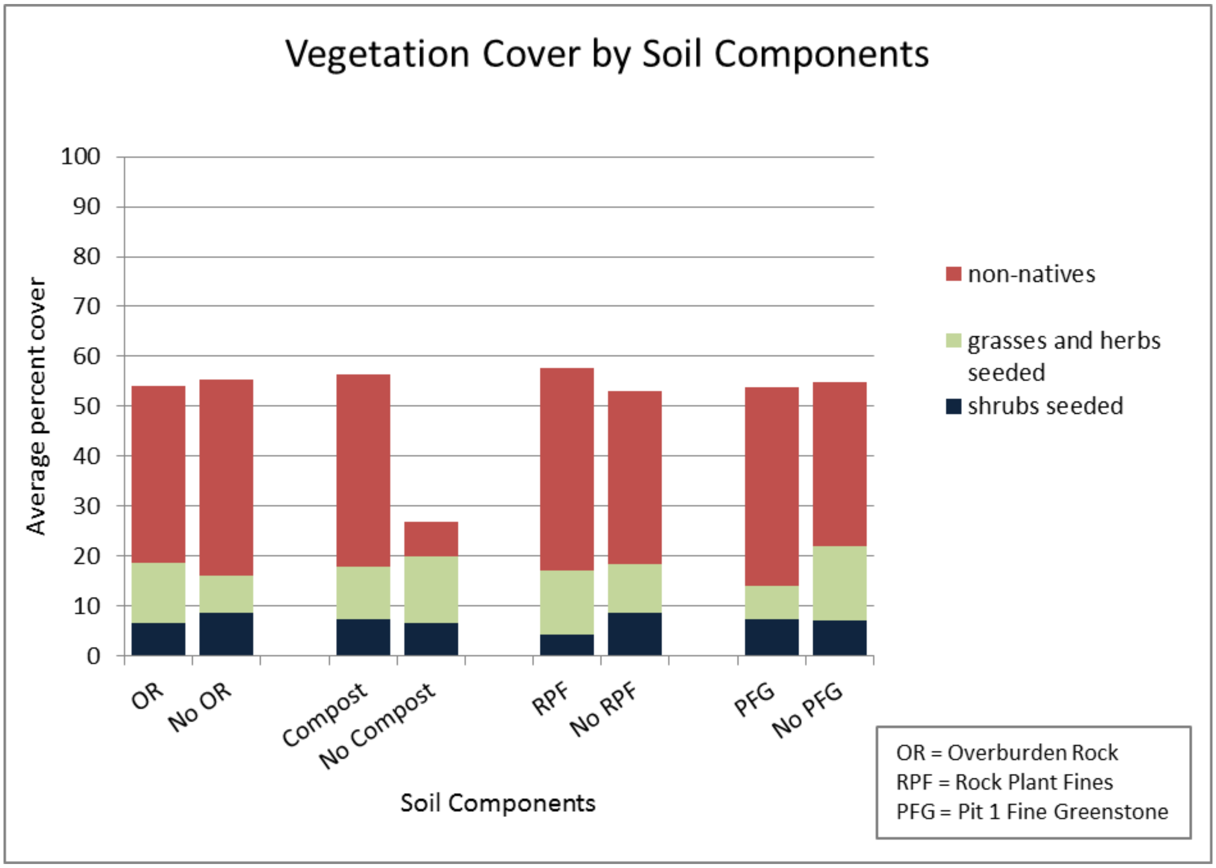


Table 3. Summary of test plots in Year 5 based on proposed monitoring metrics in the Revegetation Plan (Sorted by stem density per acre).

PLOT #	Soil treatment depth	SOIL COMPONENTS (%)				PROPOSED RECLAMATION MONITORING METRICS (Revegetation Plan [WRA 2011a])		
		Overburden Rock	Compost	Pit 1 Fine Greenstone	Rock Plant Fines	Total live vegetative cover (%) in June 2013	Native species richness (species/ 2 m^2)[1] in June 2013	Stem density (shrubs per acre) [2] in June 2013
1	6	100	-	-	-	10.6	21	72,845
2	6	75	25	-	-	66.1	19	12,141
3	6	50	50	-	-	50.5	15	6,070
4	6	35	25	-	40	38.0	16	54,634
5	6	-	25	75	-	60.2	15	32,376
6	6	33	25	25	17	63.0	15	2,023
7	12	75	25	-	-	50.5	11	8,094
8	12	37.5	25	37.5	-	59.9	15	18,211
9	12	25	25	25	25	63.3	11	ND
10	6	-	100	-	-	78.6	11	16,188
11	24	-	25	75	-	66.1	16	12,141
12	24	25	25	25	25	72.4	14	ND
13	6	75	25	-	-	66.1	20	16,188
14	6	35	25	-	40	69.3	18	2,023
15	6	-	25	75	-	63.0	13	26,305
16	24	37.5	25	37.5	-	56.8	11	20,235

[1] Species richness values are not directly comparable to the proposed performance criteria in the Revegetation Plan, as the sampling plot size is different, although only slightly different for herbaceous species. Richness values in Table 3 are the total number of native species observed in all sampling quadrats per plot, in an area totaling 2 m^2. Performance criteria monitoring currently proposed in the Revegetation Plan would obtain richness values for trees in a 10 meter-radius plot, shrubs in a 5 meter-radius plot, and herbs in a 1 meter-radius plot (3.1 m^2).

[2] ND = Not Detected. Shrubs may have been in the plot, but did not show up in the eight randomly placed quadrats.

Figure 5. Stem Density and Species Richness Graphs Year 5

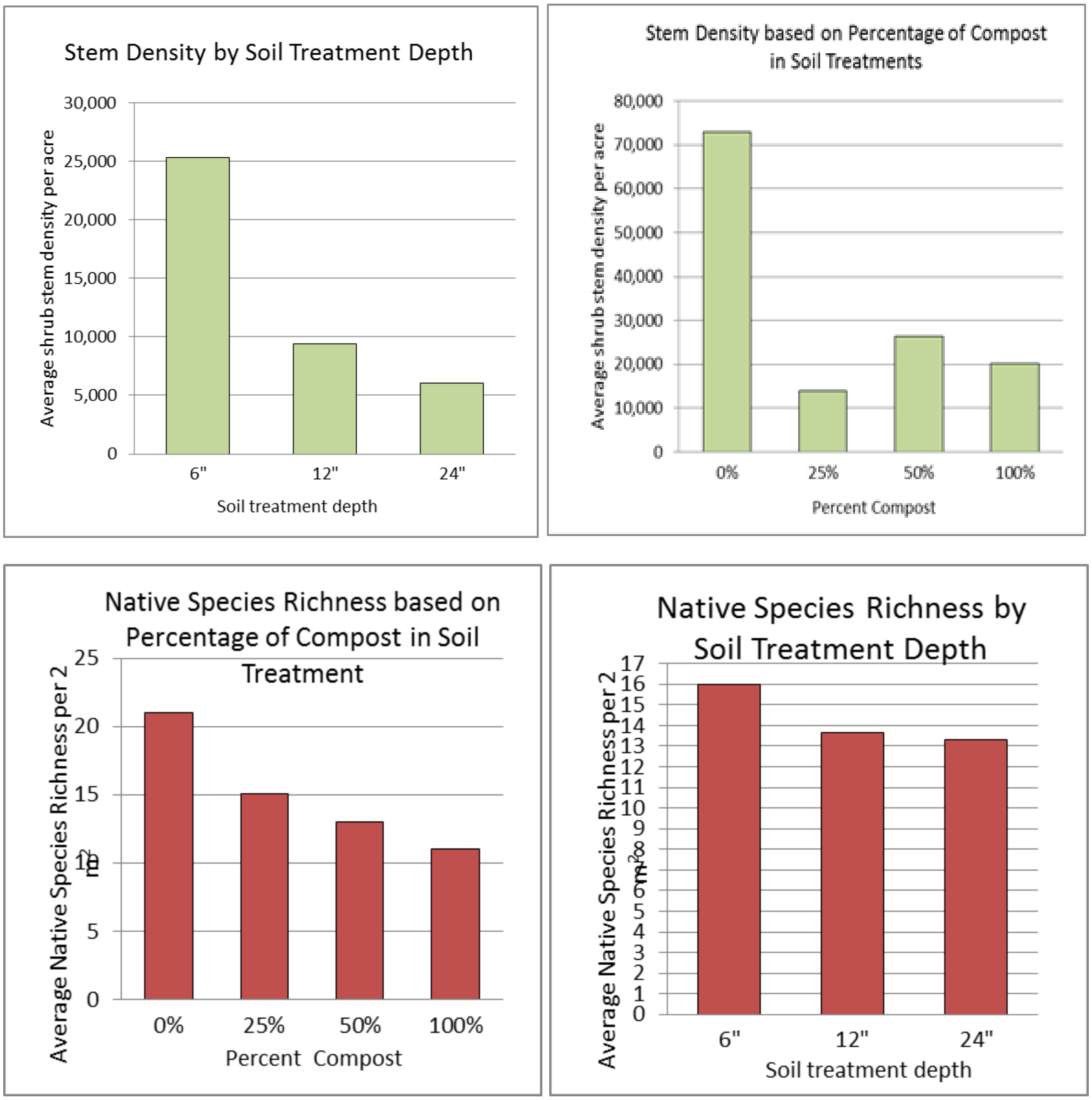


Table 4. Seed Performance in Test Plots – Year 5.
Seed mixes: #1 green (G); #2 red (R); #3 yellow (Y); #4 blue (B); shrub (S) [applied to all plots]; erosion (E) [in place of blue mix in plot 14]

SCIENTIFIC NAME	COMMON NAME	Seed mixes containing species	Presence in quadrants where seeded (%)	Average cover where seeded (%)
Vulpia microstachys	small fescue	GRYBE	60.3	6.7
Achillea millefolium	yarrow	GYB	34.8	2.1
Sisyrinchium bellum	blue-eyed grass	B	33.3	0.2
Nassella pulchra	purple needlegrass	G	31.3	0.2
Eriogonum fasciculatum	California buckwheat	S	30.2	4.2
Elymus glaucus	blue wildrye	GRYBE	25.4	0.9
Artemisia californica	California sagebrush	S	23.8	2.6
Lotus purshianus	Spanish lotus	GYB	21.7	0.4
Leymus triticoides	creeping wildrye	B	13.3	0.0
Heterotheca grandiflora	telegraph weed	G	12.5	0.1
Salvia mellifera	black sage	S	11.1	0.7
Artemisia douglasiana	California mugwort	S	9.5	0.2
Lotus scoparius	deerweed	GY	6.5	0.0
Bromus carinatus	California brome	GRYBE	4.8	0.1
Plantago erecta	foothill plantain	GBE	3.1	0.0
Adenostoma fasciculatum	blue wildrye	S	1.6	0.0
Baccharis pilularis	coyote brush	S	1.6	0.1
Mimulus aurantiacus	sticky monkeyflower	S	1.6	0.0
Ceanothus cuneatus	buckbrush	S	0.0	0.0
Clarkia purpurea ssp. *quadrivulnera*	purple clarkia	GY	0.0	0.0
Eriodictyon californicum	yerba Santa	S	0.0	0.0
Eriogonum nudum	naked buckwheat	B	0.0	0.0
Eriophyllum confertiflorum	golden yarrow	B	0.0	0.0
Festuca occidentalis	western fescue	B	0.0	0.0
Festuca rubra	red fescue	E	0.0	0.0
Heteromeles arbutifolia	toyon	S	0.0	0.0
Lupinus nanus	sky lupine	GYE	0.0	0.0
Melica californica	California melic grass	B	0.0	0.0
Oenothera hookeri	evening primrose	GY	0.0	0.0
Poa secunda	one-sided bluegrass	B	0.0	0.0
Scrophularia californica	bee plant	B	0.0	0.0
Trifolium willdenovii	tomcat clover	RE	0.0	0.0

Table 5. Non-Native Species in Test Plots – Year 5			
SCIENTIFIC NAME	COMMON NAME	INVASIVE STATUS[1]	AVERAGE PERCENT COVER (ALL PLOTS)[2]
Bromus madritensis	foxtail brome	moderate	6.6
Vulpia myuros	rattail fescue	moderate	6.0
Bromus hordeaceus	soft chess	limited	5.3
Medicago polymorpha	bur clover	limited	5.0
Carduus pycnocephalus	Italian thistle	moderate	4.3
Bromus diandrus	ripgut brome	moderate	3.9
Lolium multiflorum	rye grass	moderate	1.3
Melilotus indicus	annual yellow sweetclover	--	1.0
Avena sp.	wild oats	moderate	0.8
Hirschfeldia incana	short podded mustard	moderate	0.6
Trifolium hirtum	rose clover	moderate	0.5
Centaurea solstitialis	yellow star thistle	high	0.3
Lactuca serriola	prickly lettuce	--	0.2
Dittrichia graveolens	stinkwort	moderate (ALERT)	0
Pseudognaphalium sp.	cudweed	--	0
Hordeum murinum	foxtail barley	moderate	0
Bromus tectorum	cheatgrass	high	0
Trifolium glomeratum	clustered clover	--	0
Cirsium vulgare	bull thistle	moderate	0
Foeniculum vulgare	fennel	high	0
Hypochaeris sp.	cat's ear	limited - moderate	0
Petrorhagia sp.	pink grass	--	0
Phalaris minor	little seed canary grass	--	0
Picris echioides	bristly ox-tongue	limited	0
Polygonum arenastrum	prostrate knotweed	--	0
Polypogon monspeliensis	rabbitsfoot grass	limited	0
Sonchus asper	spiny sow thistle	--	0
Sonchus oleraceus	common sow thistle	--	0
Taeniatherum caput-medusae	medusahead grass	high	0
Taraxacum sp.	dandelion	--	0

[1] Invasive status as listed in Cal-IPC 2014. High = Species with severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Moderate = Species with substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Limited = Invasive species but with ecological impacts that are minor on a statewide level or there was not enough information to justify a higher score; may be locally persistent and problematic.

[2] Species with zero percent cover were observed as present in the plots but did not appear within sampling quadrats.

In Year 1, the non-vegetative cover in the test plots was predominantly bare rock or straw mulch. In Year 2, non-vegetative cover was predominantly bare ground and thatch from the previous year's annual grasses. In Years 3, 4, and 5 the non-vegetative cover in plots was predominantly thatch from the previous growing season's annual grasses, indicating that plant cover has increased over time.

It should be noted that while mugwort (*Artemisia douglasiana*) was included in the shrub seed mix, it is not counted as shrub cover in this analysis, as it is a perennial herb that does not provide the same structure and habitat values of the shrubs targeted for establishment in reclamation areas. It should also be noted that the summary results shown in Figure 4 and Tables 4 and 5 include combined results for EMSA and Yeager Yard test plots, although conditions at the two sites varied greatly. However, evaluating only plots 1-12, which provide the most uniform set of conditions, does not affect averages shown in Figure 4 by more than a few percentage points and does not change the overall results discussed here.

Similar to the previous four years, shrub cover was low throughout the test plots in Year 5, with 7.25 percent average cover across all plots. However, shrub cover has been expanding across plots by about 1.5 percent on average over the years: shrub cover was less than 1 percent on average across plots in Year 1, 2.4 percent in Year 2, 4.2 percent in Year 3, and 5.5 percent in Year 4. In addition, several plots had notably higher percentages of shrub cover in Year 4 with Plots 11, 13, 5, and 16 supporting 11 to 19 percent cover of shrubs. In Year 5, Plots 6, 8, 9, and 10 had increased shrub cover ranging from 11-33 percent. Low, but expanding shrub cover is to be expected as it takes several years for the slow-growing shrubs to become well-established.

Shrubs were also generally considerably larger in the EMSA than at Yeager Yard, possibly due to the north-facing aspect, the mycorrhizal inoculant, or the significantly lower amounts of deer browse observed during monitoring (WRA 2011b). In Years 2 through 5, shrub size was significantly more robust and shrub quantities were far greater at plot edges adjacent to the straw bales that form the border of the plots. The straw bales clearly provide favorable conditions for the shrubs, but the reason they do so is not apparent. It could be related to increased soil moisture (the straw bale may act as a slow-release water reservoir), protection from wind, protection from herbivory, or increased nutrients that slowly leach out of the decomposing bales. See Appendix B for further analysis of shrub growth along straw bales in the test plots.

Despite the low total cover of shrubs in the preliminary revegetation stages, many plots supported high densities of shrub seedlings, particularly plots with less grass and non-native species cover. In Year 2, plots with the shallowest (6”) soil treatments supported greater cover of shrubs. In years 3 and 4, Plot 16, the plot with the deepest (24”) soil treatment, supported the greatest cover of shrubs (see photographs in Appendix A). Plot 16 exhibited 19 percent cover of shrubs in Year 4, increasing from 13 percent in the previous year. In Year 5, Plot 16 decreased from 19 to 14 percent cover. In contrast to the Year 4 data, Figures 4 and 5 from Year 5, show that plots with the shallowest (6”) soil treatments and no compost supported greater cover and density of shrubs.

The data from Years 2 to 4 show that for shrubs to become established in the test plots, shallower soils, with no or minimal compost amendments, favor hardier native species over highly competitive non-native annual grasses. Shallower soils hold less moisture which could favor shrub establishment over grasses, the latter of which require more water for sustained growth. Although it appears that, once established, shrubs seem to be growing and expanding more vigorously in plots with deeper soils, Year 5 data shows a change in this trend. In contrast to previous years, 2013 data suggests that the plots with shallower soil and no compost have greater native species richness and higher average percent cover for shrubs. This supports the concept that plots without compost and harsher soils deter the germination and establishment of non-native species

Similarly, Plot 1 contains the least productive soils (100 percent overburden rock with no soil amendments), but it had the highest shrub density of all the plots in Years 3, 4, and 5. Improved shrub germination and initial growth is most likely due to less competition from native herbaceous species and non-natives in the shallower soils with less nutrient and moisture-rich conditions. However, although native shrub stem densities are highest in Plot 1, shrubs in this plot are often smaller and less robust than shrubs growing in other plots. Although shallow soils favor shrub germination and give shrubs a more competitive edge in the test plots, the deeper soils in some plots have favored more robust shrub growth (and therefore expansion of cover of individual shrubs), comparatively.

Small fescue (*Vulpia microstachys*), a native annual grass species, and California buckwheat (*Eriogonum fasciculatum*), a native shrub, exhibited the highest presence in plots where they were seeded, indicating that these two species have been able to most readily establish from seed. California buckwheat has exhibited the highest cover of shrub species over the past five years of monitoring, closely followed by California sagebrush (*Artemisia californica*). Although black sage (*Salvia mellifera*) and coyote brush (*Baccharis pilularis*) averaged only 0.7 and 0.1 percent cover, respectively, in quadrats in Year 5, these shrubs have consistently exhibited strong cover at the edge of plots next to straw bales and straw wattles (see photos in Appendix A). Again, straw bales and wattles seem to provide conditions which have favored shrub establishment and growth in the test plots.

Small fescue has consistently exhibited the highest cover in plots across monitoring years as it produces large amounts of seed and is able to readily colonize bare soils in the test plots. Blue wildrye (*Elymus glaucus*), a native perennial grass species, also performed very well in Years 2 through 5, and it exhibited a higher cover than most seeded species in most plots. Higher cover of small fescue, blue wildrye, and highly competitive non-native grasses (e.g. rattail fescue and foxtail brome) in plots has correlated with lower shrub cover in those plots. It is well documented that grass species are able to outcompete and preclude the establishment of shrub species in certain conditions.

The fourteen native species listed at the bottom of Table 4 were not observed in Year 5, and the majority of these species also did not appear to germinate or survive in plots in Years 2 through 5. Some of these species may require additional pre-treatments to mimic natural conditions that stimulate germination. For some others, such as one-sided bluegrass (*Poa secunda*), there is no clear reason for the lack of germination, as they are known to perform well in similar conditions. There may have been issues with the seed source or age, local site conditions, or yearly climate variability which prevented germination. Chamise (*Adenostoma fasciculatum*) did not germinate at all in any of the monitoring years, but it is suited to the rocky conditions in the reclamation areas and is present in adjacent vegetated areas at Permanente Quarry. This species requires fire to germinate, and after seeding efforts were complete, the seed supplier informed WRA that no fire-mimicking treatment was applied to the seed prior to application in the test plots. However the supplier did note that they had experience with the seed germinating after several years of sitting idle in natural conditions after seeding. After five years of monitoring with no observation of chamise in the test plots, it appears unlikely that this species will germinate from the seed that was supplied.

In Year 5, overall native species richness increased significantly in plots 1, 2, 3, 4, 6, 11, 13, and 15. In plots 5, 7, 8, 9, 10, and 11, overall species richness decreased by an average of 3 percent while plots 15 and 16 saw no increase from Year 4 to Year 5. Additionally, richness increased by an average of 4 percent per plot from Year 4 richness values. In Years 4 and 5, plots were monitored at the height of the growing season when nearly all species growing in plots were readily identifiable and exhibiting their maximum growth and cover for the year. Comparing Years 4 and 5, richness also increased in eight plots, decreased in six plots, and remained the same in two plots. Species richness increased by an average of 6 percent across plots. Monitoring in Years 4 and 5 was performed at the same general time during the height of the growing season and therefore offers a more accurate comparison. Year 5 data show that native species richness has been increasing across plots from previous years and is on average 15 species per 2 square meters, which exceeds the richness value performance criteria for larger plot sizes listed in Table 1 above.

Although sampling plot sizes for the performance criteria listed in the Revegetation Plan are not directly comparable to the sampling plot sizes for the test plots (see footnote in Table 3 above), shrub and tree richness numbers appear to be lower than what might be necessary to meet the woody richness criterion listed in Table 1 above. As of Year 5, shrub richness is greatest in Plot 15, at 7.7, and lowest in Plot 10, at 0.6. Shrub richness averages 3.4 shrubs across all plots. Additionally, only one native tree species, grey pine (*Pinus sabiniana*), remained growing in the plots where planted. Although native species richness is high and meets the general richness criteria in all plots, woody species richness may need to increase to meet the performance criteria listed in Table 1. Increasing woody species diversity should be the focus of the final revegetation treatments selected for the Final Revegetation Plan.

Year 5 native species richness is consistent with Years 2, 3, and 4 in that it is still highest in plots with 6-inch soil treatments and no compost added. These soil conditions seem to be the best for the establishment of native plants, especially shrubs, over non-native species. In Year 4, Plot 1, with the shallowest soils and highest proportion of overburden rock (100%), exhibited the highest density of native shrubs, the highest species richness, and the lowest cover of exotic species in Year 4. Although Plot 1 also had the lowest percentage of vegetative cover, the harsher soils clearly favor shrub establishment and native cover, which are two of the performance criteria for revegetation efforts in the RPA. The data from Year 5 shows that although Plot 1 still maintains the highest species richness and lowest percent cover of exotic species, Plot 13 now has the highest density of native shrubs. A possible explanation for this is that, over time, shrubs might more readily establish themselves in soils that contain higher amounts of compost.

In Year 1, non-native species averaged between 2 and 12 percent cover in the test plots, and the unexpected germination of straw mulch (sterile wheat [*Triticum aestivum*]) provided a significant portion of that cover. In Year 2, non-native species increased due largely to invasion by non-native grasses (predominantly Italian rye [*Lolium multiflorum*]) and summer mustard. Non-native cover was lowest in Plot 1 (7 percent) and highest in Plot 12 (53 percent, dominated by Italian rye and annual yellow sweetclover [*Melilotus indicus*]). The highly invasive yellow star thistle was present in small quantities and was removed from the EMSA after the June monitoring was conducted. This species will be a target for control in future reclamation efforts.

In Year 3, non-native cover decreased in 11 plots, increased in five plots, and decreased by an average of 7 percent across all plots. This change in non-native cover was partially based on the use of ratios of cover of native annual grasses to non-native annual grasses, which served as a best estimate of annual grass cover in light of identification issues at the time of monitoring. In Year 4, non-native species cover increased from Year 3, but decreased by an average of 6 percent across plots from Year 2. Once again, comparing Years 2 and 4, which were both monitored at the height of the growing season, yields a more accurate analysis of change than comparing Years 3 and 4, as described above. In Year 5, non-native cover increased in 15 plots and decreased in one. Overall, the non-native cover increased by an average of 83 percent across all plots. This increase is likely a function of the establishment of the non-native, invasive plant species that disperse large quantities of seed.

In Year 2, summer mustard invaded all plots, but particularly the EMSA plots. In Year 2, summer mustard was removed from the Yeager Yard site and the treatment seemed to have reduced the prevalence of plants there. In Year 3, summer mustard was observed in most plots and was still very abundant at the EMSA site. Summer mustard was also present at higher densities in the eastern portion of the Yeager Yard site, in plots 5, 9, 10, and 16, but was only present in 54 percent (7 of 13) of Yeager Yard plots. Treatment of summer mustard in Year 2 seems to have reduced the prevalence of summer mustard in Year 3, but the species was still germinating at high levels in untreated areas. In Year 4 summer mustard was still prevalent at the EMSA site and was also observed in 100 percent (13 of 13) Yeager Yard plots, where it is spreading. In Year 4, Italian thistle was also a prevalent invasive weed and was observed in all test plots, with a more significant infestation noted at the Yeager Yard plots. In Year 5, summer mustard was present in all plots except Plot 1. Italian thistle was also abundant in all Plots.

3.2 Container Plants

Tables 6 through 8 present a summary of container plant survival based on species, plant care, treatment, and soil treatment, respectively. All but seven container plantings had died by the time of the September 2010 monitoring visit, and only four plants survived through the 2011 Year 3 monitoring visit. The surviving plantings were four relatively healthy grey pines. By the time of the June 2012 Year 4 monitoring visit, three grey pine saplings remained. By Year 5, all but one grey pine had died. As a result of the low survivorship numbers, little valuable data on long term container plant survival can be obtained from the Years 2 through 5 monitoring results. However, monitoring conducted during this period can provide some information on potential species hardiness and the effectiveness of plant care treatments during the establishment period, as discussed below.

Mulch significantly improved plant survival in the first seven months compared to plantings without mulch. DriWater irrigation did not have a clearly beneficial impact on plant survival, and in June 2010 the plantings with no DriWater or mulch survived at a higher rate than those with DriWater. Plantings with both mulch and DriWater had the highest survival rate in June, so it is possible that the mulch improved the effectiveness of DriWater by preventing loss of the additional soil moisture. The effectiveness of DriWater irrigation could have been improved by installing the tubes at a more horizontal angle, to allow moisture coming from the base of the tube to reach areas closer to the soil surface for the smaller plant container sizes. In addition, more tubes could have been used for each plant, and Gel Pacs could have been replaced more frequently. The 90-day product performed as advertised, with moisture or leftover gel found at the base of all the tubes when they were checked in September 2010, three months after replenishment. The installation design in the test plots was selected to mimic the more conservative plant care treatments that would likely be necessary on a large scale revegetation effort.

Multiple factors appeared to contribute to the poor survivorship rates of the container plantings. Container sizes selected were mostly small treebands, selected due to the expected high volume and cost of planting the reclamation areas. However, many specimens were also very small for their container sizes, so they may not have obtained a deep and well-established root system in the nurseries. Some of the smallest plants had become buried in mulch, particularly the scrub oak (*Quercus berberidifolia*) and blue oak (*Quercus douglasii*) seedlings. Coast live oak (*Quercus agrifolia*) was installed in larger "treepots", and although plantings showed a relatively high survival rate in June, all died by September 2010.

Table 6. Tree and Shrub Container Plant Survival by Species

SCIENTIFIC NAME	COMMON NAME	CONTAINER SIZE	TOTAL					
			Planted	Alive	Alive	Alive	Alive	Alive
			Nov. 2009	June 2010	Sept. 2010	Nov. 2011	June 2012	June 2013
Pinus sabiniana	grey pine	TB	19	18 (95%)	6 (32%)	4 (21%)	3 (16%)	1
Quercus agrifolia	coast live oak	TP	19	14 (74%)	0	0	0	0
Cercocarpus betuloides	mountain mahogany	TB	19	13 (68%)	1 (5%)	0	0	0
Heteromeles arbutifolia	toyon	1G	19	8 (42%)	0	0	0	0
Arbutus menziesii	Pacific madrone	DP	19	6 (32%)	0	0	0	0
Quercus berberidifolia	scrub oak	TB	19	6 (32%)	0	0	0	0
Ribes californicum	hillside gooseberry	TB	19	6 (32%)	0	0	0	0
Quercus douglasii	blue oak	LT6 (2-LT4)	19	5 (26%)	0	0	0	0
Frangula californica	coffeeberry	TB	19	4 (21%)	0	0	0	0
		TOTAL	171	80 (47%)	7 (4%)	4 (2%)	3 (1.7%)	0%

Table 7. Tree and Shrub Container Plant Survival by Plant Care Treatment

PLANT CARE TREATMENT	PLANTED NOV. 2009	ALIVE JUNE 2010	ALIVE SEPT. 2010	ALIVE NOV. 2011	ALIVE JUNE 2012	ALIVE JUNE 2013
Mulch and DriWater	36	24 (67%)	2 (6%)	1 (3%)	1 (3%)	0
Mulch only	45	23 (51%)	2 (4%)	1 (2%)	1 (2%)	0
DriWater only	45	13 (29%)	2 (4%)	1 (2%)	0 (0%)	0
No treatment	45	20 (44%)	1 (2%)	1 (2%)	1 (2%)	0

Table 8. Tree and Shrub Container Plant Survival by Soil Treatment

PLOT	SOIL TREATMENT	PLANTED NOV. 2009	ALIVE JUNE 2010	ALIVE SEPT. 2010	ALIVE NOV. 2011	ALIVE JUNE 2010	ALIVE JUNE 2013
Plot 11	75% Pit 1 fine greenstone, 25% compost	72	30 (42%)	4 (6%)	3 (4%)	2 (2%)	0
Plot 12	25% overburden rock, 25% compost, 25% Pit 1 fine greenstone, 25% Rock Plant fines	72	38 (53%)	2 (3%)	0 (0%)	0 (0%)	0 0
Plot 16	37.5% overburden rock, 37.5% Pit 1 fine greenstone, 25% compost	27	12 (44%)	1 (4%)	1 (4%)	1(4%)	0

Another factor impacting the plantings was wildlife (WRA 2011b). Evidence of extensive deer impacts was observed throughout the Yeager Yard test plots, and deer bedded in the denser grasses of the deeper plots. The tops of most toyon (*Heteromeles arbutifolia*) and coffeeberry (*Frangula californica*) had been chewed off by deer. Evidence of mouse activity was also significant in plots 11 and 12. In June 2010, the main stems of most of the hillside gooseberry (*Ribes californicum*) and many blue oak and mountain mahogany (*Cercocarpus betuloides*) had bark chewed off or were completely chewed through. Mice had also tunneled around many plantings and DriWater tubes by this time, and in September 2010 approximately half of the DriWater tubes had large holes chewed out of them. Mice, one live and one dead, were found inside the tubes in September; it was not clear if they had consumed some of the DriWater gel or just used the empty tubes for shelter.

Finally, the planting medium of the test plots consisted of a combination of quarry materials and compost, rather than soil. The test plot soil treatments were found to be difficult to plant in, and once soils dried out in the summer after planting, the surface layer was hard. Finer materials like the Pit 1 Fine Greenstone and Rock Plant Fines are likely to have created this dense texture, whereas larger-textured overburden rock and moisture-retaining compost help to allow air and water movement.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Seeds and Soil Treatments

Year 5 test plot monitoring indicates that native shrubs and herbaceous species can be established by seed on all of the various combinations of compost and quarry materials tested. The target composition of reclaimed areas in the Revegetation Plan is a dominant canopy of shrubs and trees (WRA 2011a). Grasses and herbaceous species are also desirable for early establishment to aid in erosion control, compete with non-native plants, and increase native diversity. However, test plot results in Years 1, 2, 3, 4, and 5 have shown that establishing a dense cover of grasses may impede germination or survival of shrubs, the target community to be created over the longer term over much of the quarry. While Plot 1, with bare overburden rock, has the lowest total vegetative cover, it also has high cover of native shrubs and the highest density of shrubs of all plots, possibly due to the lack of competition from grasses and non-native species (see photograph in Appendix A). Other plots with the highest cover of shrubs initially included the shallowest (6 inches) soil treatments (Year 2) and EMSA plots (which had less deer browsing, north-facing slopes, and mycorrhizal inoculant treatments). In Years 3, 4, and 5, however, plots with the deepest (24 inches) soil treatments showed the highest cover of shrubs, indicating that once shrubs have been established, deeper soils may provide better growing conditions.

Year 2 test plot results verified assumptions made in development of the Revegetation Plan, such as that shallower soils without compost are suitable for establishing drought-tolerant native shrubs, and deeper soils and compost result in higher cover of grass and non-native species. However, Years 3, 4, and 5 monitoring results suggest that once shrubs have been established in the plots, deeper soils (Plot 16) possibly provide more nutrients and a better substrate for native shrubs to grow and compete with other species. Similar to monitoring results from previous years, Year 5 monitoring results show that shrubs performed well in plots with both 6-inch and 24-inch soil depths with a slightly greater average percent cover in the plots with 6-inch deep soils.

The Revegetation Plan currently specifies slopes to be prepared with a 6-inch blend of 50 percent native topsoil and 25 percent overburden rock. This blend could be ideal for the initial establishment of native shrubs and exclusion of exotic species (as shown by Plot 1 results), and final test plot results from Year 5 will show if this is the ideal blend for continued shrub survival or if deeper soils with more compost, rock plant fines, or fine greenstones will better promote more long-term shrub establishment.

As suggested following Year 1 and 2 monitoring, small fescue performs well as a rapidly-established erosion control species. However, it and other highly competitive species, both native and non-native, may outcompete and prevent the establishment of shrubs and other desirable native species. Since shrub cover is the dominant community targeted in the Revegetation Plan for the RPA at Permanente Quarry, small fescue may be an undesirable seed mix component for promoting long-term shrub diversity, at least in such high numbers in the seed mix. However, small fescue does appear to be a good species for erosion control as it will rapidly colonize disturbed soils. Other native grasses, including blue wild rye and California brome (*Bromus carinatus*) have also performed well in many plots over the first four years of monitoring, particularly on the north-facing slopes of the EMSA. These grasses should be included in reclamation efforts to provide erosion control, but not at densities that would prevent desired shrub seed germination.

The recommended seed mix for reclamation as described in the Revegetation Plan (WRA 2011a) was developed based on results from Year 1 test plot monitoring, and no additional changes were recommended after initial years of monitoring. However, establishing a greater diversity of shrubs per plot to meet woody species richness performance criteria should be considered after woody richness results have consistently been low over the five Years of monitoring. Chamise would still be a highly desirable species to add to the seed mix, but only if a fire-replicating seed treatment is found to improve germination rates. However, this species may be able to establish in reclaimed areas naturally due to its abundance in adjacent vegetated areas.

The Permanente Quarry erosion control mix currently used, which was tested in one quadrant of Plot 14, is also included in the Revegetation Plan as a potential preliminary step in reclamation.

As observed in the test plots in Years 1 and 2, the high density of grass seed results in rapid establishment of native cover. Native shrub cover increased significantly in Plot 14 in Years 3, 4, and 5 as shrubs became more established and were able to compete with grasses and forbs. Although native cover decreased overall in Years 3, 4, and 5 compared to Year 2, the cover of native shrub species has increased significantly following initial establishment in Years 1 and 2. As mentioned above, shrubs growing in all of three of the EMSA plots, including Plot 14, are very robust and healthy compared with shrubs in the Yeager Yard. It appears that after initial establishment of erosion control grass species, both shrubs and non-native herbs (e.g. summer mustard) have been able to establish. Native shrub cover continued to increase again in Year 5. This continued increase suggests that the performance criteria of the long term Revegetation Plan are being met and that the erosion control mix in Plot 14 was successful at establishing initial dense native cover for the purpose of erosion control leading to an eventual native-shrub dominated community.

While the erosion control seed mix is still recommended for temporarily disturbed areas where erosion control is needed, the revegetation seed mix described in the Revegetation Plan is recommended for larger reclamation areas because it includes a lower density of grasses per acre.

The majority of test plots are meeting all three performance criteria set forth in the Revegetation Plan (Table 3). Although the species richness numbers are not directly comparable (see Table 3 footnote), they indicate that test plot conditions should meet the species richness revegetation performance criteria for overall native cover. However, woody native richness is low in most plots, and the majority of plots would not meet woody richness performance criteria listed in Table 1 above and the Revegetation Plan.

After five years of monitoring, shallower soils and lower amounts of compost seem to provide ideal conditions for establishing native species, especially shrubs, which can better compete with non-native plants in these growing conditions. In addition, it has become evident after five years of monitoring that the straw bales at the edges of the test plots are supporting robust and sustained shrub growth and survival. Therefore, WRA recommends randomly scattering straw bales throughout reclamation areas to similarly promote successful shrub growth and survival as part of the Final Revegetation Plan.

Years 3, 4, and 5 data show that once shrubs are established, however, they seem to prefer the growing conditions provided by deeper soils (Plot 16). High levels of compost in soils seem to still be preventing shrub establishment in Year 5.

4.2 Container Plants

Container plantings were largely a failure, possibly due to the dry and exposed conditions of the Yeager Yard and lack of natural topsoil combined with heavy damage from mice and deer. On the larger scale of Quarry reclamation, wildlife impacts should not have such a significant impact, but protective cages around toyon and coffeeberry may be necessary as these were observed to be most susceptible to deer browse, both in the test plots and at many other restoration sites monitored by WRA. The majority of container plantings are proposed for benches on north and east facing slopes that will supply more moisture and likely benefit container plant establishment. Furthermore, given the noted success and large growth of shrubs adjacent to straw bales, using scattered straw bales adjacent to some container plantings may provide enhanced survival rates.

Mulching around container plantings may be the most feasible protective treatment to improve survival rates. The test plots do confirm that grey pine, which is a dominant component of the

Revegetation Plan, is a hardy tree species that may have the best chance of survival of the species selected. The Revegetation Plan also suggests acorn planting for oak plantings. WRA recommends this method of establishing oaks because it can result in better-established trees that are naturally selected for the local conditions.

Larger container sizes may also be desirable for reclamation efforts, but the plantings should still be installed as young (generally 1-2 year old) plants in narrow, deep containers, and they should be hardened off prior to installation. The emphasis in growing trees and shrubs for the Quarry should be to obtain plants with deep root systems that are not dependent on protective nursery conditions.

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APPENDIX A

MONITORING PHOTOGRAPHS

Above: Year 5 shrub cover in Plot 16, yellow quadrant.

Below: Year 5 shrub cover in Plot 16, blue quadrant

Photographs taken June 6, 2013.

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Above: In Year 5, shrubs exhibit robust growth when adjacent to straw bales which may provide additional moisture, shade, or wind protection.

Below: Robust shrub cover adjacent to straw bales also depicted here.

Photographs taken June 6, 2013.

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Above: Shrubs are more robust and developed at the EMSA site compared to the Yeager Yard site.

Below: Another example of the robust shrub growth at the EMSA site. At the EMSA site, robust shrubs are found throughout the Plot and not just along the wattles and hay bales.

Photographs taken June 6, 2013.

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Above: In Year 4, Plot 1 with 6" soils composed of 100 percent overburden rock exhibits the lowest total vegetation cover, but also the lowest cover of exotics, and the highest density of shrub stems per acre.

Below: In Year 5, Plot 1 vegetation cover and shrub growth had not shown much improvement since Year 4.

Above Photograph taken June 8, 2012.
Below Photograph taken June 6, 2013.

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APPENDIX B

SHRUB DENSITY COMPARISON BETWEEN STRAW BALES AND CENTER-PLOTS

1.0 INTRODUCTION

As part of the design of the Revegetation Test Plot Program (WRA 2010), straw bales were used to delineate the outer boundary of each plot. WRA, Inc. (WRA) biologists observed that shrub growth, particularly that of coyote brush (*Baccharis pilularis*), appeared denser and more robust in close proximity to the straw bales. Though this effect was unintended, WRA decided to take advantage of the situation and sample shrub vegetation along the straw bales. The purpose of this smaller study was to determine whether the placement of straw bales is a useful treatment for future revegetation needs at the Permanente Quarry (Quarry).

2.0 METHODS

On September 10, 2013, WRA biologists used 0.5 square-meter quadrats to sample stem density of shrubs along the straw bales. Each quadrat was randomly placed along the edges of the straw bales, and the number of stems of each woody species was counted within the quadrats. A total of eight sample points were used for each plot. In the Yeager Yard area of the Quarry, which has 13 plots, 104 sample points were used. In the East Materials Storage Area (EMSA) part of the Quarry, which has three plots, 24 sample points were used.

The shrub density, measured as the average number of stems per acre, along the straw bales was compared with the shrub density of the overall plot, which was determined from the annual vegetation monitoring. Comparisons were made between the Yeager Yard plots, the East Material Storage Area (EMSA) plots, and all plots combined.

Although cover was not measured directly, a qualitative observation was made to compare cover along the straw bales and the center-plot vegetative cover.

It should be noted that while mugwort (*Artemisia douglasiana*) was included in the shrub seed mix, it is not included in shrub cover in this analysis. It is a perennial herb that does not provide the same structure and habitat values of the shrubs targeted for establishment in reclamation areas.

3.0 RESULTS

Yeager Yard

The stem density measured 11,363 stems per acre over the 104 straw bale quadrats with a range of 0 to 16 per quadrat. The stem density measured 18,056 stems per acre over the 104 center-plot quadrats with a range of 0 to 14 per quadrat. Stem density along the straw bales was approximately 37 percent lower than in the center-plot quadrats.

Although overall stem density over was lower along the straw bales, the stem density of coyote brush and black sage (*Salvia mellifera*) increased; the stem density of California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), and sticky monkeyflower (*Mimulus aurantiacus*) decreased; and the stem density of the remaining species was unchanged with zero stems per acre.

Shrub cover along the straw bales was greater than shrub cover in the center of the plots. Generally, the shrubs along the straw bales were larger and had denser foliage, covering much more area per plant than those in the center of the plots.

The sampling results in the Yeager Yard are summarized in Table 1 and Figure 1.

Table 1. Summary of Stem-Density Sampling Efforts in the Yeager Yard Plots.

YEAGER	**Total Number of Stems**		**Average Number of Stems Per Plot**		**Average Stems Per Acre**	
	Center-Plot	**Straw Bales**	**Center-Plot**	**Straw Bales**	**Center-Plot**	**Straw Bales**
Adenostoma fasciculatum	0	0	0.00	0.00	0	0
Artemisia californica	62	21	4.77	1.62	9650	3269
Baccharis pilularis	2	14	0.15	1.08	311	2179
Ceanothus cuneatus	0	0	0.00	0.00	0	0
Eriodictyon californicum	0	0	0.00	0.00	0	0
Eriogonum fasciculatum	38	21	2.92	1.62	5915	3269
Eriophyllum confertiflorum	0	0	0.00	0.00	0	0
Heteromeles arbutifolia	0	0	0.00	0.00	0	0
Mimulus aurantiacus	3	1	0.23	0.08	467	156
Salvia mellifera	11	16	0.85	1.23	1712	2490
Total					18056	11363

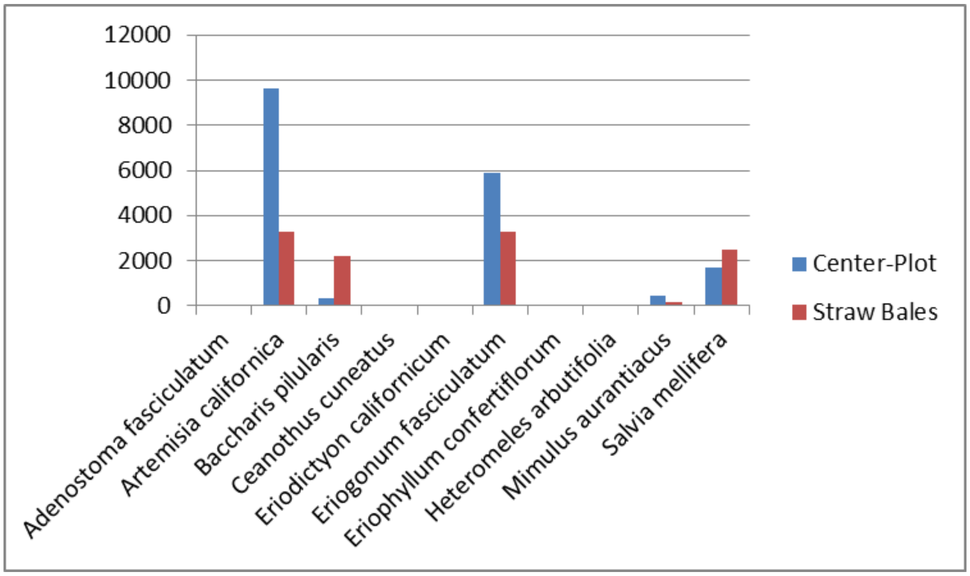

Figure 1. Bar graph depicting stem density sampling results by species in the Yeager Yard plots.

EMSA

The stem density measured 12,815 stems per acre over the 24 straw bale quadrats with a range of 0 to 9 per quadrat. The stem density measured 11,466 stems per acre over the 24 center-plot quadrats with a range of 0 to 8 per quadrat. Total shrub density was approximately 12 percent greater along the straw bales than it was in the center-plot quadrats.

Along the straw bales, the stem density of California buckwheat, coyote brush, and black sage increased; the stem density of California sagebrush decreased; and the stem density of the remaining species was unchanged at zero stems per acre.

Shrub cover along the straw bales did not appear to differ greatly from the cover in the center of the plot. Shrub size and foliage density was also similar between the two areas.

The sampling results in the EMSA are summarized in Table 2 and Figure 2.

Overall

The stem density measured 11,635 stems per acre over the 128 straw bale quadrats with a range of 0 to 16 per quadrat. The stem density measured 16,820 stems per acre over the 128 center-plot quadrats with a range of 0 to 14 per quadrat. Total shrub density was approximately 31 percent less along the straw bales than it was in the center-plot quadrats. The much smaller number of plots in the EMSA (three plots) than in the Yeager Yard (13 plots) results in the overall data being heavily influenced by the Yeager Yard data.

Along the straw bales, the stem density of coyote brush and black sage increased; the stem density of California sagebrush, California buckwheat, and sticky monkeyflower decreased; and the stem density of the remaining species was unchanged with zero stems per acre.

There was no overall trend in shrub cover, size, or density of foliage. As discussed in the previous two sections, the shrub cover, size, and foliage density in the Yeager Yard was greater along the straw bales than in the center-plot quadrats. In the EMSA, it was similar along the straw bales and in the center-plot quadrats.

The overall sampling results are summarized in Table 3 and Figure 3.

Table 2. Summary of Stem-Density Sampling Efforts in the EMSA Plots.

EMSA	**Total Number of Stems**		**Average Number of Stems Per Plot**		**Average Stems Per Acre**	
	Center-Plot	**Straw Bales**	**Center-Plot**	**Straw Bales**	**Center-Plot**	**Straw Bales**
Adenostoma fasciculatum	0	0	0.00	0.00	0	0
Artemisia californica	3	1	1.00	0.33	2023	674
Baccharis pilularis	0	1	0.00	0.33	0	674
Ceanothus cuneatus	0	0	0.00	0.00	0	0
Eriodictyon californicum	0	0	0.00	0.00	0	0
Eriogonum fasciculatum	14	16	4.67	5.33	9443	10792
Eriophyllum confertiflorum	0	0	0.00	0.00	0	0
Heteromeles arbutifolia	0	0	0.00	0.00	0	0
Mimulus aurantiacus	0	0	0.00	0.00	0	0
Salvia mellifera	0	1	0.00	0.33	0	674
Total					11466	12815

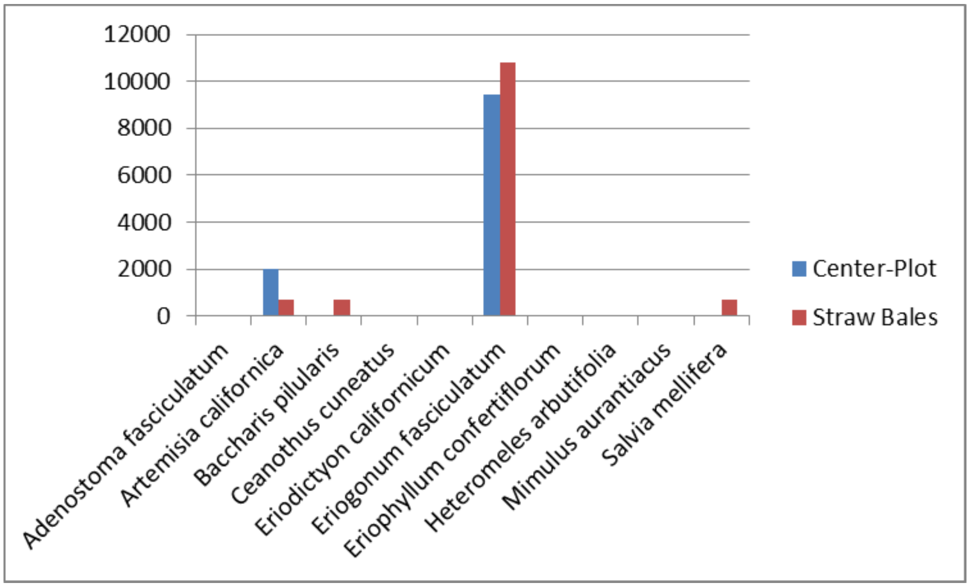

Figure 2. Bar graph depicting stem density sampling results by species in the EMSA plots.

Table 3. Summary of stem-density sampling efforts in all plots.

ALL PLOTS	**Total Number of Stems**		**Average Number of Stems Per Plot**		**Average Stems Per Acre**	
	Center-Plot	**Straw Bales**	**Center-Plot**	**Straw Bales**	**Center-Plot**	**Straw Bales**
Adenostoma fasciculatum	0	0	0.0	0.0	0	0
Artemisia californica	65	22	4.1	1.4	8220	2782
Baccharis pilularis	2	15	0.1	0.9	253	1897
Ceanothus cuneatus	0	0	0.0	0.0	0	0
Eriodictyon californicum	0	0	0.0	0.0	0	0
Eriogonum fasciculatum	52	37	3.3	2.3	6576	4679
Eriophyllum confertiflorum	0	0	0.0	0.0	0	0
Heteromeles arbutifolia	0	0	0.0	0.0	0	0
Mimulus aurantiacus	3	1	0.2	0.1	379	126
Salvia mellifera	11	17	0.7	1.1	1391	2150
Total					16820	11635

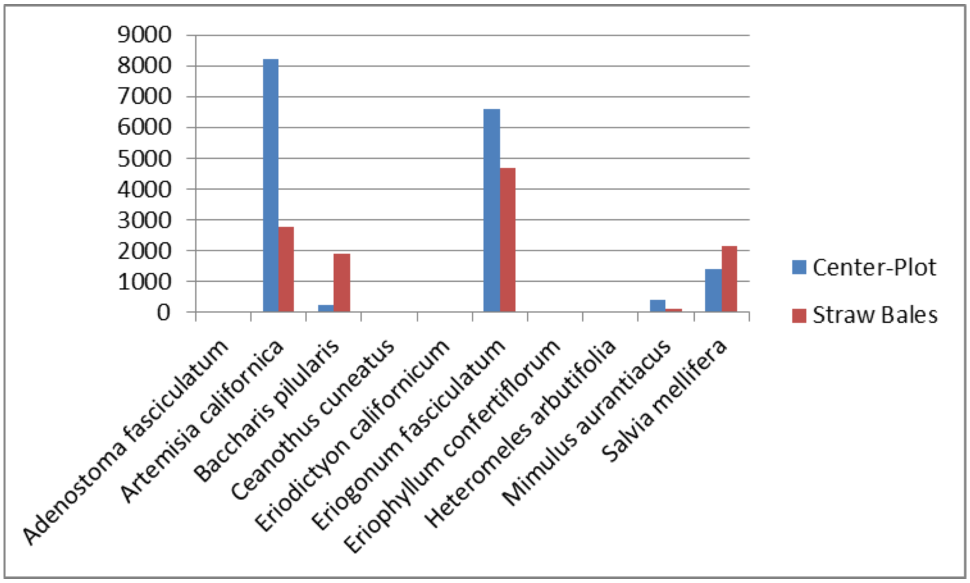

Figure 3. Bar graph depicting stem density sampling results by species in all plots.

4.0 CONCLUSION

Based on stem density and a qualitative, visual assessment of cover, it appears that the cooler, north-facing slopes in the EMSA lead to more favorable conditions for plant growth than the flat topography of Yeager Yard. Straw bales appear to have minimal influence on plant growth on north-facing slopes and may not be useful for revegetation in such conditions. However, the straw bales do appear to promote plant growth on flat sites which are hotter and receive more sunlight than north-facing slopes. The straw bales may provide thermal protection and increased moisture on harsher sites, and as such, could prove useful in revegetation efforts on flat ground or south-facing slopes.

For sites on north-facing slopes, California sagebrush and California buckwheat appear to be the best choices for revegetation efforts, regardless of the presence of straw bales. Coyote brush and black sage may also be good choices.

For harsher sites with straw bales, coyote brush appears to be the best choice. It is a fast-growing, tall, native shrub that provides cover, and its roots may provide protection from erosion by stabilizing the slopes it grows on. If coyote brush continues to respond to the presence of straw bales on other harsh sites, then the placement of straw bales could increase the likelihood of meeting performance criteria in such areas.

Many of the revegetation areas in the Quarry are steep, often at the angle of repose, and consist of loose substrate. Such conditions were not present at the Yeager Yard or the EMSA plots. Further experiments are recommended to see if the findings of this study can be applied to other situations in the Quarry.

5.0 REFERENCES

WRA, Inc. 2010. Revegetation Test Plot Program As-Built Report. Permanente Quarry, Cupertino, Santa Clara County, California. Prepared for Lehigh Southwest Cement Company. March.

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APPENDIX O:

FINANCIAL ASSURANCE COST ESTIMATE TRANSMITTAL

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EnviroMINE Inc.
Environmental and Mine Permitting Services

August 29, 2014

Ms. Marina Rush
Planner III
County of Santa Clara
Department of Planning and Development
Planning Office
70 West Hedding Street
San Jose, CA 95110

RE: Updated Financial Assurance Cost Estimate (FACE) for the Hanson Permanente Quarry State Mine ID# 91-43-0004

Please see the enclosed updated Financial Assurance Cost Estimate for the Permanente Quarry. The costs and information used to update the FACE represent the most up to date and best available information for the site. Costs have been updated according to updated Caltrans rates, prevailing wages and third party quotes. Current site conditions and updated topographical information was also used in updating the FACE to provide a snap-shot of the current reclamation costs.

Please review the updated FACE and forward a copy of the estimate to the Department of Conservation for a 45 day review. Their address is:

Department of Conservation
Office of Mine Reclamation
801 K Street
Sacramento, CA 95814

Also, please copy us on all responses to the estimate so we can ensure that Lehigh Hanson's reclamation bond for this site is modified as necessary. Lehigh Hanson will need an approval letter from Santa Clara County in order to modify the bond for the site.

Please do not hesitate to contact us if you have any questions.

Sincerely,
EnviroMINE,Inc.

Damien Galford

Damien L. Galford, Project Manager

cc: Greg Knapp, Lehigh Hanson, 12667 Alcosta Boulevard Floor 4 Room 400, San Ramon, CA 94583

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APPENDIX P:

FEASIBILITY OF WATER TREATMENT FOR DISCHARGES FROM THE PERMANENTE QUARRY CONTAINING SELENIUM

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Feasibility of Water Treatment for Discharges From The Permanente Quarry Containing Selenium

This report provides information on the feasibility of constructing a water treatment system at the Permanente Quarry with respect to the Quarry Pit, West Materials Storage Area, and East Materials Storage Area. Lehigh Southwest Cement Company ("Lehigh") is submitting this information at the request of the Planning Department and in connection with the Planning Commission's review of the Quarry pursuant to Condition 82 of the County's June 26, 2012 Reclamation Plan Approval.

Background

The Permanente Quarry is a limestone and aggregate mining operation in the unincorporated foothills of western Santa Clara County, approximately two miles west of the City of Cupertino. The Quarry occupies a portion of a 3,510-acre property owned by Hanson Permanente Cement, Inc., and is operated by Lehigh Southwest Cement Company (collectively, "Lehigh"). Mining operations commenced at the Quarry in 1903.

The Quarry includes approximately 614 acres of existing and future operational areas. These areas consist of mining excavations, overburden stockpiling, crushing and processing facilities, exploration areas, access roads, administrative offices and equipment storage. The Quarry also contains undisturbed areas that are either held in reserve for future mining, or which buffer Lehigh's mining operations from adjacent land uses. Permanente Creek is a seasonal stream that runs through the Quarry in a northeasterly direction before emptying into the San Francisco Bay. Most runoff from Quarry operations enters Permanente Creek.

Lehigh excavates limestone and other rock types from the Quarry, which are processed into cement and aggregate products. Limestone is extracted from a single excavation area, the Quarry pit, which has elevations ranging from 750 to 1,750 feet above mean sea level (amsl). The pit also produces other rock types (including greenstone, metabasalts, and graywacke) that are not suitable for producing cement or aggregates, known as "overburden." Overburden is placed in permanent storage in the West Materials Storage Area ("WMSA"), which is located immediately west of the pit, or the East Materials Storage Area ("EMSA") which is located farther to the east.

Mining operations are subject to California's Surface Mining and Reclamation Act ("SMARA") and the County's surface mining ordinance. Both SMARA and County ordinances state that mining operations must have an approved reclamation plan which describes how mined lands will be prepared for post-mining use. The County serves as lead agency under SMARA. In March 1985, the County first approved a Reclamation Plan for the Quarry. In June 2012, the County approved an amended Reclamation Plan, as described in more detail below.

Reclamation Strategy for Selenium

Selenium is a naturally-occurring metal. It is an important nutrient for mammals and other species, but can have toxic effects if ingested at high doses. At the Quarry, selenium is contained within the limestone that is quarried to produce cement and aggregate. When limestone is quarried, selenium can become exposed to atmospheric levels of oxygen (compared to the low levels of oxygen in groundwater). This causes the selenium to become oxidized to a soluble selenite form (Se 6+) that may become dissolved in the storm runoff.

Selenium concentrations in Permanente Creek have been recorded at levels above the applicable water-quality standards. The San Francisco Bay Regional Water Quality Control Board has established chronic and acute limits of 5 and 20 parts per billion (μg/L), respectively. Dissolved selenium concentrations in the creek have been found between 13 μg/L and 81 μg/L. These conditions have not had an apparent effect on fish or benthic organisms in the creek, based on biological studies and laboratory testing using fathead minnows (*Pimephales Promelas*). (WRA, 2010.)

Selenium was studied in detail in connection with the 2012 Reclamation Plan amendment. The proposed amendment contained detailed information on selenium in surface water, groundwater and quarried rock. This included the results of surface water and groundwater (i.e., monitoring well) testing in and around Permanente Creek. It also included the results of field and laboratory testing to determine the amount of selenium in the various rock types at the Quarry, the leachable percentage of selenium in rock, and the capacity of the rock to release selenium when exposed to oxygen and water.

The proposed Reclamation Plan amendment also included reclamation strategies to reduce or eliminate selenium in the Quarry's discharges. For decades, regulatory agencies have focused on preventing stormwater pollution by eliminating contact between runoff and source materials. This "source control" approach, which prevents pollutants from mobilizing into water in the first place, is generally favored over water treatment facilities. This approach is the fundamental Reclamation Plan strategy for closure of most areas in the Quarry, including the EMSA.

The reclamation strategy for the Quarry pit was backfilling, to a minimum elevation of 990 feet amsl, using onsite material from the WMSA. The final backfilled surface would be covered with a layer of non-limestone material and a vegetation growth layer, to isolate runoff from any limestone in the backfill. In addition, organic matter (i.e., green waste) would be mixed in the backfill material to create anaerobic, non-oxygenated conditions that prevent the generation of selenium. Using these techniques, the Reclamation Plan amendment projected that selenium concentrations in pit discharges would fall to between 2-4 μg/L, which meets the applicable water-quality standards.

The reclamation approach to the EMSA and WMSA emphasized the concept of source control to minimize the exposure of limestone rock to oxygen and water. The Reclamation Plan amendment proposed to cover both the EMSA and WMSA at the time of final reclamation with a layer of non-limestone material, followed by a second layer of revegetation growth media. This would isolate stormwater runoff in the EMSA and WMSA from any limestone rock within the overburden. The cover-and-isolation strategy would function to prevent a release or entrainment of selenium in runoff. The amended Reclamation Plan projected that these reclamation actions would reduce the concentrations of selenium in EMSA and WMSA runoff to levels which meet the current water-quality standards.

2012 Feasibility Study

The Planning Department reviewed the proposed Reclamation Plan amendment with assistance from independent, third-party consultants. The consultants agreed that the reclamation strategies in the amendment were sound, and would effectively reduce selenium in the Quarry's discharges to concentrations meeting the applicable water-quality standards. These conclusions were stated in a draft environmental impact report ("DEIR") in December 2011. The DEIR noted, however, that because final reclamation was not scheduled to begin until 2015 in the EMSA, and 2025 in other areas, there was a possibility that "interim" selenium impacts could occur as reclamation work was occurring but before reclamation was completed.

To address the potential interim impact, the DEIR considered whether technologies were available to reduce selenium in runoff to levels below the current standard of 5 µg/l. The DEIR concluded that a treatment system was not feasible, based on the anticipated high cost of installing and operating such a system. Before preparing the final environmental impact report ("FEIR"), however, the Planning Department retained another independent consultant, CH2M Hill, to study whether a treatment system was feasible.

In April 2012, CH2M Hill prepared a "Feasibility Assessment" which evaluated the engineering and cost considerations for a fluidized bed reactor ("FBR") system that was capable of achieving the current 5 µg/l selenium standard. CH2M Hill concluded that the technical feasibility of such a system was uncertain, without further study, because of varying runoff rates and other site-specific factors. CH2M Hill also projected installation and operating costs of approximately $165 million (excluding additional costs for "technology confirmation," or pilot testing, which CH2M Hill had recommended).

On June 26, 2012, the Board of Supervisors approved the amended Reclamation Plan, and certified the FEIR. With respect to water treatment, the Board expressly found that "a mitigation measure requiring the installation and operation of a treatment facility to treat selenium runoff during reclamation activities is not feasible, at this time" based on technological and economic factors. The Board did, however, impose conditions of approval that required Lehigh to perform further study of whether a water treatment facility was feasible for interim selenium discharges in advance of final reclamation.

Conditions of Approval

The June 2012 Conditions of Approval included four specific conditions (Nos. 79, 80, 81, 82) that addressed the possibility of interim selenium impacts. In general, these required numerous "best management practices" for selenium control; ongoing sampling and testing for selenium; and further study of a treatment facility through a pilot system. The conditions also required the Planning Commission to consider whether a treatment system was warranted in the event that interim discharge requirements were not met.

Condition 79 provides:

> 79. **Interim Stormwater Monitoring Plan**:
>
> Prior to the start of reclamation activities, the Mine Operator shall develop a Stormwater Monitoring Plan for sampling and testing stormwater, that would supplement preexisting surface water monitoring required by General Industrial Storm Water and Sand and Gravel NPDES Permit and any other applicable permits designed to specifically monitor surface water during reclamation activities in active and inactive excavation and backfill areas, and locations where water discharges to Permanente Creek. The purpose of this plan is to evaluate performance of temporary BMPs and completed reclamation phases and to identify areas that are sources of selenium (measured on recoverable basis), sediment, or high TDS. At a minimum, the plan shall require the Mine Operator to inspect BMPs and collect water samples for analysis of TDS and metals, including selenium, within 24 hours after a qualifying rain event and sample non-stormwater discharges when they occur. If elevated selenium, sediment, or TDS is identified through sample analysis, the Mine Operator shall identify the source and apply any new or modified standard BMPs available. BMPs that show sign of failure or inadequate performance shall be repaired or replaced with a more suitable alternative. Following implementation, the Mine Operator shall retest surface water to determine the effectiveness of such modifications, and determine whether additional BMPs are necessary. *(Implements Mitigation Measures 4.4-5 and 4.10-2b)*
>
> For Phase I, submit the Stormwater Monitoring Plan for Phase I to the Planning Manager for review and approval prior to October 1, 2012. For Phase II and III, submit a Monitoring Plan to the Planning Manager for review and approval sixty (60) days prior to the start of Phase II. Stormwater testing results shall be submitted to Planning Manager on a monthly basis between October 15 and

April 15 of each year. If a qualifying rain event did not occur during any month during this period (and stormwater testing was not conducted), notification shall be submitted to the Planning Manager in lieu of testing results.

Condition 80 provides:

80. **Monitoring and Determination of BMP Effectiveness for the EMSA**:

a. Within 30 days of RPA approval, sampling and testing shall occur within 24 hours after a qualifying rain event. If no qualifying rain event occurs within 30 days of RPA approval, then testing shall begin at the first qualifying rain event. Testing shall be conducted in accordance with the Interim Stormwater Monitoring Plan developed and approved in accordance with Condition #79.

b. If test results for two consecutive years show that stormwater discharging from the EMSA into Permanente Creek exceeds total recoverable selenium of Basin Plan Water Quality Objective, currently 5 μg/L (micrograms per liter), or other applicable discharge requirement as determined by the RWQCB, then the County shall schedule a public hearing before the Planning Commission to determine whether the Mine Operator is complying with stormwater discharge requirements. For purposes of triggering Planning Commission review, the sampling shall occur at locations where water discharges to Permanente Creek.

c. If the Planning Commission determines that the Mine Operator is not complying with discharge requirements, then the operator shall install a treatment system (or alternative) as described in Condition #82. *(Implements Mitigation Measures 4.4-5 and 4.10-2c)*

In addition, Condition 81 states:

81. **Monitoring and Determination of BMP Effectiveness for the WMSA and Quarry Pit**:

a. Within 30 days of RPA approval, sampling and testing shall occur within 24 hours after a qualifying rain event. If no qualifying rain event occurs within 30 days of RPA approval, then testing shall begin at the first qualifying rain event. Testing shall be conducted in accordance with the Interim Stormwater Monitoring Plan developed and approved in accordance with Condition #79.

b. If test results for two consecutive years show that stormwater discharging from the EMSA into Permanente Creek exceeds total recoverable selenium of Basin Plan Water Quality Objective, currently 5 µg/L (micrograms per liter), or other applicable discharge requirement as determined by the RWQCB, then the County shall schedule a public hearing before the Planning Commission to determine whether the Mine Operator is complying with stormwater discharge requirements. For purposes of triggering Planning Commission review, the sampling shall occur at locations where water discharges to Permanente Creek.

c. If the Planning Commission determines that the Mine Operator is not complying with discharge requirements, then the operator shall install a treatment system (or alternative) as described in Condition #82. *(Implements Mitigation Measures 4.4-5 and 4.10-2c)*

a. Within 30 days of the start of reclamation activities for Phase II, the Mine Operator shall conduct monthly water sampling and testing results in compliance with the Interim Stormwater Monitoring Plan, as described under Condition #79.

b. If test results for two consecutive years show that selenium levels are higher than base levels, then the County shall schedule a public hearing before the Planning Commission to determine whether the reclamation activities are causing an increase in total selenium above the base levels. "Base levels" shall be defined as water testing results for an average for two years immediately prior to start of Phase II reclamation for discharge into Permanente Creek from the WMSA and Quarry Pit. For purposes of triggering Planning Commission review, the sampling shall occur at locations where water discharges to Permanente Creek.

c. If the Planning Commission finds that reclamation activities are causing an increase in selenium over base levels, then the Mine Operator shall install a treatment system (or alternative) as described under Condition #82. *(Implements Mitigation Measures 4.4-5 and 4.10-2d.)*

Finally, Condition 82 states:

a. Within 30 days of RPA approval, the Mine Operator shall begin designing a treatment facility (or alternative) and pilot system for discharge into Permanente Creek. The treatment shall be designed to achieve the Basin Plan Water Quality Objective for selenium (total recoverable selenium of 5 μg/L) for discharge from the EMSA as defined in Condition #80, and/or to achieve the "base level" standard for the WMSA and Quarry Pit as defined in Condition #81 *(reference to Mitigation Measures 4.10-2d).*

b. The Mine Operator shall complete design, pilot testing, and feasibility analysis for a treatment facility within 24 months of RPA approval or by such other time as may be prescribed by the RWQCB.

c. The Planning Commission shall hold a public hearing no later than 30 months after RPA approval to determine feasibility of the treatment facility (or alternative). The Planning Commission may defer the public hearing if the RWQCB determines that additional time is necessary to complete the design, pilot testing, and feasibility analysis. If the Planning Commission determines that a treatment facility is feasible, the Planning Commission shall also establish a timeline for implementing the treatment facility.

d. Construction, installation, and operation of a treatment facility (or alternative) shall be required if discharge requirements are not met as described under Conditions # 80 and # 81 based on a determination of the Planning Commission, and if it has been determined feasible by the Planning Commission following a public hearing. *(Implements Mitigation Measures 4.4-5 and 4.10-2e.)*

Post-Approval Stormwater Testing in EMSA

Lehigh tested its stormwater discharges from the EMSA and other areas during the two years since the Reclamation Plan's approval. Stormwater testing in the 2012-2013 wet season showed negligible selenium in runoff from the EMSA, measured at the discharge of Pond 30 to Permanente Creek. These tests showed that selenium was either Non Detect ("ND") or at concentrations slightly higher (<1 ug/L) than the current water quality criteria, 5 ug/L. During the 2013-2014 wet season, sampling from two Pond 30 discharges were higher and exceeded the current criteria for selenium.

Lehigh responded to these testing results by instituting the procedure required by Condition 79. That condition requires, if elevated selenium is detected by sampling and testing, that Lehigh identify the source and modify its "best management practices" as needed to address the issue.

In July 2014, Lehigh provided the County with a report which described the actions that Lehigh would employ to prevent elevated concentrations of selenium from discharging from the EMSA. (See Attachment 1.)

In its report, Lehigh informed the County that it would commence final reclamation in the EMSA on an advance schedule, including installing a non-limestone cover. These actions implement the "source control" strategies in the Reclamation Plan that were peer reviewed by the County's consultants, and which will reduce selenium to levels meeting the current water quality criteria. Lehigh will begin to install the non-limestone cover by October 15, 2014, and complete the process in the 2015 dry season. During the 2015-16 wet season, Lehigh will perform at least three rounds of stormwater testing (pursuant to Conditions 76(f) and 79) to verify that the cover is effectively controlling selenium, before applying a topsoil layer and planting the EMSA with native grasses, shrubs and trees.

Feasibility Analysis

The Planning Commission must determine, pursuant to Condition 82, whether it is "feasible" to build and operate a water treatment system that is capable of controlling selenium to levels consistent with the current discharge standard, 5 ug/L. The term "feasible" has a specific meaning under CEQA. Public Resources Code section 21061.1 defines it as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors." CEQA's Guidelines add that a determination of feasibility may take into account "legal" factors. (Cal. Code of Regulations, tit. 14, § 15364.)

The circumstances that bear on the feasibility of water treatment vary for different areas of the Quarry. The issue of feasibility must be analyzed separately for the Quarry Pit/WMSA, versus the EMSA.

Quarry Pit and West Materials Storage Area ("WMSA")

Since the Reclamation Plan's approval, Lehigh has diligently pursued emerging technologies to control selenium discharges from the pit and WMSA. Lehigh's focus has centered on the pit and WMSA because these areas together are the source of the majority of water discharges from the Quarry. For the same reasons, discharges containing selenium from the pit/WMSA have been the focus of the Regional Water Board's permitting efforts. Runoff from the EMSA, in contrast, is episodic and comparatively small.

In August 2013, Lehigh shared an early proposal with the County to build a water treatment system in a location east of the pit near the Quarry offices. The project description that Lehigh submitted to the Planning Department is included in Attachment 2. The project proposed to install a number of anaerobic bioreactors that remove selenium from pit/WMSA water. This proposal had certain drawbacks, however. The system would have required a sizeable influent pond (300 ft. x 150 ft.) of up to 14 acre-feet of capacity to ensure that flows entering the bioreactors were uniformly low in suspended sediments. The system also required cylindrical steel tanks (150,000 gal/each) and a metal building (90 ft. x 85 ft. x 32 ft.) for housing equipment. The footprint, location, visual profile and potential environmental impacts of this system presented a range of concerns. Lehigh subsequently withdrew this proposal.

Concurrently, Lehigh continued to explore alternative technologies. In August 2013, Lehigh learned of a new microbial treatment system designed by Frontier Water Systems. The Frontier water treatment system was developed by the individuals who pioneered the "ABMet" systems that had been considered the state of the art in selenium treatment. The Frontier system utilizes non-hazardous bacteria to establish anaerobic "reducing" conditions, which change the selenium from a dissolved state to a solid state that can precipitate out in a solid form and be collected for disposal.

The Frontier treatment system represents the only commercially-available technology that appears capable of treating the highly-variable, yet consistent (i.e. occurs on a large number of days annually) inflow rates which characterize the Quarry pit dewatering flows and runoff, while meeting the extremely low selenium effluent limits established by the current water quality standards. Its compact, modular design offers a major advantage over other systems. The system does not require an influent pond, reducing the overall footprint. Equipment is housed mainly in trailer-sized modules that can be easily relocated, and do not need fixed foundations.

In fall 2013, Lehigh installed a pilot system using the Frontier technology. The pilot system operated at the 750-level pond within the Quarry pit (see Attachment 3 photographs). The pilot system received an inflow of approximately three gallons per minute from the pit/WMSA over a four-week period in October and November 2013. The results exceeded expectations. The pilot system repeatedly reduced selenium to levels below the current standard, 5 ug/L. The pilot system results are contained in the report provided in Attachment 3, and also shown in the table below.

Pilot System Selenium Results (Values in ug/L)				
Date	Influent SE	Stage 1 SE	Stage 2 SE	Final SE
10/16/13	1.8	1.7	0.48	--
10/21/13	ND	ND	ND	--
10/28/13	26	21	15	--
10/30/13	31	22	14	15
10/31/13	60	40	23	22
11/4/13	57	26	8	7.7
11/6/13	57	25	5	4
11/7/13	62	28	5.7	5
11/11/13	57	25	5.2	3.1
11/13/13	65	23	3.4	2.3
11/15/13	58	17	2	1.3

The data generated by the pilot system indicated that the Frontier technology can be scaled to a larger treatment system with consistent results. Consequently, Lehigh is currently proceeding to implement a larger, interim treatment system ("ITS") that will be completed by October 2014 in a location adjacent to Pond 4A, south of the Quarry pit. The location and approximate footprint of the ITS is illustrated in the report provided under Attachment 3. The ITS will treat and remove selenium from up to 24,000 gallons per hour from the pit. The ITS is scheduled to be operational during the 2014-15 wet season. The data generated over the next two years will permit Lehigh to determine whether it is technically possible to expand the system's inflow capacity to handle all water discharged from the Quarry pit and WMSA.

In summary, the information developed by Lehigh since the Reclamation Plan's approval indicates, on a preliminary basis, that it is feasible to install a water treatment system that is capable of treating water from the Quarry pit and WMSA to levels below the current 5 ug/L standard for selenium. Lehigh anticipates that the data generated during the following two wet seasons (2014-15, 2015-16) will permit a final determination. Lehigh submits that it is appropriate to amend the Conditions of Approval to acknowledge that the ITS will operate, and to thereafter reassess (in April 2016 or later) the feasibility of this technology to treat all pit and WMSA water.

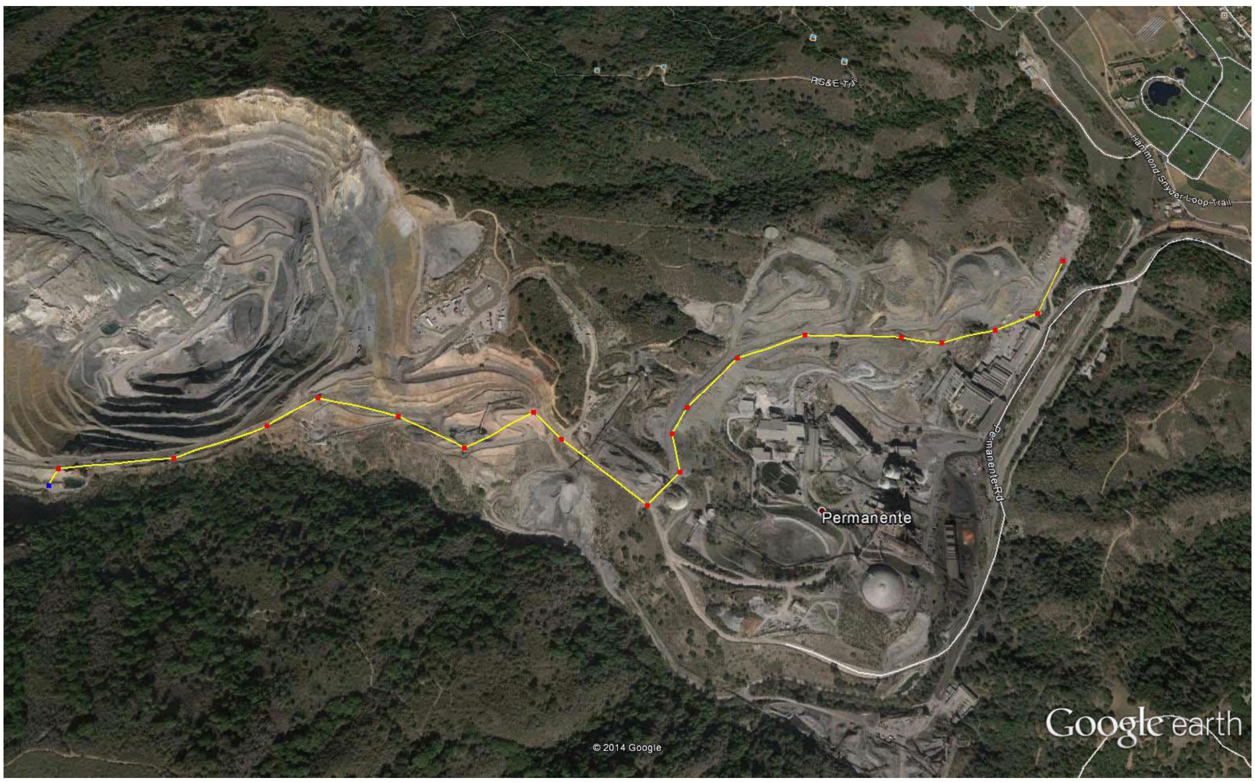
East Materials Storage Area ("EMSA")

A water treatment system for EMSA discharges presents a different set of considerations. At the outset is a timing issue. The approved Reclamation Plan requires reclamation to commence in the EMSA earlier than in other areas of the Quarry. Final reclamation, including placement of a non-limestone cover, must begin by 2015 in the EMSA, whereas reclamation in other areas will not begin until at least 2025. Moreover, Lehigh has committed to starting final reclamation on an even earlier schedule. As stated in Lehigh's July 2014 report, Lehigh will begin installation of a non-limestone cover in October 2014 and complete the cover in mid-2015. As such, a treatment system would have utility for no more than one wet season (2014-15), after which the protective non-limestone cover will be in place.

The EMSA's physical configuration is also a factor. The EMSA is a stockpile which occupies approximately 54 acres. The EMSA is designed so that storm runoff flows to a series of ditches, and then to a series of sedimentation basins, including a final basin (Pond 30), which discharges into Permanente Creek. Because of the EMSA's size and drainage controls, and because the EMSA is composed mainly of pervious fill, it generates relatively little runoff to the creek. For example, the EMSA produced only two measurable discharges during the 2012-13 and 2013-14 wet seasons, respectively. (See Attachment 1.) The EMSA contrasts with the pit/WMSA area, which covers a much larger drainage area and delivers a consistent flow of water to Permanente Creek for much of the year.

In light of the above factors, Lehigh has considered whether a stand-alone water treatment facility for the EMSA is feasible. Feasibility means that that an action is capable of being accomplished in a successful manner within a reasonable period, taking into account "technological factors." It is well known, however, that current treatment technologies, including the Frontier system, require a steady inflow to establish and maintain anaerobic "reducing" conditions. A treatment system is not able to function effectively based on the small, intermittent discharges which characterize the EMSA. Unlike the pit, which collects and stores water from a large area that can be pumped in a continuous flow, the EMSA rarely generates a treatable volume of runoff. Based on these considerations, it is clear that a stand-alone treatment facility at the EMSA is technologically infeasible.

As an alternative, Lehigh also has considered if it is feasible to treat EMSA stormwater runoff by pumping the water to Pond 4A, where the ITS facility is located. Such a project would require a series of pumps and pipes to deliver water from the EMSA to the treatment facility. The project would require approximately 1.7 miles of pipe to link Pond 30 (in the EMSA) to the location of the treatment facility at Pond 4A. It also would require pumps to lift water over a 700-foot vertical gradient, in order to cross a ridge separating the EMSA from the facility. The approximate alignment of the piping and pumping system is illustrated below.



A water delivery system presents timing issues, however, as prefaced above. Lehigh estimates that it would require approximately two years to design and construct a water delivery system (excluding any time that may be required for the Planning Department to prepare an environmental review). By the time this system would be operational, the EMSA will already have been covered with the non-limestone layer called for by the Reclamation Plan to protect against selenium, and the delivery system would no longer have usefulness. In short, this alternative is not "capable of being accomplished in a successful manner within a reasonable period of time…" (Pub. Resources Code, § 21061.1.)

In addition, Lehigh currently does not have legal authority to deliver water from the EMSA to the ITS for treatment and discharge. In March 2014, the Regional Water Board issued Lehigh a water discharge permit and a cease and desist order. The permit and CDO authorize a very specific set of discharges from the Quarry. In particular, the permit and CDO allows Lehigh to use the ITS for treating process water discharges from the Quarry pit. It does not, however, authorize Lehigh to redirect stormwater runoff from other areas of the Quarry (such as the EMSA) to the ITS for treatment. As such, an alternative that involves pumping EMSA water to the treatment facility is legally infeasible at this time. (Cal. Code of Regulations, tit. 14, § 15364.)

Delivering EMSA water to the ITS also raises technological issues. A primary concern is the risk of upsetting the treatment system by the variations in water temperature and quality represented by the EMSA influent. The performance of the microbial system depends on the characteristics of the influent. A microorganism's ability to survive in water depends on the oxidation/reduction potential ("ORP") of the water, which is affected by the temperature and quality of the influent. During pilot testing in 2013, Frontier observed that fluctuations in the influent temperature affected system performance, and recommended that Lehigh draw water from its well system rather than surface water. As the EMSA produces only surface water, water from the EMSA would have a different profile for temperature and suspended solids than the pit/WMSA influent. It cannot be determined at this time whether the ITS can effectively absorb and tolerate such influent variations without reducing performance. As a result, this alternative is not feasible at this time based on technological factors. (Pub. Resources Code, § 21061.1.)

The anticipated costs of a water delivery system also bear consideration. Lehigh estimates that the cost of designing and installing a water delivery system would exceed $4 million. As previously noted, however, a delivery system would be rarely used because the EMSA seldom generates enough runoff to cause a discharge. It is appropriate to balance the usefulness of delivery system against the costs of the system. In this case, because the anticipated costs of the delivery system appear to far outweigh any usefulness which the delivery system may have, this alternative appears to be economically infeasible. (Pub. Resources Code, § 21061.1.)

Similar to a water delivery system, Lehigh also analyzed the option of transporting water from the EMSA to the treatment facility using off-road trucks. In this scenario, water collected in Pond 30 would be pumped into off-road water trucks that Lehigh would be required to purchase (although the Quarry has existing water trucks, it does not have any available water trucks that are capable of driving through the cement plant which may not exceed an 8,000 gallon capacity). Loaded trucks would travel an approximately 1.9-mile route from the EMSA to the treatment facility and then return. The alternative of trucking water to the treatment system confronts many of the same issues posed by a pumping delivery system. The Regional Water Board permit and CDO do not provide Lehigh with the legal authority to deliver water from the EMSA to the ITS. In addition, introducing EMSA water into the treatment facility can unbalance the microbial system. Thus, for the same reasons that a pump-based delivery system is infeasible, trucking EMSA water to the treatment facility is infeasible as well.

Finally, Lehigh has considered whether there are alternatives to a water treatment facility that will prevent untreated runoff from entering Permanente Creek, in the event that discharges from the EMSA following installation of the cover do not meet the current 5 ug/L selenium standard. In this regard, Condition 82(c) states the Planning Commission may consider an "alternative" to a treatment facility. In this regard, Lehigh has considered the possibility of enlarging Pond 30 (at the base of the EMSA) to a capacity that will minimize the likelihood of a stormwater discharge to Permanente Creek under foreseeable storm events. The enlarged pond would be designed and sized based on the Regional Water Board's requirements.

At this time, the alternative of enlarging Pond 30 appears to be feasible, subject to the need for a subsurface analysis to ensure that the area surrounding Pond 30 can accept an enlarged pond. Lehigh believes it would be appropriate for the Planning Commission to require Lehigh to provide a status update regarding the feasibility of enlarging Pond 30 at the time of the 2015 annual report.

Conclusion

Lehigh appreciates the opportunity to provide this input to the Planning Commission, and looks forward to answering questions.

ATTACHMENT 1

East Materials Storage Area
Condition No. 79 – Modifications to Best Management Practices

This document describes the actions currently planned by Lehigh Southwest Cement Company to address the recent sampling results from the East Materials Storage Area ("EMSA") to comply with the June 26, 2012 Conditions of Approval.

On June 26, 2012, the Santa Clara County Board of Supervisors approved an amended Reclamation Plan for the Permanente Quarry, which encompasses the EMSA. Among the range of issues addressed by the amended plan was the presence of selenium in elevated concentrations in stormwater runoff from portions of the quarry, including the EMSA. To address this issue, the Reclamation Plan and Conditions of Approval contained several requirements designed to reduce or eliminate selenium. A wide range of water monitoring provisions, best management practices, and sediment controls are set forth in Condition Nos. 74 through 81.

Among them, Condition 79 provides that Lehigh must monitor stormwater discharges from the EMSA for selenium and other pollutants. Lehigh does this by sampling its stormwater discharges from the EMSA at the outfall structure located at Pond 30. In the 2012-13 and 2013-14 wet seasons, Lehigh tested four measurable discharges. Samples in December 2012 indicated that selenium was non-detectable or dropping compared to past results. Sampling in early 2014, however, showed a comparative increase in selenium.

Pond 30 Sampling Results 2012-2014	
Date	Result (in ug/l)
12/5/12	5.9
12/26/12	Non-Detect
2/27/14	14.6
4/2/14	29.2

The increase in selenium is the likely result of activities in the EMSA that may have exposed areas holding higher concentrations of limestone, which is known to release selenium when exposed to air and water.

In circumstances where elevated selenium levels have been detected in EMSA stormwater discharges, Condition of Approval No. 79 requires Lehigh to identify the source of the selenium and modify its best management practices to address the issue. Condition No. 79 provides, in relevant part:

> If elevated selenium, sediment, or TDS is identified through sample analysis, the Mine Operator shall identify the source and apply any new or modified standard BMPs available. BMPs that show sign of failure or inadequate performance shall be repaired or

replaced with a more suitable alternative. Following implementation, the Mine Operator shall retest surface water to determine the effectiveness of such modifications, and determine whether additional BMPs are necessary.

Lehigh will take the following steps to implement these modified best management practices, and according to the following schedule:

1. By July 31, 2014, Lehigh will retain geological and geotechnical consultants to complete an inspection of the EMSA to identify concentrated areas of limestone for removal or regrading. Lehigh expects that removal or cover of this material alone will return runoff concentrations of selenium to 2012 levels.

2. By July 31, 2014, Lehigh will retain geological and geotechnical consultants to identify the sources of suitable non-limestone rock cover material and to oversee the placement of cover materials (a contract/resume for this consultant already has been provided to the County).

3. By October 15, 2014, Lehigh will commence installing the non-limestone cover. Non-limestone rock will be harvested as it is produced from mining operations. Rock will be delivered directly to the EMSA from the quarry after mining, or temporarily stockpiled if it is infeasible to deliver material directly to the EMSA for placement. Lehigh will advise staff of any temporary stockpiles in advance. Placement and testing of cover materials will be supervised by a certified engineering geologist as required by Condition No. 74.

4. Once the non-limestone cover is installed, Lehigh will conduct stormwater sampling to verify that the cover is functioning to reduce or eliminate selenium in EMSA runoff. Lehigh will perform at least three rounds of stormwater sampling under Condition No. 76(f) and No. 79. Samples will be collected during the 2015-16 rainy season, and successive wet seasons until rains are sufficient to permit three or more rounds of sampling. Sampling and testing will be conducted and reported as follows:

- Lehigh will sample EMSA discharges for selenium, total dissolves solids and metals.
- Lehigh will collect samples within 24 hours after each qualifying rain event.
- Lehigh will provide laboratory testing results to County staff on a monthly basis during the wet season (October 15-April 15).

The cover design received a detailed review by the County's consultants prior to Reclamation Plan approval. The County's consultants concurred that the cover will be effective to reduce or eliminate selenium in runoff. Should the cover not perform as expected, Lehigh will consider its options for routing EMSA stormwater runoff to the interim water treatment system which Lehigh is developing in furtherance of Condition No. 82.

ATTACHMENT 2

Project Description

1. Project Overview

On June 26, 2012, Santa Clara County ("County") approved the Reclamation Plan for the Permanente Quarry ("Quarry"), a limestone and aggregate quarry located at 24001 Stevens Creek Boulevard, Cupertino, Santa Clara County, California (Figure 1). The County granted approval upon the condition that the operator, Lehigh Southwest Cement Company ("Lehigh")[1], study the feasibility of building and effectively operating a treatment system to ensure that discharges from the Quarry meet certain standards for water quality, and specifically, for selenium. Additionally, in April 2013 Lehigh entered into a consent decree with the Sierra Club which requires Lehigh to install a treatment system to remove selenium and other constituents from the Quarry's water discharges.

At this time, Lehigh proposes to build an interim water treatment system ("ITS") to remove selenium from water discharged from the Quarry pit into Permanente Creek. The ITS is intended to further Lehigh's effort to determine if it is feasible to build and operate a treatment system for all Quarry runoff according to the June 26, 2012 conditions of approval. The ITS also is intended to meet the consent decree's requirements. Lehigh seeks the County's approval of a Reclamation Plan amendment ("Project") to recognize the installation of the ITS, and to describe its operation and its eventual reclamation.

The ITS will cover 2.5 acres (the "Project Area") entirely within the existing Reclamation Plan boundary (Figure 2). The ITS will treat up to 400 gallons per minute of water from the Quarry pit using treatment equipment to be installed along the pit's eastern rim. Treated water would be pumped to an existing outfall which discharges to Permanente Creek. The ITS is not designed to treat water from other areas of the Quarry that do not drain into the Quarry pit.

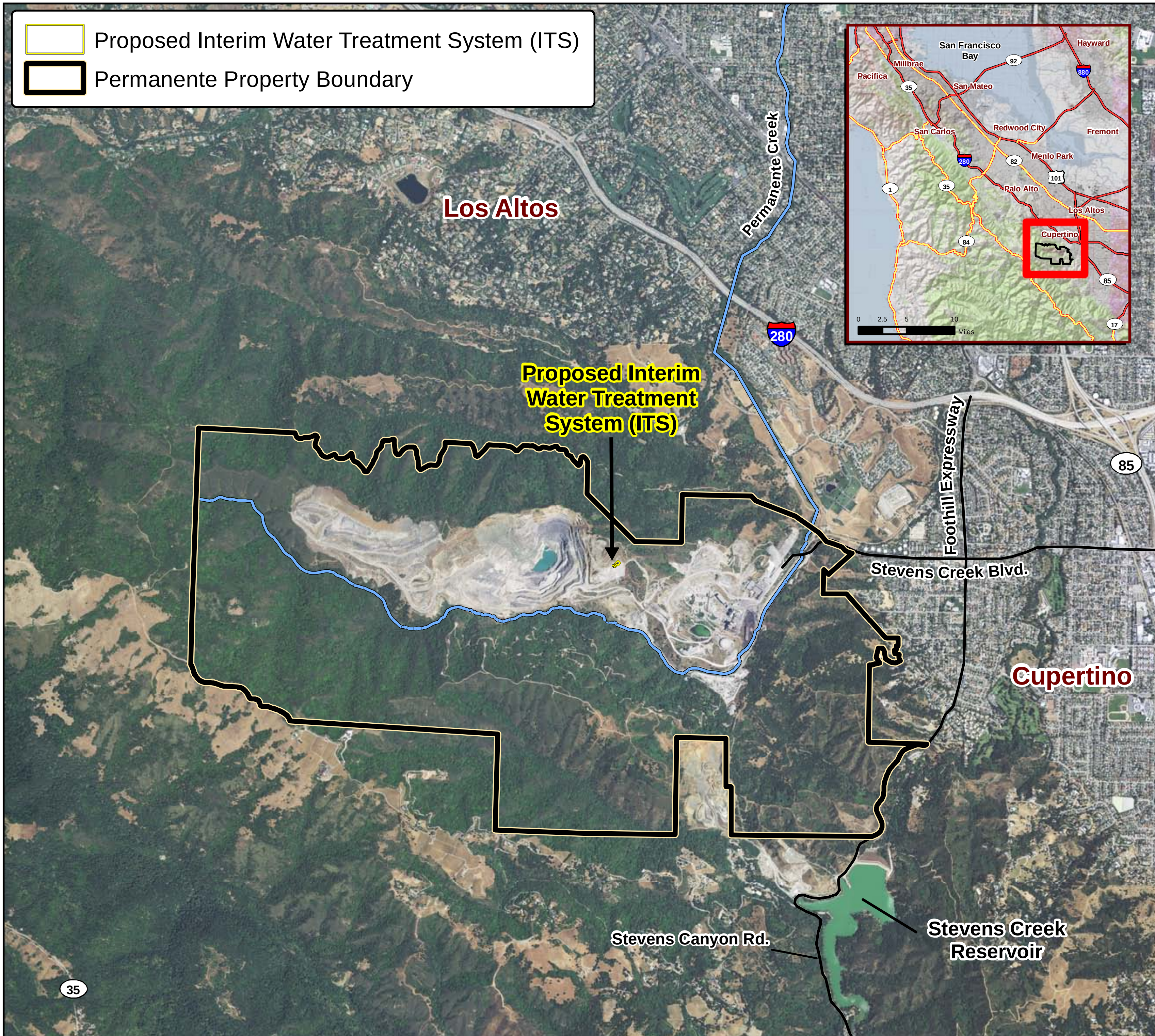
Lehigh anticipates that it will eventually install a "final" treatment system to treat water discharged from other portions of the Quarry. The final treatment system is not addressed by this Reclamation Plan amendment. Although the final system is expected to utilize some of the same equipment and infrastructure used by the ITS, the ultimate design, configuration and selection of technology in the final system will depend on data collected during operation of the ITS, and it is speculative to forecast the details of the final system at this point in time. If a later amendment is necessary to accommodate a comprehensive final system, it will be processed after the final system design is selected.

2. Project Location

2.1 Regional Setting

The Quarry is located in an unincorporated area of the County to the west of the City of Cupertino, and approximately two miles west of the Interstate 280 intersection with Highway 85.

[1] The Permanente Quarry (Mine ID No. 91-43-0004) is owned by Hanson Permanente Cement, Inc. and operated by Lehigh. Lehigh and Hanson both are part of the HeidelbergCement Group, a worldwide producer of construction materials.



Lehigh Permanente Quarry
Santa Clara County, CA

Figure 1.

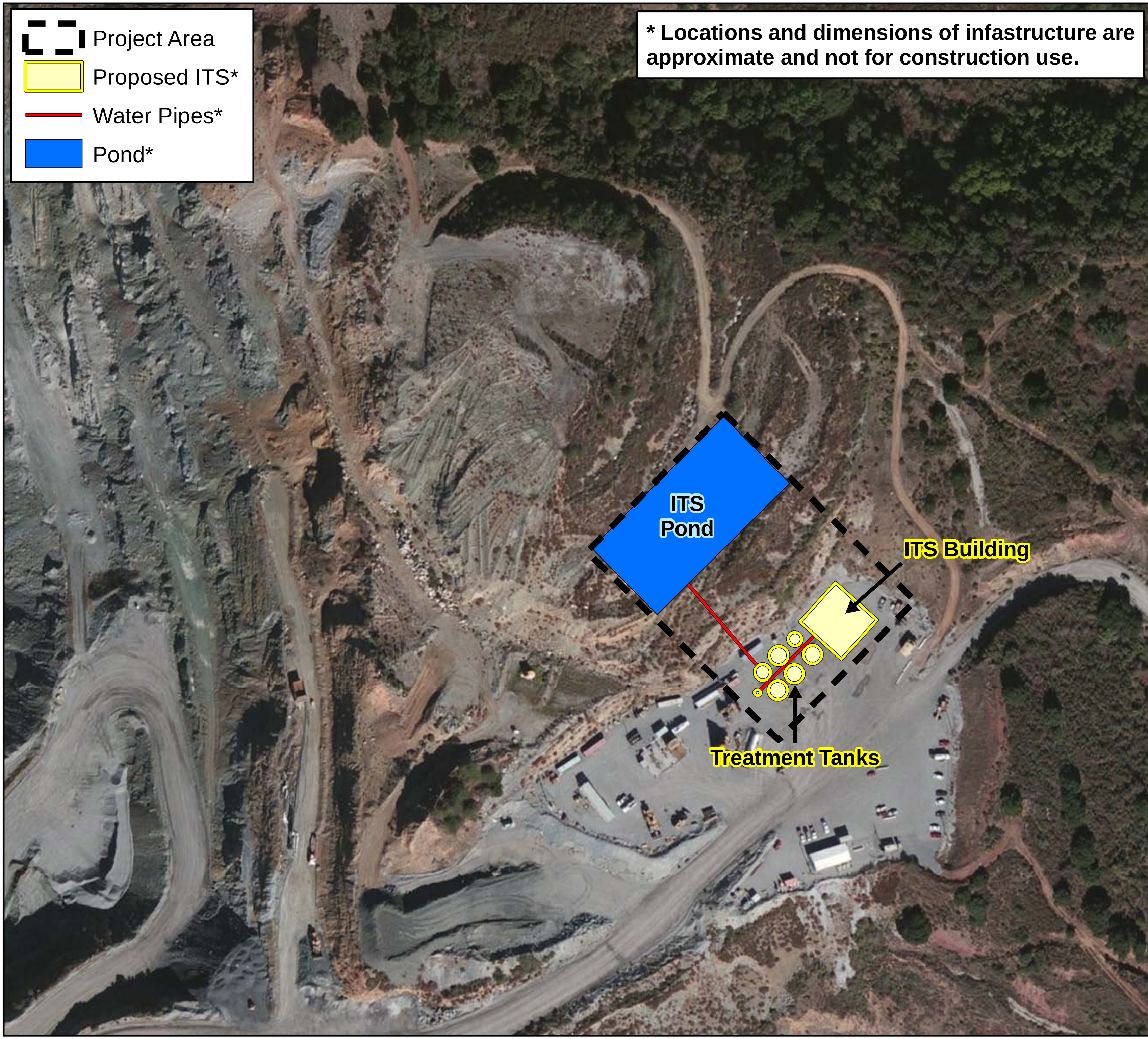
Proposed Interim Water Treatment System (ITS) Location Map

N
W E
S

0 0.25 0.5 1
Miles

Date: July 2013
Map By: Michael Rochelle
Image: 2009 NAIP

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Viewshed\Location.mxd



wra ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry
Santa Clara County, CA

Figure 2.

Site Map for Proposed Interim Water Treatment System (ITS)

N W E S

0 50 100 200
Feet

Date: July 2013
Map By: Michael Rochelle
Image: 2009 NAIP

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Viewshed\Site Plan.mxd

Vehicle access to the Quarry is provided via Stevens Creek Boulevard or Foothill Expressway and Permanente Road. The property address is 24001 Stevens Creek Boulevard, Cupertino, California, 95014.

The Quarry is located in the eastern foothills of the Santa Cruz Mountains, which are part of California's Coast Range and which separate the San Francisco Bay Area from the Pacific Ocean along the San Francisco Peninsula. Lehigh's approximately 3,510-acre ownership is bordered by large open space areas to the north, south and west, and is in proximity to urban areas to the east. North and northeast are the Rancho San Antonio County Park and Mid-Peninsula Regional Open Space District land. The closest residential areas are in the cities of Cupertino, Los Altos, Palo Alto, and Saratoga.

The existing Reclamation Plan boundary covers approximately 1,238 acres of Lehigh's ownership. From this boundary, the City of Cupertino is approximately 0.45 mile to the east, the City of Los Altos is 1 mile northeast, and the City of Saratoga is 3.25 miles to the southeast. Two census-designated residential areas (Loyola and Los Altos Hills) are approximately 1 mile north. A separate surface mining operation, the Stevens Creek Quarry, is located approximately 1 mile south.

The Project Area is within the unincorporated County and is subject to the County's land use jurisdiction.

2.2 Project Area

The Project Area is the area occupied by the ITS, which includes the treatment equipment and related infrastructure, including the pumps, pipes, tanks, and pond. The Project Area occupies a total of 2.5 acres in the central portion of the Quarry. The Project Area includes the influent pond, the treatment system/building, and pipelines connecting the two (Figure 2). The ITS does not include all of the areas over which storm runoff flows which will be treated by the ITS because the Project will cause no physical change to such areas. Topography in and around the Project Area is generally steep with elevations from 450 feet above sea level ("asl") at the eventual pit bottom to 1,350 asl at the inflow pond. The Project Area lies north of Permanente Creek, a perennial stream which is a tributary to San Francisco Bay.

3. Existing Land Use

3.1 Existing Land Use in the Project Area

The Project Area is within an ongoing surface mining operation. These land uses are characterized by a range of mining activities which include overburden removal, drilling and blasting, extraction of rock, and hauling and rock processing. These activities also are marked by the use of heavy mining equipment, including excavators, bulldozers, drill rigs and off-road haul trucks to extract and transport mined material. These land uses will not change with either the construction of the water treatment system or the proposed amendment to the Reclamation Plan.

Surface mining operations at the Quarry take place without a use permit from the County because the Quarry is considered a legally nonconforming use. In March 2011, the Santa Clara County Board of Supervisors formally determined that the Quarry was "vested" and delineated the geographic scope of the vested right. The Project Area is entirely within the area determined by the Board of Supervisors to be vested.

3.2 Existing Land Uses in the Vicinity

Existing land uses within the immediate vicinity of the Project Area, and within Lehigh's ownership, are surface mining and processing, and cement manufacturing at the Cement Plant. To the west, the nearest land that is not operated by Lehigh is open space approximately 0.5 mile away. To the south, the nearest non-Lehigh land use is the Stevens Creek Quarry, another mining operation. Other existing uses farther south and more than 0.5 mile from the Project Area include rural residential and small agricultural uses. To the east, the nearest non-extractive uses are open space and recreational uses related to the Rancho San Antonio County Park, the Gates of Heaven Cemetery and residential subdivisions. North, the nearest non-extractive uses are open space and recreational (i.e., Mid-Peninsula Regional Open Space District and Rancho San Antonio County Park lands). The nearest residences to the Project Area is located a minimum of one mile to the north and northeast.

4. Project Purpose and Need

4.1 Overview

The Project is a Reclamation Plan amendment that would recognize the installation and operation of the ITS, and provide for its removal and reclamation.

As background, SMARA and the County's surface mining ordinance require that mining operators have an approved reclamation plan which describes how land affected by mining lands will be reclaimed to allow post-mining land uses. (Pub. Res. Code § 2770; Santa Clara County Code § 4.10.370(C).) Reclamation is defined by state law as:

> [T]he combined process of land treatment that minimizes water degradation, air pollution, damage to aquatic or wildlife habitat, flooding, erosion, and other adverse effects from surface mining operations, including adverse surface effects incidental to underground mines, so that mined lands are reclaimed to a usable condition which is readily adaptable for alternate land uses and create no danger to public health or safety. The process may extend to affected lands surrounding mined lands, and may require backfilling, grading, resoiling, revegetation, soil compaction, stabilization, or other measures.

(Pub. Res. Code § 2733.)

The Reclamation Plan originally was approved by the County in March 1985. The 1985 Reclamation Plan covered a 25-year period and an area of 330 acres. In 2007, the Quarry began the process of updating the reclamation plan to account for changes in site conditions and also to address certain compliance issues. The County approved the amendment on June 26, 2012. As amended, the Reclamation Plan describes the process of reclaiming all operational components, and areas of historic disturbance from with earlier periods of site operation.

The need for the ITS is based partially upon the 2012 Reclamation Plan amendment approval. The County recognized at that time that some water discharges may contain selenium, which is a naturally-occurring substance. As a result, the June 26, 2012 approval included conditions which were designed to reduce or eliminate selenium from groundwater and storm runoff. Condition 82 identified the option of building a treatment plant. However, in light of uncertainty over whether such a plant could be feasibly built and operated, Condition 82 required that Lehigh first operate a pilot program to determine if treatment was feasible and second, to assess whether interim best management practices could effectively control selenium, before requiring a treatment system.

Lehigh has since installed a small-scale pilot treatment system. The results of the small-scale program indicate that the technology for treating selenium with the prevailing site conditions and flow volumes is potentially achievable, and the next step towards that goal is the operation of the ITS, an intermediate system. The ITS' performance will assist Lehigh to determine whether it is feasible to build and operate a treatment system for all Quarry runoff, pursuant to Condition 82. Also, in April 2013, Lehigh ended litigation by the Sierra Club by entering into a consent decree which required Lehigh to construct an interim treatment system to remove selenium from the Quarry's discharges. The ITS is also intended to accommodate the requirements of the consent decree.

4.2 Objectives

The Project's objectives are to:

- Approve an amendment to the Reclamation Plan to recognize the installation and operation of a water treatment system.
- Ensure that structures, equipment and facilities associated with the water treatment facility are properly reclaimed to avoid or eliminate residual hazards to public health and safety.

5. Project Elements

5.1 Overview

The ITS would function by delivering water stored in the Quarry pit to a pond and a series of treatment tanks located on the eastern edge of the Quarry pit (see Figure 2). Treated water will be pumped to Pond 4A and discharged to Permanente Creek from Pond 4A using the same outfall which the Quarry currently uses to discharge water that either collects in the pit or is captured by the system of groundwater wells in the pit. A supplemental technical description is provided as part of the application package following this Project Description. The following is a summary of the main operational elements.

5.2 Physical Features

The ITS will include the following physical components:

<u>Storage Pond:</u> The ITS will include a lined pond to ensure that flows entering the treatment equipment are uniformly low in suspended sediments. The pond will be between 10 and 14 acre-feet in capacity at the maximum water level with at least two feet of freeboard. Pond edges will be bermed to eliminate stormwater inflow to the pond from runoff. The pond dimensions will be

approximately 150 feet by 300 feet. Inflow and outflow control structures will allow suspended solids to settle before water is drawn into the treatment equipment. The pond will have a single geomembrane liner, protected by a granular surface over the liner, so that sediment can be removed without damaging the liner. The pond serves the following purposes:

- Surge control – The pond will protect the treatment processes from rapid changes in flow rate in the quarry dewatering system and associated with high flow rate backwash and recycle flows.
- Constant flow – The pond will allow for the ITS to be set for a constant flow rate, with level controls in the pond signaling when gradual flow rate changes are needed.
- Sedimentation – The pond will reduce peaks in suspended solids to the ITS which may occur in the dewatering system from time to time, especially during the wet season.

Tank System: The ITS is comprised of a series of treatment tanks, up to 150,000 gallons each in volume, connected by piping, valves, and pond pumps to move the water through the system, and controls and instruments to manage and monitor treatment performance. The tanks will be sited outside of the building, described below (see Figure 2).

Building: A steel building will be constructed to house additional treatment equipment, including filtration and pH adjustment (Figure 2). The building will be approximately 85 feet wide by 90 feet long, with wall heights of 20 feet and a maximum roof peak of 32 feet. Process controls, electrical connections and other minor process support equipment will be housed in the building. The ITS will not require upgrades to the existing electrical lines to the Quarry office area.

The tanks and building profiles are expected to be sufficiently low to avoid visibility from the Santa Clara Valley floor. Additionally, structures will be painted with a color compatible with the surrounding landscape to minimize their visual impact.

Lehigh anticipates that operation of the ITS will not change the overall volume of water discharged into Permanente Creek at the current time. Presently, flows are variable and generally represent the volume of water needed to dewater the Quarry pit. Flows into Permanente Creek through the ITS will be designed to accomplish the same objective.

5.3 Hours and Personnel

The ITS will operate continuously. Up to two (2) full-time employees will be required to monitor system performance using a workstation within the building structure. Employees will be present only during normal business hours. Employees will utilize the neighboring Quarry offices for restroom and break facilities.

5.4 Hazardous Materials Management

Hazardous materials associated with the project include chemicals necessary for use in the treatment process. Residuals from the process itself, including biological and chemical residues generated by the treatment equipment during the process of water treatment, are not expected to exhibit hazardous characteristics. The technical supplement includes a further description of the expected characteristics of the ITS inflow, the storage and use of chemicals in the treatment process, the disposal of residuals generated by the process, and operational health and safety.

5.5 Operational Electricity Usage

The ITS will utilize electrical power for system operations. The expected 460V, 3-Phase electrical loadings are as follows:

- ITS – 150 Kilowatt-hours (KwH) per year
- Building (heating/ventilation) – 31 KwH per year

Electricity during operations will be supplied by a line drawing power from PG&E.

6. Construction Equipment and Labor

6.1 Grading and Earthworks

The ITS will require earthworks grading to construct a pad for construction of the structures, tankage, and the lined inflow pond (Figure 2). Currently, Lehigh anticipates that grading in the following volumes will be necessary (estimates may be updated prior to construction):

- Bulk grading excavation: 15,000 cubic yards (cy).
- Bulk grading fill (18" base rock on rock pad): 10,000 cy.
- Pond liner / soil veneer fill: 800 cy (using 3/8-inch diameter or smaller rock, obtained on-site or through import).

6.2 Construction Equipment

The detailed list of construction equipment for the ITS project is provided in the Air Quality Impact Analysis. A summary of that is provided in Table 1.

The construction phase of the project will require the following truck trips for delivery of construction material and fuel:

- 203 round trips (RTs) made by an over-the-road diesel tractor-trailer for delivery of construction material
- 12 RTs by a diesel powered fuel truck for diesel fuel delivery
- 2400 RTs by light-duty (gasoline) pickups for personnel and craftsmen ingress/egress

Table 1
ITS Diesel Construction Equipment Use

Equipment Type	**ITS Plant**	**Pond**	**Total Hours**	HP	Hp-hours
Front End Loader (Cat 962)	135		215	221	47515
Excavator (Cat 245)	80	80	160	325	52000
Excavator (Cat 320)			80	138	11040
Rubber-tired Backhoe (Cat 450F)	135	24	159	125	19875
4WD Forklift Cat GP50K	425	40	465	97	45105
Bobcat, JD257 or equal (S250 used)	65		65	75	4875
Boom Crane (Grove AP206)	20		20	66	1320
JLG Man Lift (JLG 260 MRT)	1000		1000	25	25000
Compactor/drum roller (Cat CS 64)	40	48	88	156	13728
Generator (49 HP)	1200	40	1000	49	49000
777 On-site Truck		20	20	870	17400
Articulated Dump Truck (Volvo A40F)		160	160	476	76160
Tracked Dozer (Cat D9)		128	128	410	52480
Welder (diesel)			450	45	20250

6.3 Construction Labor

Construction of the ponds will involve the following labor:

- Ten (10) heavy equipment operators and off-road truck drivers;
- One superintendent;
- One foreman;
- Four laborers for the earthworks and inlet/outlet control portion of the project;
- One geomembrane superintendent;
- One geomembrane quality control technician;
- Two geomembrane welding technicians;
- Six geomembrane laborers; and
- Additional truck drivers for delivery of pipe, geomembrane, and select soil veneer.

6.4 Construction Schedule

ITS construction will begin in January 2014 and is planned to become operational by October 1, 2014, according to the following schedule.

- Design engineering – currently ongoing through Q2 2014

- Completion of onsite pilot testing – August 2013
- Submittal of RPA Application – August 2013
- Technology selection – September 2013
- Execution of technology purchase contract – Q4 2013
- ITS construction commencement – January 2014
- System operational - October 1, 2014

7. Geotechnical Analysis

The inflow pond, treatment tanks and building will be sited in areas that have received geotechnical review to ensure that soil and slope stability conditions meet Good Engineering Practices. Golder Associates completed core drilling, laboratory testing, and slope stability analyses in August 2013 which verify the following minimum slope stability criteria:

- Pond level: *To be added following completion of geotechnical review*.
- Tanks and Building level: *To be added following completion of geotechnical review*.

8. Reclamation

The ITS will be reclaimed within Phase 3 of the existing reclamation phasing, after most disturbed areas have been reclaimed. Reclamation of the Project Area will match the approved reclaimed condition for the "Crusher and Quarry Office Area" in the existing Reclamation Plan, without change in the ultimate reclamation end use. Generally, reclamation of the ITS will entail the following:

- Removal and proper disposal (or re-purposing) of all appurtenant water control structures and piping.
- Removal and proper disposal of all pond liners.
- Re-grading of the pond excavation, with fill as-needed to create smooth final grades according to the existing Reclamation Plan.
- Removal of any temporary stockpiles.
- Application of a vegetation layer consistent with that required by the Reclamation Plan
- Re-vegetation of the restored pond areas consistent with that required by the Reclamation Plan.

Additional details regarding the steps for reclaiming the ITS will be included in revisions to the 2012 Reclamation Plan.

9. Amendments to the 2012 Reclamation Plan

The addition of the ITS to the Quarry facility will require amending the June 26, 2012 Reclamation Plan text to recognize the new facility infrastructure and use. The proposed additions to the text are depicted below in bold text. There are no deletions to the text.

Page 27:

Crusher and Support Area: The Crusher and Support Area is an existing area which contains primary and secondary crushing stations, Quarry offices, **water treatment facilities** and maintenance areas. The Crusher and Support Area is located to east of the North Quarry and to the west of the EMSA. This part of the Quarry currently totals approximately 60 acres and serves as a general support area for ongoing operations. Approximately 7 acres of the Crusher and Support Area will be incorporated into the North Quarry under this Amendment, reducing the final acreage to approximately 53.4 acres.

Page 42:

Crusher and Support Area

Reclamation of the Crusher and Support Area will involve the dismantling and demolition of structures as required. The scrap will be sold for salvage value or removed from the site. Facilities located within the Crusher and Support Area include the primary crusher, secondary crushers, **water treatment facilities** and an equipment maintenance facility. A small amount of hazardous materials such as fuels, oils and other vehicle fluids are stored at the equipment maintenance facility. **In addition, the water treatment facilities will generate a small amount of residual material (less than 4,000 lbs. annually) that will be tested for hazardous waste characteristics.** Containers holding these materials will be transported off-site by an approved carrier per State and Local regulations. The Quarry offices are portable and will be removed from the site. The above ground fuel tank located adjacent to the Quarry offices will be emptied, cleaned and tested per State and Local regulations prior to transporting offsite by an approved carrier.

ATTACHMENT 3

State of the Art Biological Selenium Solutions for Mining

FRONTIER WATER SYSTEMS

Who is Frontier Water Systems?

applied biosciences

1996

- Tim Pickett Co-Founds Applied Biosciences Corporation in SLC, UT
- Selenium product line launched
- Multiple ***full scale*** installations and pilot trials

2006

- Applied Biosciences is ***acquired by GE***
- ABMet® recognized as ***best available technology*** *for selenium treatment*

FRONTIER WATER SYSTEMS

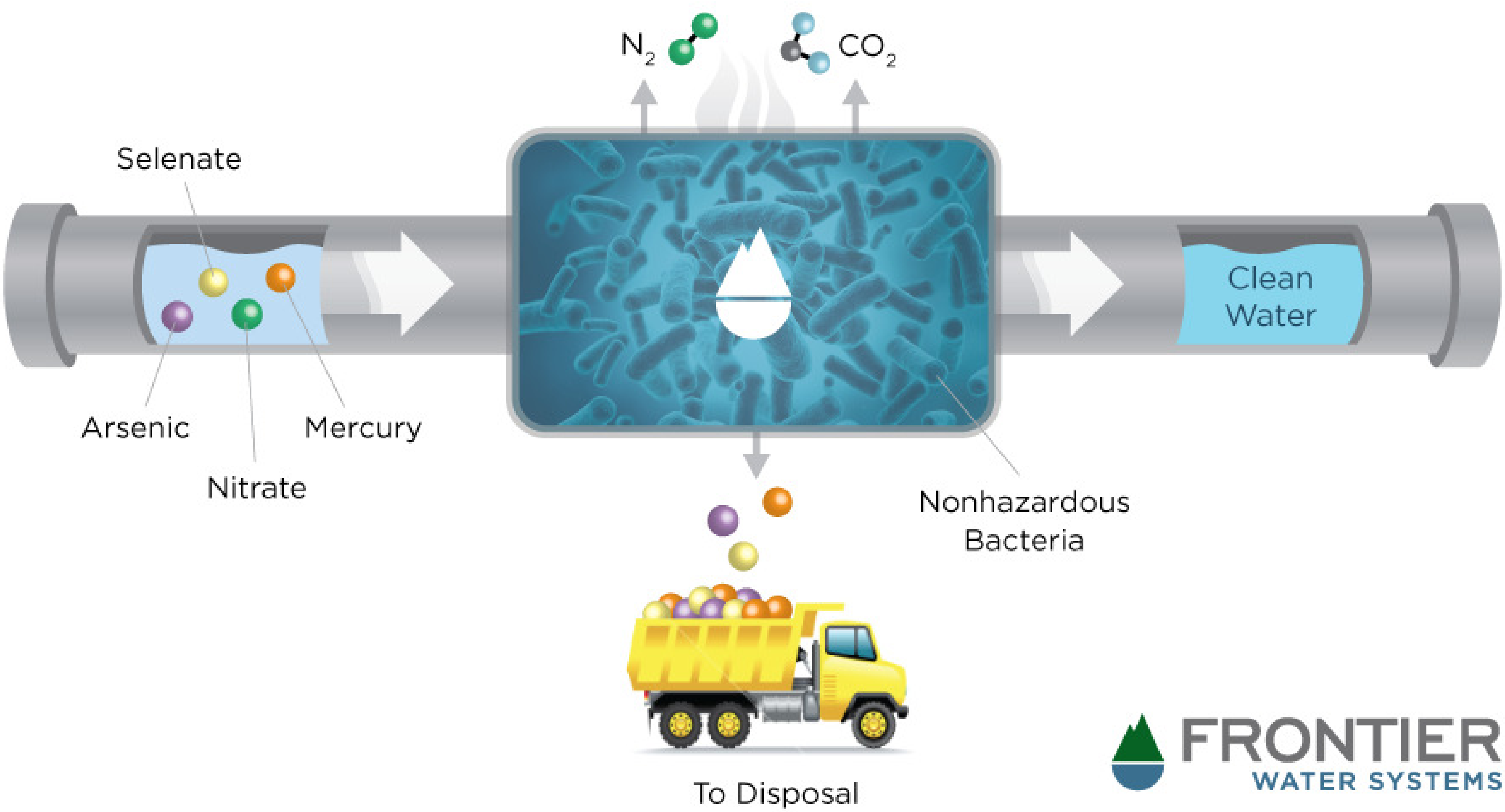
2012

- ***Founders*** Tim Pickett and James Peterson exit GE *May, 2012 to form* ***Frontier Water***
- ***Next generation*** anoxic biofilter system developed for selenium treatment

Biological Selenium Reduction

$$SeO_4^{2-} + \text{org. C} \rightarrow SeO_3^{2-} + \text{org. C} \rightarrow Se^0 + CO_2 + H_2O$$

$$NO_3^- + \text{org. C} \rightarrow NO_2^- + \text{org. C} \rightarrow N_2 + CO_2 + H_2O$$



FRONTIER WATER SYSTEMS

Biological Selenium Project Experience

Plant	Vendor/Engineer/ Contractor	Year	Design Flow
Wharf Resources, Ross Valley Project South Dakota.	Applied Biosciences/ Wharf Resources	2002	300 gpm
Wharf Resources, Annie Creek Biotreatment System, South Dakota	Applied Biosciences/ Wharf Resources	2002	300 gpm
Wharf Resources, Foley Liner Project, Selenium And Nitrate Biotreatment System	Applied Biosciences/ Wharf Resources	2003	300 gpm
Zortman Landusky Mine Biotreatment System	Applied Biosciences/ Spectrum Eng	2003	300 gpm
Goldcorp, Couchenour Mine Tailings Biotreatment Plant, Ontario, CANADA	Applied Biosciences/ Merit Consulting	2004	250 gpm
Progress Energy, ABMet Bioreactor System, FGD Blowdown, Roxboro, NC	Zenon/Pharmer Eng/ Whorley Parsons	2008	1400 gpm
Duke Energy Belews Creek ABMet Bioreactor System, NC USA	Zenon/Siemens/ Crowder	2008	640 gpm
Progress Energy Mayo Station ABMet Bioreactor System, NC USA	GE/Zachry/	2009	260 gpm
Duke Energy Allen Station ABMet Bioreactor System, NC USA	GE/Siemens/ Crowder	2009	440 gpm
AEP Mountaineer ABMet Bioreactor System, WV USA	GE/HDR/Bowen	2011	600 gpm
Umicore ABMet Bioreactor System Belgium	GE/TBD	In design	800 gpm

Taking Selenium Treatment a Step Forward

3 Product Objectives:

1. Smallest Footprint and Height

1. Modular Packaged Equipment (Transportable)

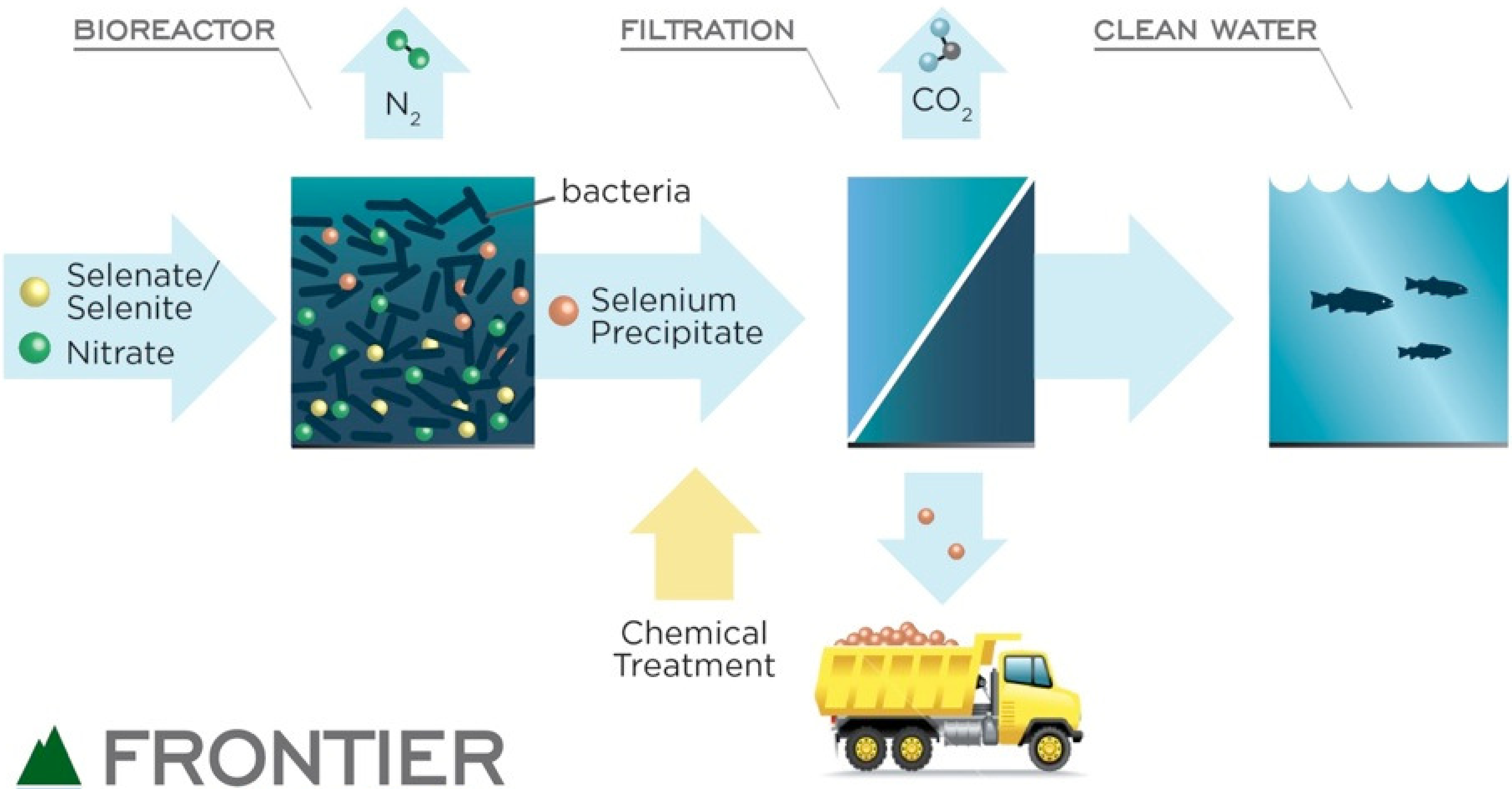
2. Complete Effluent Quality From a Single Process Solution:

Constituent	Target
Selenium	<5 ug/L
Nitrate	<0.1 mg/L
BOD	< 10 mg/L
TSS	<5 mg/L

Mine Options for Selenium Treatment

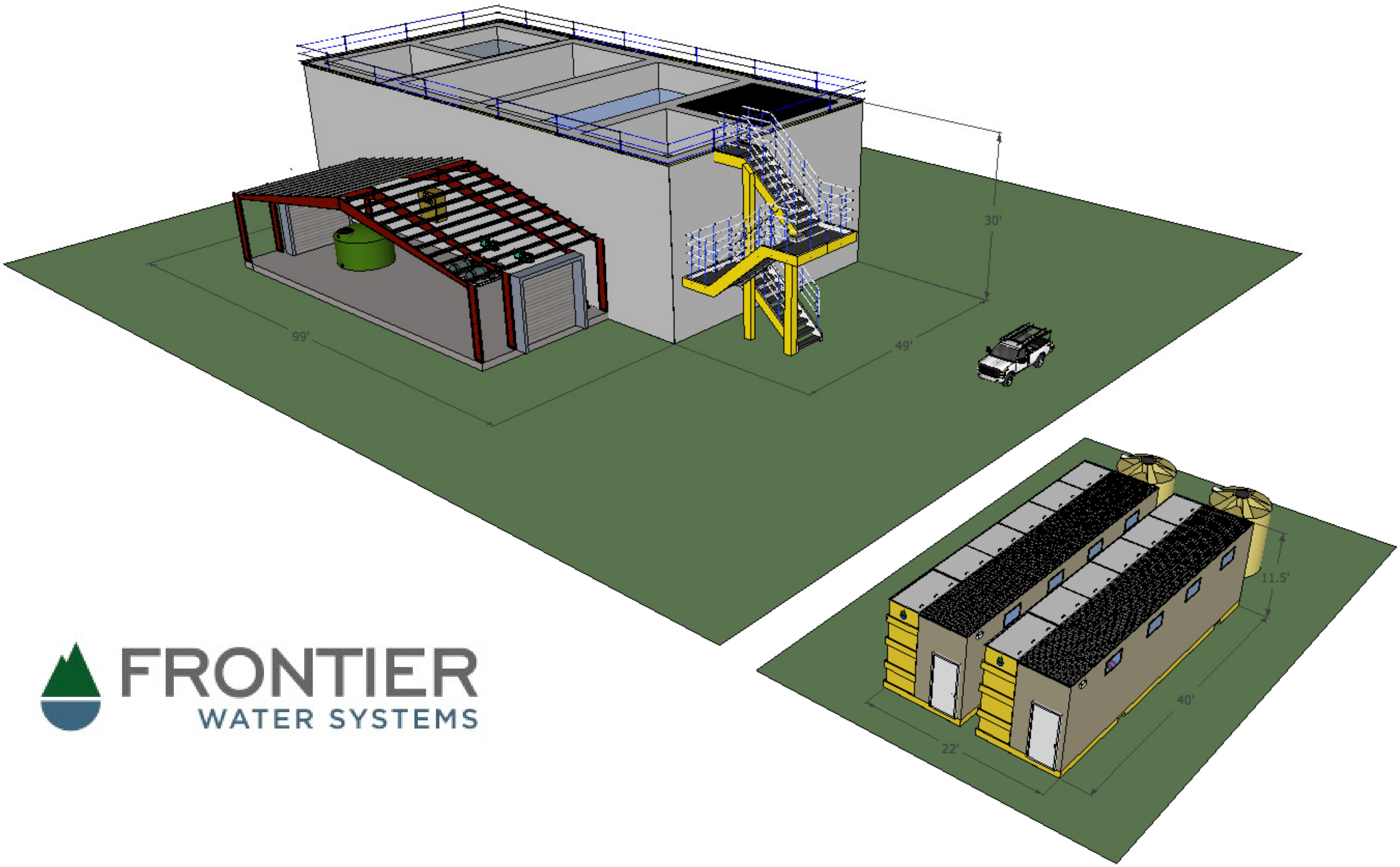
	Total Effluent Selenium (< 5 ug/L)	Footprint	Effluent BOD/TSS	Solids/Residuals	O+M Cost	Installed Cost
Chemical - ZVI	✖	✔	✖	✖	✖	✔
Fixed Bed Bioreactor (ABMet®)	✔	✖	✔	✔	✔	✖
Fluid Bed Bioreactor	✖	✔	✖	✔	✖	✖
Frontier Water Systems	✔	✔	✔	✔	✔	✔

The Frontier Selenium Process



FRONTIER
WATER SYSTEMS

500 gpm Selenium Treatment Comparison

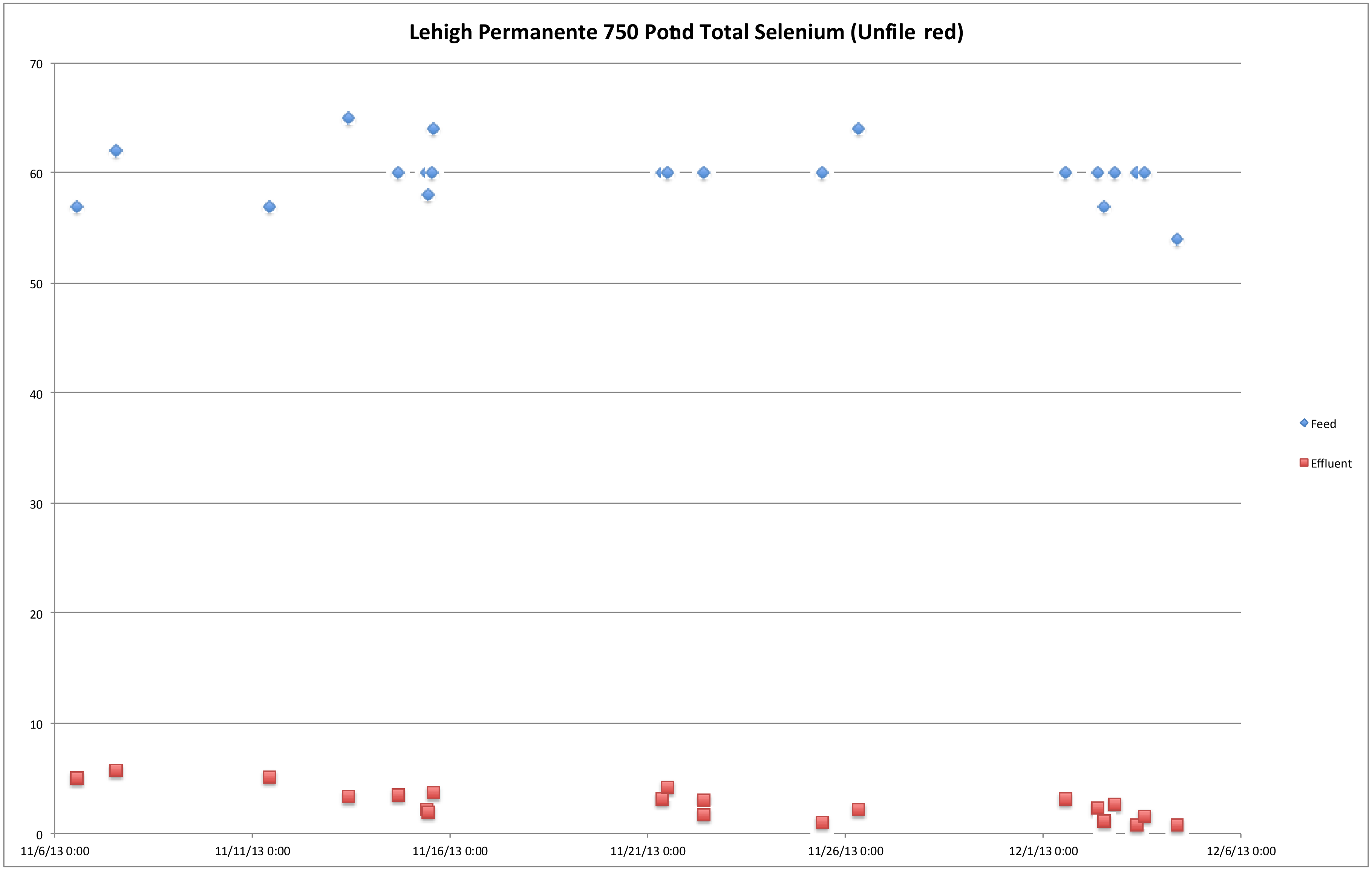


FRONTIER
WATER SYSTEMS

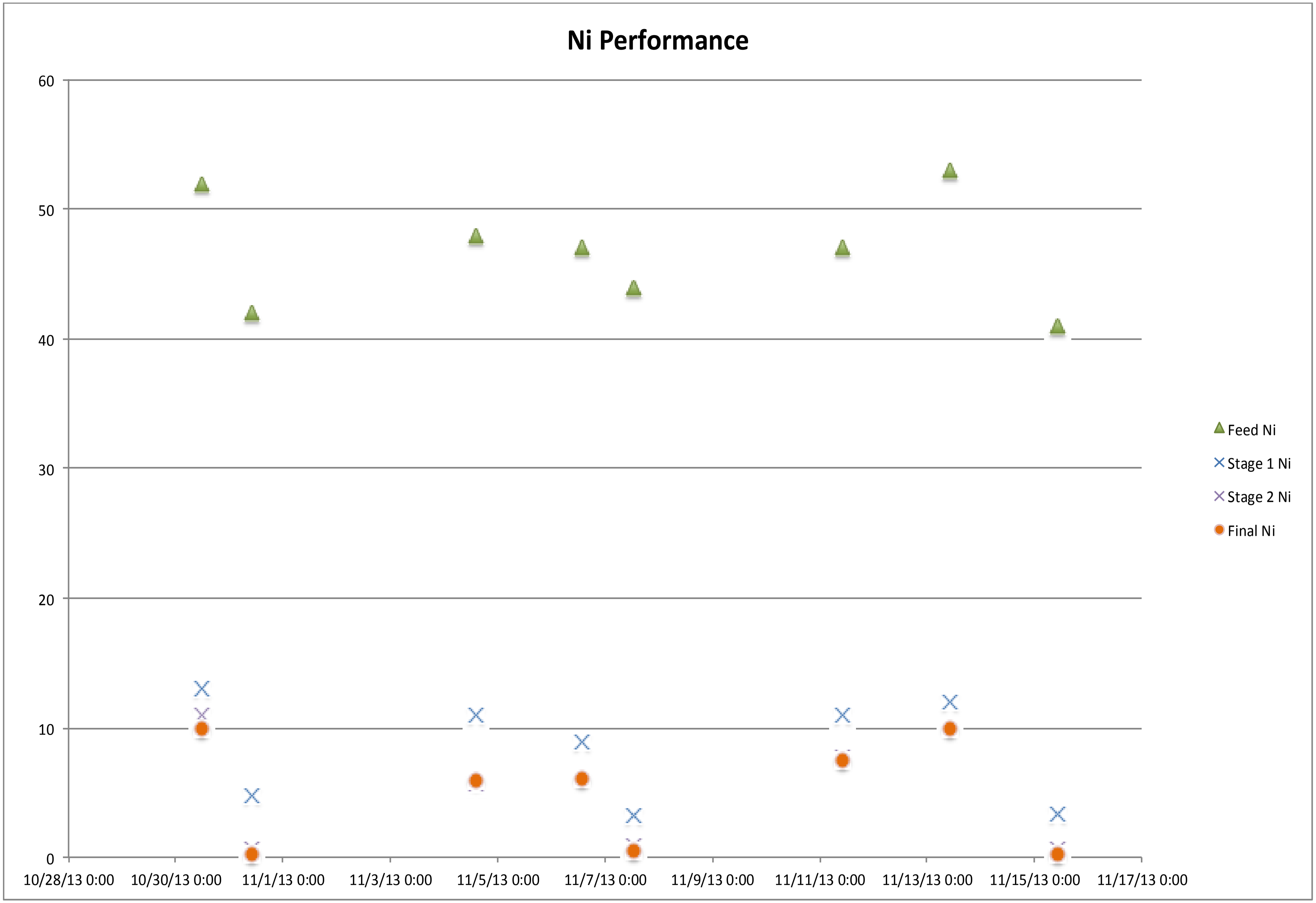
The BX Module - State of the Art Biological Selenium Treatment

- Shorter Retention Time
- Lower Reactor Height
- Less Nutrient Consumption
- Effluent BOD < 10 mg/L
- Total selenium < 5 ug/L


Frontier Pilot at 750 Pond
LONG
SIDE

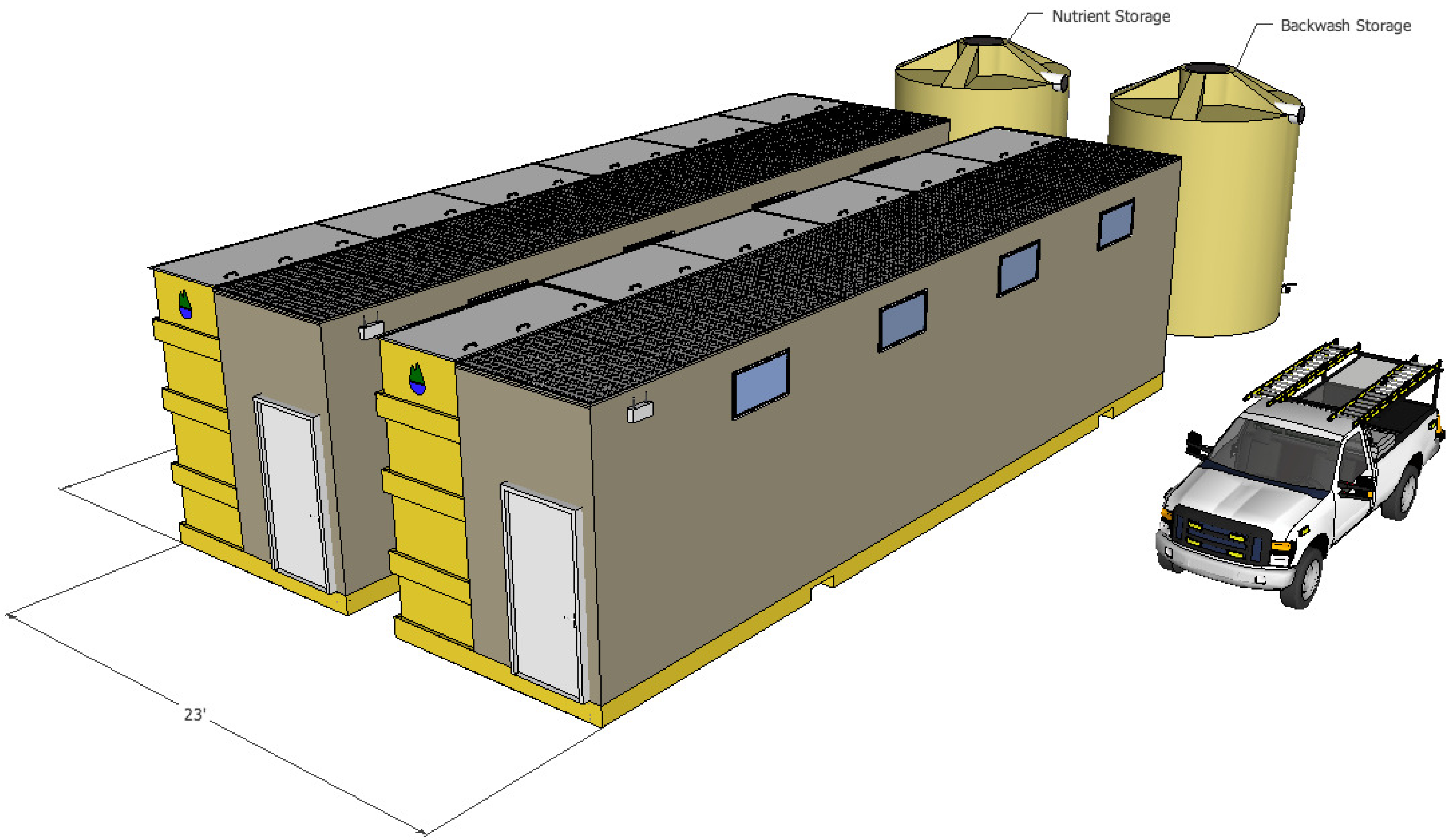


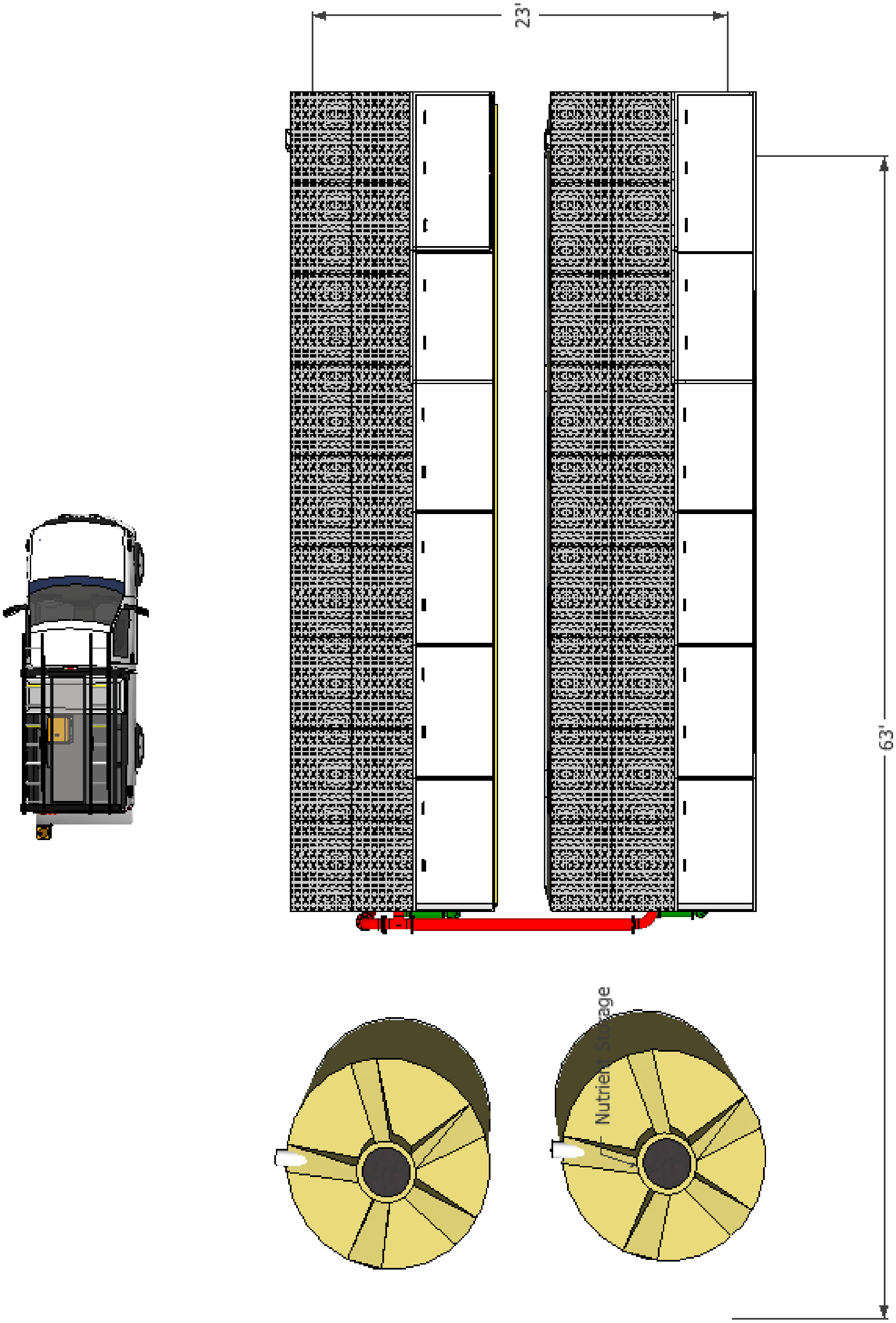
Note: Feed water concentrations were artificially elevated due to low selenium in quarry well water.



Ni Performance
60
50
40
30
20
10
0
10/28/13 0:00
10/30/13 0:00
11/1/13 0:00
11/3/13 0:00
11/5/13 0:00
11/7/13 0:00
11/9/13 0:00
11/11/13 0:00
11/13/13 0:00
11/15/13 0:00
11/17/13 0:00
Feed Ni
Stage 1 Ni
Stage 2 Ni
Final Ni


Frontier Installation at Pond 4A
10'
40'
10'
40'
10' DIA NUTRIENT STORAGE TANK
12' DIA BACKWASH SUPPY AND RECEIPT


Nutrient Storage
Backwash Storage
23'


23'
63'
Nutrient Storage

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APPENDIX Q:

EAST MATERIALS STORAGE AREA CONDITION NO. 79 – MODIFICATIONS TO BEST MANAGEMENT PRACTICES

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East Materials Storage Area
Condition No. 79 – Modifications to Best Management Practices

This document describes the actions currently planned by Lehigh Southwest Cement Company to address the recent sampling results from the East Materials Storage Area ("EMSA") to comply with the June 26, 2012 Conditions of Approval.

On June 26, 2012, the Santa Clara County Board of Supervisors approved an amended Reclamation Plan for the Permanente Quarry, which encompasses the EMSA. Among the range of issues addressed by the amended plan was the presence of selenium in elevated concentrations in stormwater runoff from portions of the quarry, including the EMSA. To address this issue, the Reclamation Plan and Conditions of Approval contained several requirements designed to reduce or eliminate selenium. A wide range of water monitoring provisions, best management practices, and sediment controls are set forth in Condition Nos. 74 through 81.

Among them, Condition 79 provides that Lehigh must monitor stormwater discharges from the EMSA for selenium and other pollutants. Lehigh does this by sampling its stormwater discharges from the EMSA at the outfall structure located at Pond 30. In the 2012-13 and 2013-14 wet seasons, Lehigh tested four measurable discharges. Samples in December 2012 indicated that selenium was non-detectable or dropping compared to past results. Sampling in early 2014, however, showed a comparative increase in selenium.

Pond 30 Sampling Results 2012-2014	
Date	Result (in ug/l)
12/5/12	5.9
12/26/12	Non-Detect
2/27/14	14.6
4/2/14	29.2

The increase in selenium is the likely result of activities in the EMSA that may have exposed areas holding higher concentrations of limestone, which is known to release selenium when exposed to air and water.

In circumstances where elevated selenium levels have been detected in EMSA stormwater discharges, Condition of Approval No. 79 requires Lehigh to identify the source of the selenium and modify its best management practices to address the issue. Condition No. 79 provides, in relevant part:

> If elevated selenium, sediment, or TDS is identified through sample analysis, the Mine Operator shall identify the source and apply any new or modified standard BMPs available. BMPs that show sign of failure or inadequate performance shall be repaired or

> replaced with a more suitable alternative. Following implementation, the Mine Operator shall retest surface water to determine the effectiveness of such modifications, and determine whether additional BMPs are necessary.

Lehigh will take the following steps to implement these modified best management practices, and according to the following schedule:

1. By July 31, 2014, Lehigh will retain geological and geotechnical consultants to complete an inspection of the EMSA to identify concentrated areas of limestone for removal or regrading. Lehigh expects that removal or cover of this material alone will return runoff concentrations of selenium to 2012 levels.

2. By July 31, 2014, Lehigh will retain geological and geotechnical consultants to identify the sources of suitable non-limestone rock cover material and to oversee the placement of cover materials (a contract/resume for this consultant already has been provided to the County).

3. By October 15, 2014, Lehigh will commence installing the non-limestone cover. Non-limestone rock will be harvested as it is produced from mining operations. Rock will be delivered directly to the EMSA from the quarry after mining, or temporarily stockpiled if it is infeasible to deliver material directly to the EMSA for placement. Lehigh will advise staff of any temporary stockpiles in advance. Placement and testing of cover materials will be supervised by a certified engineering geologist as required by Condition No. 74.

4. Once the non-limestone cover is installed, Lehigh will conduct stormwater sampling to verify that the cover is functioning to reduce or eliminate selenium in EMSA runoff. Lehigh will perform at least three rounds of stormwater sampling under Condition No. 76(f) and No. 79. Samples will be collected during the 2015-16 rainy season, and successive wet seasons until rains are sufficient to permit three or more rounds of sampling. Sampling and testing will be conducted and reported as follows:

- Lehigh will sample EMSA discharges for selenium, total dissolves solids and metals.
- Lehigh will collect samples within 24 hours after each qualifying rain event.
- Lehigh will provide laboratory testing results to County staff on a monthly basis during the wet season (October 15-April 15).

The cover design received a detailed review by the County's consultants prior to Reclamation Plan approval. The County's consultants concurred that the cover will be effective to reduce or eliminate selenium in runoff. Should the cover not perform as expected, Lehigh will consider its options for routing EMSA stormwater runoff to the interim water treatment system which Lehigh is developing in furtherance of Condition No. 82.

APPENDIX R:

BAY AREA AIR QUALITY MANAGEMENT DISRICT AUTHORITIES TO CONSTRUCT

CEMENT KILN STACK and CLINKER COOL STACK (APPLICATION NO. 26247)
and
SELECTIVE NON-CATALYTIC REDUCTION (SNCR) SYSTEM (APPLICATION NO. 25447)

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BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT
SINCE 1955

June 18, 2014

Lehigh Southwest Cement Company
24001 Stevens Creek Blvd.
Cupertino, CA 95014

Attention: Alan Sabawi

Authorities to Construct for Permit Application No. 26247, Plant No. 17

Required Action

Your Authorities to Construct are enclosed. These Authorities to Construct are not Permits to Operate. **To receive your Permits to Operate you must:**

1. Complete the Start-up Notification portion of the Authorities to Construct.
2. Send the Start-up Notifications to the assigned Permit Engineer via e-mail, fax or mail **at least seven days** prior to operating your equipment.

Note: Operation of equipment without sending the Start-up Notification to the District may result in enforcement action.

Authorization of Limited Use

The Authority to Construct authorizes operation during the start-up period from the date of initial operation indicated in your Start-up Notification until the Permit to Operate is issued, up to a maximum of 90 days. All conditions (specific or implied) included in this Authority to Construct will be in effect during the start-up period.

Contact Information

If you have any questions, please contact your assigned Permit Engineer:

Thu H. Bui, Senior Air Quality Engineer

Tel: (415) 749-5119 **Fax:** (415) 749-5030 **Email: tbui**@baaqmd.gov

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BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Authority to Construct

(This is not a Permit to Operate)

Plant No. **17**
Application No. **26247**

Lehigh Southwest Cement Company
24001 Stevens Creek Blvd. Cupertino, CA 95014
is hereby granted an *Authority to Construct* for the following equipment:

P-154 Cement Kiln Stack
295 feet high x 15 feet diameter

(emission point for abatement devices A141, A-142, A154, A156, A171 & A172)

Equipment above is subject to attached condition nos. 603, 2786, 11780 & 24781

Approved by

for JIM KARAS, P.E.
DIRECTOR OF ENGINEERING

Issue date: June 3, 2014
Expiration date: June 2, 2016

Start-up Notification

Instructions: At least **seven days** before the scheduled initial operation contact your assigned Permit Engineer via email or complete and send this Start-up Notification to the District via fax or mail.

Engineer: Thu H. Bui, Senior Air Quality Engineer
Tel: (415) 749-5119 **Fax:** (415) 749-5030
Email: tbui@baaqmd.gov

Plant No. 17
Device No. P-154
Application No. 26247

The initial operation of this equipment is scheduled for ______________ (month/day/year)

Print your first and last name ______________________________

Telephone No. ______________________________

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Authority to Construct

(This is not a Permit to Operate)

Plant No. 17
Application No. 26247

Lehigh Southwest Cement Company
24001 Stevens Creek Blvd. Cupertino, CA 95014

is hereby granted an *Authority to Construct* for the following equipment:

P-166 Clinker Cooler Stack
116 feet high x 7 feet diameter
(emission point for abatement device A161)

Equipment above is subject to attached condition nos. 2786 & 24781

Approved by

for JIM KARAS, P.E.
DIRECTOR OF ENGINEERING

Issue date: June 3, 2014
Expiration date: June 2, 2016

Start-up Notification

Instructions: At least **seven days** before the scheduled initial operation contact your assigned Permit Engineer via email or complete and send this Start-up Notification to the District via fax or mail.

Engineer: Thu H. Bui, Senior Air Quality Engineer
Tel: (415) 749-5119 **Fax:** (415) 749-5030
Email: tbui@baaqmd.gov

Plant No. 17
Device No. P-166
Application No. 26247

The initial operation of this equipment is scheduled for ________________ (month/day/year)

Print your first and last name ____

Telephone No. ____

Condition # 603

S-154 Calciner Kiln
S-171 Kiln Fuel Mill System
S-172 Precalciner Fuel Mill System
Amended by A/N 15398, A/N 18535, A/N 21753, A/N 22953, A/N 25447, and A/N 26247

Any condition that is preceded by an asterisk is not federally enforceable.

1. The owner/operator shall not operate the pneumatic system from trucks to storage unless it is vented to a dust collection system. The S-171 Kiln Mill System shall be abated by A-171 Dust Collector, and the S-172 Precalciner Mill shall be abated by the A-172 Dust Collector. (Basis: Regulation 2-2-212 Cumulative Increase)

2. The owner/operator of S-171 and S-172, shall not exceed the following usage limits in the Pre-calciner and Kiln (S-154):
   Operation with 100 % coal at maximum 29 tons/hr; or
   Operation with 100% Petroleum Coke at maximum 20 tons/hr

   The owner/operator may use any combination of coal and petroleum coke other than specified above, provided that the owner/operator can demonstrate that the total fuel consumption does not exceed 4,960,000 MMBTU/yr (1,600,000 tons/yr clinker x 3.1 MMBtu/ton).

   For calculation purposes, the coal's heat content is assumed to be 25 MMBTU/ton and coke's heat content is assumed to be 29 MMBTU/ton. The values may change depending on each shipment received.
   (Basis: Cumulative Increase).

3. Deleted, (inappropriate PSD analysis trigger level for lead per Regulation 2-2-306)

4. Deleted, (inappropriate PSD analysis trigger level for beryllium per Regulation 2-2-306)

*5. The owner/operator of S-154 shall not exceed 2.08 pounds of hexavalent chromium per any consecutive 12-month. (Basis: Toxics)

6. Deleted, (Part 8 replaces quarterly composition analysis of coke)

7. Deleted (flow meters maintenance and service)

*8. The owner/operator of S-154 shall conduct a source test at the exhausts (P-154) of Dust Collectors (A-141, A-142, A-171 and A-172) to demonstrate subsequent compliance with Parts 5, 11, 16, 21 and 22. The test should be conducted with the raw mill on and the raw mill off. The owner/operator shall also test for trace metals contents (Sb, As, Be, Cd, Cr^{+6}, total Cr, Cu, Hg, Mn, Ni, P, Pb, Se, V, Zn), benzene, ammonia (NH3), Hydrochloric Acid (HCl), and total hydrocarbon (THC) at least once per calendar year. The owner/operator shall also test for dioxinsfurans (D/F), and total organic HAP (formaldehyde, benzene, toluene, styrene, m-xylene, p-xylene, o-xylene, acetaldehyde and napthalene) at least once every 30 months. The owner/operator shall submit the source test results to the District Source Test Section and Engineering Divisions no later than 60 days after the source test. (Basis: Periodic Monitoring, Regulation 1-502)

9. The owner/operator shall obtain approval for all source test procedures from the District's Source Test Manager prior to conducting any tests. The owner/operator shall comply with all applicable testing requirements for continuous emissions monitors as approved by the District's Source Test Manager. The owner/operator shall notify the District's Source Test Manager, in writing, of the source test protocols and projected test dates at least 7 days prior to testing. (Basis: Source test compliance verification and accuracy)

10. The owner/operator shall maintain daily records (calendar day), in a District approved log, for: (1) the amount of coke and coal usage, each separately (2) the coke's heat content and the coal's heat content. The daily throughput of fuel used and daily average volumetric flow rates shall be submitted to the District monthly. All records shall be retained for a period of at least five years from the date of entry. This log shall be kept on site and made available to District staff upon request. (Basis: Recordkeeping)

11. The owner/operator of S-154 and A-154 Lime Dry/Slurry Injection System shall not exceed 3 ppmv of HCl, at 7 percent oxygen, over 30-operating day rolling average. The owner/operator may use the hydrate lime injection rate as a parametric monitor for HCl while the Performance Specification for HCl is being developed. The owner/operator of S-154 and A-154 shall not operate below 2.8 ton of dry/slurry lime injection per day, over 30-operating day rolling average. (Basis: Cumulative increase, NESHAP Subpart LLL effective September 9, 2015, Regulation 9-13)

12. The owner/operator of the Lime Dry/Slurry Injection system (A-154) shall install, operate and maintain a District-approved continuous hydrochloric acid (HCl) emission monitors at the exhausts of Dust Collectors (P-154) as suggested by the manufacturer's recommendation. (Basis: Regulation 2-6-503, NESHAP Subpart LLL effective September 9, 2015, Regulation 9-13).).

*13. The owner/operator shall maintain hourly continuous emission monitoring records for the Hg, HCl, THC, PM, Temperature, Opacity, and Volumetric Flow monitoring systems in a form suitable for inspection and approved by the APCO and the EPA administrator. Such records shall include, but are not limited to:

(i) The continuous emission monitoring measurements for Hg, HCl and THC expressed in ppm (1-hour average);
(ii) The production rates of clinker (tons/hr and tons/month);
(iii) The emission rates of Hg in lb/hr (for each hour of the month, the maximum 1-hour average during month, rolling 3-hr average, and rolling 30- day average) and lb/yr (30-day rolling average and 12-month rolling average);
(iv) The date, time, and duration of any start-up, shutdown or malfunction in the operation of any of the kiln systems or the emission monitoring equipment; and,
(iv) The results of performance testing, evaluation, calibration, checks, adjustments, and maintenance of the continuous emission monitoring system.
(Basis: H&S Code 44300 et seq.)

*14. The owner/operator shall maintain the Hg, HCl, THC, PM, Temperature, Opacity and Volumetric Flow CEMS records at the facility for at least five years. These records shall be made available to the APCO or the EPA Administrator upon request. (Basis: Cumulative Increase, H&S Code 44300 et seq.))

*15. The Hg, HCl, THC, PM, opacity and Volumetric Flow Continuous Emission Monitor System (CEMs) shall meet the requirements of District Manual of Procedures, Volume V, Continuous Emission Monitoring, Policy and Procedures. All CEMS shall be operated and maintained as suggested by the manufacturer's recommendations. (Basis: Regulation 1-522, 1-602; Manual of Procedures, Volume V)

*16. The owner/operator of S-154, S-171 and S-172 shall not emit more than the followings during normal operation:
(i) 55 pounds of mercury per million tons of clinker produced, over 30-operating day rolling average;
(ii) Maximum 88 pounds of mercury per year (12-month rolling average)
(iii) 0.. (Basis: H&S Code 44300 et seq., Regulation 9-13).

*17. The owner/operator of the Activated Carbon Injection System (A-156) shall install, operate and maintain District approved continuous mercury (Hg) emission monitors at the exhausts of Dust Collectors (A-141 and A-142) as suggested by the manufacturer's recommendation. (Basis: H&S Code 44300 et seq.).

*18. Deleted, interim mass balance for mercury before CEM is installed.

*19. Deleted, interim mass balance for mercury before CEM is installed

*20. The owner/operator of the Hg, NH3, HCl, THC, PM , opacity and Volumetric Flow CEMs must submit a monitoring plan to the District for approval. All operating parameters must be specified within 90 days of CEMs startup. (Basis: H&S Code 44300 et seq.)

*21. The owner/operator of S-154 shall not emit more than 12 ppmv of total organic HAPs, at 7 percent oxygen over 30-operating day rolling average. The owner/operator may use the total hydrocarbon (THC) CEMS as a parametric monitor for the total organic HAP as approved by the District and established by source tests. The owner/operator of S-154 and A-154 shall not exceed 13,500 ppmv of THC, over 30-operating day rolling average. A correlation total organic HAP and THC concentration shall be determined at least once every 30 months where the total HAP shall be set during that compliance period. (Basis: Cumulative increase, NESHAP Subpart LLL effective September 9, 2015, Regulation 9-13)

*22. The owner/operator of S-154 shall not emit more than 0.2 ng-TEQ/dscm of dioxins and furans (D/F), at 7 percent oxygen over 24-hour rolling average. The owner/operator may use temperature CEMS as a parametric monitor for the D/F as approved by the District and established by source tests. The kiln exhaust gas at the inlet to the PM control device shall not exceed 198 °C (388 °F), over 24-hour rolling average. A correlation between D/F concentrations and temperature shall be determined at least once every 30 months where an operating temperature shall be set during that compliance period. (Basis:

Cumulative increase, NESHAP Subpart LLL effective September 9, 2015, Regulation 9-13)

23. In order to adjust for the air dilution, the adjusted air flow rate will be calculated using the booster fan's curve in Attachment A. The owner/operator of the booster fan shall monitor and record the fan operating total pressure (kPa) or its volumetric flow rate in Standard Cubic Feet per Minute (SCFM) on a daily basis. The adjusted concentration in ppmv shall be used to calculate total emissions and demonstrate compliance with Regulation 9-13 standards. The owner/operator of S-154 and S-161 shall adjust the measured concentration (ppmv) of all CEMS as follows: (Basis: Cumulative Increase)

ppmv (adjusted) = ppmv (measured) x [SCFM measured / (SCFM measured-SCFM fan)]

24. The owner/operator of S-154 and S-161 shall produce the CEM results in the data format specified with the appropriate calculation method used as suggested by the District's Source Test Section. All monthly CEMS data shall be reported using the same format specified in the source test's letter in Attachment B. The Attachment B will be developed and approved by Source Test Section before the permit to operate for new stacks is issued (Basis: Cumulative Increase)

End of Conditions

Plant Name: Lehigh Southwest Cement Company

Condition No. 2786 Plant No. 17 Application No. 26247

COND #2786 For:
S-111 Rail Unloading System, abated by A-111 Dust Collector 1-DC-1
S-112 Additive Hopper transfer system, abated by A-112 Dust Collector 1-DC-2
S-113 additive bin transfer facilities, abated by A-113 Dust Collector 1-DC-3
S-115 Additive Storage, abated by A-115 Dust Collector 1-DC-5
S-121 Tertiary scalping screen 2-VS-1-2, abated by A-121 Dust Collector 2-DC-1
S-122 Tertiary crusher 2-CR-1, abated by A-122 Dust Collector 2-DC-2
S-123 rock conveying system, S-131 rock sampling system, abated by A-123 Dust Collector 2-DC-3
S-132 preblend, abated by A-132 Dust Collector 3-DC-2
S-134 preblend storage bin 4-S-1, 4-S-2, abated by A-134 Dust Collector 3-DC-4
S-135 high grade storage bin 4-S-3, 4-S-4, abated by A-135 Dust Collector 3-DC-5
S-141 raw mill 4-GM-1, abated by A-141 Dust Collector 4-DC-7 through 4-DC-22
S-142 raw mill 2 4-GM-2, abated by A-142 Dust Collector 3-DC-23 through 4-DC-38
S-143 raw mill 1 separator system 4-SE-3, abated by A-143 Dust Collector 4-DC-3
S-144 raw mill 2 separator circuit 4-SE-4, abated by A-144 Dust Collector 4-DC-4
S-151 homogenizer 5-S-1-2, abated by A-151 Dust Collector 5-DC-1
S-153 kiln feed system, abated by A-153 Dust Collector 5-DC-3
S-154 Precalciner Kiln, abated by A-141, A-142, S-171 and A-172 Dust Collectors
S-161 clinker Cooler 5-CC-1, abated by A-161 Dust Collector 5-DC-11 through 5-DC-20
S-162 Clinker Silo A, abated by A-162 Dust Collector 5-DC-24
S-163 Clinker silo B, abated by A-163 Dust Collector 5-DC-25
S-164 free lime storage bin, abated by A-164 Dust Collector 5-DC-23
S-165 clinker transfer system, abated by A-164 Dust Collector 5-DC-27
S-171 Kiln Fuel Mill System, abated by A-171 Baghouse 5-DC-5
S-172 Precalciner Fuel Mill System, abated by A-172 Baghouse 5-DC-6

A. Gaseous Emission Limitations:

1. The owner/operator shall ensure the emission of sulfur dioxide does not exceed 481 lb/hr averaged over the 24 hour calendar day. (Basis: Cumulative Increase)

2. Deleted (Basis: The maximum allowable emission rate for oxides of nitrogen is redundant with condition 11780, part C.1.)

3. The owner/operator shall install at a location approved by the APCO continuous in-stack SO2 and NOx monitoring equipment on the Kiln stack (P-154), and shall provide to the District, upon request, information on SO2 and NOx emissions in terms of pounds per hour and concentrations in parts per million. The monitoring equipment required shall be calibrated, maintained, serviced and repaired by the person responsible for the operation so that it will function and adequately sense, indicate and record the parameters it is designed to sense, indicate and record. The owner/operator shall also regularly provide to the District information concerning the feed sulfur input. (Basis: Cumulative Increase)

4. Deleted. Stacks are combined.

B. Particulate Emission Limitations: The owner/operator of S-141, S-142, S-154, S-161, S-171, and S-172 shall perform an annual source test to demonstrate compliance with the limits below in B(1), B(2), B(3), B(4), B(5) and B(6). The owner/operator shall obtain approval for all source test procedures from the District Source Test Manager prior to conducting any tests. The owner/operator shall notify the District Source Test Manager in writing of the source test protocols and projected test dates at least 7 days prior to testing. The owner/operator shall submit the source test results to the District Source Test Manager and Engineering Division no later than 60 days after the source test. (Basis: Regulation 2-2-212 Cumulative Increase, Regulation 1-502):

The owner/operator shall ensure particulate emissions or grain loading from these sources does not exceed the following:

1. Raw Mills (S-141, S-142) = 36 lb/hr total and 0.02 gr/SDCF. (Basis: Cumulative Increase)

2. Fuel Drying and Grinding (S-171 and S-172) = 6.6 lb/hr total and 0.02 gr/SDCF. (Basis: Cumulative Increase)

3. Clinker Cooler (S-161) = 0.04 lb/ton of clinker produced, based on three run test average. (Basis: Regulation 9-13)

4. Cement Kiln (S-154) = 0.04 lb/ton of clinker produced, based on three run test average. (Basis: Regulation 9-13)

The owner/operator shall ensure opacities from these sources does not exceed the following:

5. Cement Kiln (S-154) shall not emit for a a period or periods aggregating more than three minutes in any hour an emission equal to or greater than Ringelmann 1 or 20% opacity. (Basis: Regulation 9-13, Regulations 6-1-301 and 302)

6. Clinker Cooler (S-161) shall not emit for a a period or periods aggregating more than three minutes in any hour an emission equal to or greater than Ringelmann 1 or 20% opacity. (Basis: Regulation 9-13, Regulations 6-1-301 and 302)

C. Testing Facilities (Basis: Regulation 1-501)

The owner/operator shall provide test facilities so that representatives sampling and accurate measurements can be made of all emissions from all sources subject to NESHAP Subpart LLL effective September 9, 2015, Portland Cement Plants and for all measurements necessary to prove compliance with the conditions of this permit.
(Basis: Regulation 1-501)

D. Deleted. Redundant clinker production rate with Condition #11780 B.1.

E. Deleted (Basis: The sequence of shutting down the six cement kilns is no longer necessary. The owner/operator has only one cement kiln)

1. Deleted. Superseded by CAM Condition #24781 for bag leak detector.

2. Deleted. Superseded by CAM Condition #24781 for bag leak detector.

End of Conditions

COND# 11780
For Source 154 Cement Kiln, Plant 17

The following federally enforceable conditions limit the emissions of nitrogen oxides (NOx) from the cement manufacturing facility operated by the owner/operator, Lehigh Southwest Cement Company (previously Hanson Permanente Cement, Inc.) located at 24001 Stevens Creek Boulevard, Cupertino, Cal. 95014, for the purpose of complying with Section 182(f) of the Federal Clean Air Act. These conditions represent reasonably available control technology (RACT) for this activity.

A) Definitions: (Basis: CAA Section 182(f) – RACT)

1. Breakdowns shall be handled according to provisions established in BAAQMD, Regulation 1, Section 112 and Section 431 through 434. (Basis: RACT)

2. Cement Kiln is a device for the calcining and clinkering of limestone, clay and other raw materials in the manufacture of cement. (Basis: Applicability)

3. Clinker is a mass of fused material produced in a cement kiln from which the finished cement is manufactured by milling and grinding. (Basis: Applicability)

4. Start-up is that period of time when fuel is first introduced into the kiln to heat it and when the kiln operating temperature reaches normal operating limits and raw material feed begins. A startup period shall not last longer than 36 hours. (Basis: Regulation 9-13)

5. Short ton is equivalent to 2,000 pounds. (Basis: Compliance Verification Component)

6. Shut-down is that period of time when kiln raw material feed and fuel to the kiln begin to be decreased to reduce the kiln operating temperature until both feed and fuel are no longer fed into the kiln and it has ceased operation. A shutdown period shall not last more than 24 hours. (Basis: Regulation 9-13)

B) Production and Throughput Limits: (Basis: Regulation 2-2-212)

1. The owner/operator shall not process more than 1.6 million short tons per year of clinker. (Basis: Regulation 2-2-212 Cumulative Increase)

2. The owner/operator shall ensure the total throughput of aqueous ammonia hydroxide at S-154 does not exceed 2,450,000 gallons in any calendar year. (Basis: Regulation 2-2-212 Cumulative Increase)

3. The owner/operator shall not exceed 410 ammonia hydroxide delivery trucks in any consecutive 12 month period. (Basis: Cumulative Increase)

4. To determine compliance with the above parts, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above parts, including the following information:
   a. Total monthly hours of operation.
   b. The monthly hours of operation shall be totaled on a yearly basis.
   c. The total daily throughput of clinker and monthly throughput of ammonia hydroxide.
   d. Total monthly number of truck for ammonia hydroxide delivery and their delivery times.

   All records shall be retained on-site for at least five years, from the date of entry, and made available for inspection by District staff upon request. These recordkeeping requirements shall not replace the recordkeeping requirements contained in any applicable District Regulations. (Basis: Cumulative Increase)

C) Emission Limits: (Basis: Regulation 2-2-212)

1. Deleted. Old NOx requirement.

2. Deleted. Emission points definition.

3. The emission of Nitrogen Oxides into the atmosphere shall not exceed 2.3 lb/ton of clinker as determined on a 30-operating day rolling average. (Basis: Regulation 9-13)

4. The owner/operator of S-154 shall not exceed the six month, 24-hour rolling average of 68 ppmv of ammonia, dry at 7% oxygen. (Basis: Regulation 9-13).

5. The owner/operator of S-154 Cement Kiln shall abate the NOx emissions from S-154 at all times it is in use with properly maintained A-157 Selective Non-Catalytic Reduction (SNCR) System. (Basis: Cumulative Increase, Regulation 9-13)

D) Compliance Determination: (Basis: RACT)

1. All emission determinations shall be made in the as-found operating condition, except no compliance determination shall be established during or using periods of start-up, shut-down, or under breakdown conditions. (Basis: RACT)

2. For the purposes of mass emission limits, Nitrogen Oxides (NOx) shall be calculated as NO2 on a dry basis. (Basis: RACT)

3. The following expression shall be used to convert uncorrected observed volume in parts per million of NOx to pounds of NOx per hour produced at standard conditions of 70 degrees F. and 29.92 inches of mercury: (Basis: RACT)

[(PPMvNOx)(46lb/lb mole)(Exhaust Flow Rate (sdcfm))(60 min/hr)]/ [386 cf/lb mole * 1E6] = lbs NOx/hr

E) Monitoring and Records: (Basis: RACT)

1. The owner/operator shall maintain in good working order and operate an in-stack continuous emission monitoring system (CEMS) to demonstrate compliance with the emission limit in Part C.3. and C.4 by measuring the emission of nitrogen oxides (NOx) and ammonia (NH3). The in-stack continuous emission monitoring system shall be located on an emission point of the Kiln (P-154) and shall continuously monitor and record NOx and NH3 emissions in a manner approved by the APCO and the EPA Administrator whenever the kiln is operating as defined in Part D.1. above. (Basis: Cumulative Increase)

2. The owner/operator shall maintain daily records of clinker production and heat input including the type of fuel burned and the quantity of fuel burned expressed as millions of BTU per ton of clinker. The amount of clinker produced shall be totaled so that the limit in Part B is not exceeded. (Basis: RACT)

3. The owner/operator shall maintain hourly continuous emission monitoring records for the NOx and NH3 monitoring systems in a form suitable for inspection and approved by the APCO and the EPA administrator. Such records shall include, but are not limited to: (Basis: RACT)

   (i) The continuous emission monitoring measurements for NOx and ammonia expressed in ppm;
   (ii) The date, time, and duration of any start-up, shutdown or malfunction in the operation of any of the kiln systems or the emission monitoring equipment; and,
   (iii) The results of performance testing, evaluation, calibration, checks, adjustments, and maintenance of the continuous emission monitoring system.

4. The CEMS records as well as records of clinker production and heat input shall be maintained at the facility for at least five years and shall

be made available to the APCO or the EPA Administrator upon request. (Basis: Cumulative Increase)

F) Manual of Procedures

1. Determination of Nitrogen Oxides: The methods by which samples of exhaust gases are collected and analyzed to determine concentrations of nitrogen oxides are set forth in the District Manual of Procedures, Volume IV, ST-13A or 13B. EPA Method 7E may also be used to determine compliance. A source shall be considered in violation if the emissions measured by any of the referenced test methods exceed the standards of this rule. (Basis: Manual of Procedures, Volume IV)

   Determination of ammonia: The methods by which samples of exhaust gases are collected and analyzed to determine concentration of ammonia are set forth in the District Manual of Procedure, Volume IV, ST-1B and EPA method 350.3 and by the parametric monitors that have been installed pursuant to Section 9-13-501 and meet the requirements of EPA Preliminary Performance Specification PPS-001 for Ammonia CEMs.

2. The CEMS must meet the requirements of District Manual of Procedures, Volume V, Continuous Emission Monitoring, Policy and Procedures. (Basis: Regulation 1-522, 1-602; Manual of Procedures, Volume V)

End of Conditions

Compliance Assurance Monitoring (CAM) Permit Condition #24781

For the following sources:
S-141 Raw Mill 4-GM-1, abated by A-141 Dust Collector
S-142 Raw Mill 4-GM-2, abated by A-142 Dust Collector
S-154 Precalciner Kiln, abated by A-141, A-142Baghouses, and A-171, A-172 Dust Collectors and
A-154 Slurry Dry/Lime Injection System;
A-156 Activated Carbon Injection System; and
A-157 Selective Non-Catalytic Reduction (SNCR) System
S-161 Clinker Cooler, abated by A-161 Dust Collector
S-171 Kiln Fuel Mills System, abated by A-171Dust Collector
S-172 Precalciner Fuel Mills System, abated by A-172 Dust Collector

For the purpose of this engineering evaluation, Parts 1 through 22 and 34 through 44 are not included and remain unchanged.

23. The owner/operator shall install 44 broken bag leak detectors including alarms at A-141, A-142, A-171, A-172, and A-161 in lieu of conducting the daily visual emissions testing to ensure compliance with BAAQMD Regulation 6-301. [Basis: 40 CFR 63 Subpart LLL]

24. The following definitions apply to the Compliance Assurance Monitoring plan for S-154 and S-161 to assure compliance with Regulation 6:
    a. Exceedance is defined as detecting particulate matter emissions at concentrations of greater than 10 milligrams per actual cubic meter.
    b. Excursion is defined as any 1 minute particulate matter emission concentration that meets the definition of exceedance.

    [Basis: 40 CFR Part 64.6(c)(2)]

25. The owner/operator shall equip A-141, A-142, A-171, A-172, and A-161 Dust Collectors with a broken bag leak detector or a continuous parameter monitoring system (CPMS) that must complete a minimum of one cycle of operation for each successive 15-minute period and a minimum of four successive cycles of operation to have a valid hour of data.[Basis: 40 CFR Part 64.6(c)(1)]

26. The concentration of particulate matter emissions that assures no visible emissions from A-141, A-142, A-171, A-172, and A-161 Dust Collectors shall be less than 10 milligrams per actual cubic meter. The broken bag leak detector must be certified by the manufacturer to be capable of detecting particulate matter emissions at concentrations of 10 or fewer milligrams per actual cubic meter. [Basis: 40 CFR Part 64.4(a)]

27. The owner/operator of for A-144 and S-161 must equip A-141, A-142, A-171, A-172, and A-161 with an alarm system that will alert an operator automatically when an increase in relative particulate matter emissions over a preset level is detected. [Basis: 40 CFR Part 64.3(b)(4)(iii)]

28. If an exceedance occurs at a broken bag leak detector installed at A-141, A-142, A-171, A-172, and A-161, the owner/operator shall determine the cause of the exceedance and if necessary restore operation of A-141, A-142, A-171, A-172, and A-161 to their normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions. Lehigh must review the procedures used in response to an excursion or exceedance. If exceedances continue to occur, the District may require the owner/operator to develop and implement a Quality Improvement Plan (QIP). [Basis: 40 CFR Part 64.6(c)(3), 64.7(d)(2), 64.8]

29. The owner/operator must inspect the broken bag leak detector on a monthly basis according to the manufacture's specification to ensure the monitor is operating properly. [Basis: 40 CFR Part 64.3(b)(3), EPA -454/R-98-015 Guidance]

30. The owner/operator of S-144, S-161, A-141, A-142, A-171, A-172, and A-161 shall submit a semi-annual monitoring report to the District in accordance with 40 CFR Part 70.6(a)(3)(iii). The report shall include all of the following information:
    a. Summary information on the number, duration, and cause of excursions or exceedances and the corrective actions taken.
    b. Summary information on the number, duration, and cause for monitor downtime incidents

    [Basis: 40 CFR Part 64.6(c)(3) and 40 CFR Part 64.9(a)(2)]

31. The owner/operator shall inspect each dust collector based on the manufacturer's recommendations on a yearly basis. The owner/operator shall keep a record of all yearly inspections and any corrective action taken. [Basis: 40 CFR Part 64.6(c)(1)(iii)]

32. The owner/operator shall perform source tests for A-141, A-142, A-171, A-172, and A-161 at least once every year to demonstrate with compliance limits of Regulation 6-1. The owner/operator shall obtain approval for all source test procedures from the District's Source Test Section prior to conducting any tests. The owner/operator shall comply with all applicable testing requirements as specified in Volume V of the District's Manual of Procedures. The owner/operator shall notify the District's Source Test Section, in writing, of the source test protocols and projected test dates at least 7 days prior to testing. All measurements, records and data required to be maintained by the owner/operator shall be retained and made available for inspection by the District for at least five years. [Basis: Regulation 2-1-403]

33. The owner/operator shall keep the records of the concentration, pressure drop, visible emission readings, calibrations, test results, excursions and exceedances required by the above conditions for at least 5 years and shall make the records available to District staff upon request. [Basis: Regulation 2-6-501 Recordkeeping]

End of Conditions

122850

August 19, 2013

Lehigh Southwest Cement Company
24001 Stevens Creek Blvd
Cupertino, CA 95014

Attention: Scott Renfrew

Application Number 25447
Plant Number: 17
Equipment Location: *same as above*

Dear Applicant:

SUBJECT: LETTER OF EXEMPTION

We have completed our evaluation of your application for a Permit to Operate the following equipment:

S-168 **Ammonia Hydroxide Storage Tank, 19% Ammonia Hydroxide, 30,000 gallon capacity w/Concrete Containment**

We have determined that your operation is exempt from permitting per the following:

2-1-123 **Exemption, Liquid Storage and Loading Equipment:** The following equipment is exempt from the requirements of Sections 2-1-301 and 302, provided that the source does not require permitting pursuant to Section 2-1-319.

123.2 Tanks, vessels and pumping equipment used exclusively for the storage or dispensing of any aqueous solution which contains less than 1 percent (wt) organic compounds. Tanks and vessels storing the following materials are not exempt.

- **2.1** Sulfuric acid with an acid strength of more than 99.0% by weight.
- **2.2** Phosphoric acid with an acid strength of more than 99.0% by weight.
- **2.3** Nitric acid with an acid strength of more than 70.0% by weight.
- **2.4** Hydrochloric acid with an acid strength of more than 30.0% by weight.
- **2.5** Hydrofluoric acid with an acid strength of more than 30.0% by weight.
- **2.6** More than one liquid phase, where the top phase contains more than one percent VOC (wt).

(Adopted 10/19/83; Amended 7/11/84; 7/17/91; 6/7/95; 5/17/00)

This exemption applies solely to permits. The equipment must be operated in compliance with any applicable District regulations and with other regulatory agency requirements. The District's regulations may be viewed online at www.baaqmd.gov/. Note that this exemption is not permanent. Any change in your operation or in District regulations may require you to obtain permits in the future.

Please include your application number with any correspondence with the District If you have any questions on this matter, please call **Thu H Bui, Senior Air Quality Engineer at (415) 749-5119**.

Very truly yours,

Jim Karas
Director of Engineering

for JHO
by
Air Quality Engineering Manager

THB
123.2.6

BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT
SINCE 1955

August 19, 2013

Lehigh Southwest Cement Company
24001 Stevens Creek Blvd
Cupertino, CA 95014

Attention: Scott Renfrew

Authority to Construct for Permit Application No. 25447, Plant No. 17

Required Action

Your Authority to Construct is enclosed. This Authority to Construct is not a Permit to Operate. **To receive your Permit to Operate you must:**

1. Complete the Start-up Notification portion of the Authority to Construct.
2. Send the Start-up Notification to the assigned Permit Engineer via e-mail, fax or mail **at least seven days** prior to operating your equipment.

Note: Operation of equipment without sending the Start-up Notification to the District may result in enforcement action.

Authorization of Limited Use

The Authority to Construct authorizes operation during the start-up period from the date of initial operation indicated in your Start-up Notification until the Permit to Operate is issued, up to a maximum of 90 days. All conditions (specific or implied) included in this Authority to Construct will be in effect during the start-up period.

Contact Information

If you have any questions, please contact your assigned Permit Engineer:

Thu H Bui, Senior Air Quality Engineer

Tel: (415) 749-5119 **Fax:** (415) 749-5030 **Email:** tbui@baaqmd.gov

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BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Authority to Construct

(This is not a Permit to Operate)

Plant No. 17
Application No. 25447

Lehigh Southwest Cement Company

24001 Stevens Creek Blvd, Cupertino, CA 95014

is hereby granted an *Authority to Construct* for the following equipment:

A-157 Selective Non-Catalytic Reduction (SNCR) System to abate S-154 Calciner Kiln

Equipment above is subject to attached condition nos. 603 and 11780.

Approved by for JKC

for JIM KARAS
DIRECTOR OF ENGINEERING

Issue date: August 19, 2013
Expiration date: August 19, 2015

Start-up Notification

Instructions: At least **seven days** before the scheduled initial operation contact your assigned Permit Engineer via email or complete and send this Start-up Notification to the District via fax or mail.

Engineer: Thu H Bui, Senior Air Quality Engineer
Tel: (415) 749-5119 **Fax:** (415) 749-5030
Email: tbui@baaqmd.gov

Plant No. 17
Source No. A-157
Application No. 25447

The initial operation of this equipment is scheduled for ______________ (month/day/year)

Print your first and last name ______________________________

Telephone No. ______________________________

COND# 11780
For Source 154 Cement Kiln, Plant 17

The following federally enforceable conditions limit the emissions of nitrogen oxides (NOx) from the cement manufacturing facility operated by the owner/operator, Lehigh Southwest Cement Company (previously Hanson Permanente Cement, Inc.) located at 24001 Stevens Creek Boulevard, Cupertino, Cal. 95014, for the purpose of complying with Section 182(f) of the Federal Clean Air Act. These conditions represent reasonably available control technology (RACT) for this activity.

A) Definitions: (Basis: CAA Section 182(f) – RACT)

1. Breakdowns shall be handled according to provisions established in BAAQMD, Regulation 1, Section 112 and Section 431 through 434. (Basis: RACT)

2. Cement Kiln is a device for the calcining and clinkering of limestone, clay and other raw materials in the manufacture of cement. (Basis: Applicability)

3. Clinker is a mass of fused material produced in a cement kiln from which the finished cement is manufactured by milling and grinding. (Basis: Applicability)

4. Start-up is that period of time when fuel is first introduced into the kiln to heat it and when the kiln operating temperature reaches normal operating limits and raw material feed begins. A startup period shall not last longer than 36 hours. (Basis: Regulation 9-13)

5. Short ton is equivalent to 2,000 pounds. (Basis: Compliance Verification Component)

6. Shut-down is that period of time when kiln raw material feed and fuel to the kiln begin to be decreased to reduce the kiln operating temperature until both feed and fuel are no longer fed into the kiln and it has ceased operation. A shutdown period shallnot last more than 24 hours. (Basis: Regulation 9-13)

B) Production and Throughput Limits: (Basis: Regulation 2-2-212)

1. The owner/operator shall not process more than 1.6 million short tons per year of clinker. (Basis: Regulation 2-2-212 Cumulative Increase)

2. The owner/operator shall ensure the total throughput of aqueous ammonia hydroxide at S-154 does not exceed 1,850,000 gallons in any calendar year. (Basis: Regulation 2-2-212 Cumulative Increase)

3. The owner/operator shall not exceed 310 ammonia hydroxide delivery trucks in any consecutive 12 month period. (Basis: Cumulative Increase)

4. To determine compliance with the above parts, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above parts, including the following information:
   a. Total monthly hours of operation.
   b. The monthly hours of operation shall be totaled on a yearly basis.
   c. The total daily throughput of clinker and monthly throughput of ammonia hydroxide.
   d. Total monthly number of truck for ammonia hydroxide delivery and their delivery times.

   All records shall be retained on-site for at least five years, from the date of entry, and made available for inspection by District staff upon request. These recordkeeping requirements shall not replace the recordkeeping requirements contained in any applicable District Regulations. (Basis: Cumulative Increase)

C) Emission Limits: (Basis: Regulation 2-2-212)

1. The maximum allowable emission rate for Nitrogen Oxides from all kiln emission points shall not exceed both (i) 527 lb/hour based on 30-operating day rolling average and (ii) a maximum concentration of 201 ppm (dry basis) based on 30-operating day rolling average without correction for oxygen. (Basis: RACT)

2. The kiln emission points affected include the stacks venting the kiln-mill system (dust collector 4-DC-7 through 4-DC-38), the kiln coal mill exhaust (dust collector 5-DC-5) and the precalciner coal mill exhaust (dust collector 5-DC-6). (Basis: RACT)

*3. The emission of Nitrogen Oxides into the atmosphere shall not exceed 2.3 lb/ton of clinker as determined on a 30-operating day rolling average. (Basis: Regulation 9-13)

4. The owner/operator shall not exceed baseline emission level by more than 10 ppmv of ammonia, dry at 7% O2 on a 24-hour rolling average. The baseline ammonia must be established before the permit to operate for SNCR is issued. (Basis: Regulation 9-13).

D) Compliance Determination: (Basis: RACT)

1. All emission determinations shall be made in the as-found operating condition, except no compliance determination shall be established during or using periods of start-up, shut-down, or under breakdown conditions. (Basis: RACT)

2. For the purposes of mass emission limits, Nitrogen Oxides (NOx) shall be calculated as NO2 on a dry basis. (Basis: RACT)

3. The following expression shall be used to convert uncorrected observed volume in parts per million of NOx to pounds of NOx per hour produced at standard conditions of 70 degrees F. and 29.92 inches of mercury: (Basis: RACT)

[(PPMvNOx)(46lb/lb mole)(Exhaust Flow Rate (sdcfm))(60 min/hr)]/ [386 cf/lb mole * 1E6] = lbs NOx/hr

The exhaust flow rate using the readings from six new flow meters is calculated as follows:

[(flow11+ flow26)/2] x 20 + [(flow19 + flow34)/2] x12 – [(flow11 + flow19 + flow26 + flow34)/4] x2 + [flow from two Feed Mills] = Exhaust Flow Rate

There are 20 units that filter process air and exhaust to ambient
There are 12 units that filter process air and send approximately 85% to ambient and 15% to cleaning units
There are 2 units that are cleaning at any one time

E) Monitoring and Records: (Basis: RACT)

1. The owner/operator shall maintain in good working order and operate an in-stack continuous emission monitoring system (CEMS) to demonstrate compliance with the emission limit in Part C.1. and C.4 by measuring the emission of nitrogen oxides (NOx) and ammonia (NH3). The in-stack continuous emission monitoring system shall be located on an emission point of one of the Kiln-Mill baghouses and shall continuously monitor and record NOx and NH3 emissions in a manner approved by the APCO and the EPA Administrator whenever the kiln is operating as defined in Part D.1. above. (Basis: Cumulative Increase)

2. The owner/operator shall maintain daily records of clinker production and heat input including the type of fuel burned and the quantity of fuel burned expressed as millions of BTU per ton of clinker. The amount of clinker produced shall be totaled so that the limit in Part B is not exceeded. (Basis: RACT)

3. The owner/operator shall maintain hourly continuous emission monitoring records for the monitoring system in a form suitable for inspection and approved by the APCO and the EPA administrator. Such records shall include, but are not limited to: (Basis: RACT)

   (i) The continuous emission monitoring measurements for NOx and ammonia expressed in ppm;
   (ii) The date, time, and duration of any start-up, shutdown or malfunction in the operation of any of the kiln systems or the emission monitoring equipment; and,
   (iii) The results of performance testing, evaluation, calibration, checks, adjustments, and maintenance of the continuous emission monitoring system.

4. The CEMS records as well as records of clinker production and heat input shall be maintained at the facility for at least five years and shall be made available to the APCO or the EPA Administrator upon request. (Basis: Cumulative Increase)

F) Manual of Procedures

1. Determination of Nitrogen Oxides: The methods by which samples of exhaust gases are collected and analyzed to determine concentrations of

nitrogen oxides are set forth in the District Manual of Procedures, Volume IV, ST-13A or 13B. EPA Method 7E may also be used to determine compliance. A source shall be considered in violation if the emissions measured by any of the referenced test methods exceed the standards of this rule. (Basis: Manual of Procedures, Volume IV)

Determination of ammonia: The methods by which samples of exhaust gases are collected and analyzed to determine concentration of ammonia are set forth in the District Manual of Procedure, Volume IV, ST-1B and EPA method 350.3 and by the parametric monitors that have been installed pursuant to Section 9-13-501 and meet the requirements of EPA Preliminary Performance Specification PPS-001 for Ammonia CEMs.

2. The CEMS must meet the requirements of District Manual of Procedures, Volume V, Continuous Emission Monitoring, Policy and Procedures. (Basis: Regulation 1-522, 1-602; Manual of Procedures, Volume V)

End of Conditions

Condition #603
S-154 Calciner Kiln
S-171 Kiln Fuel Mill System
S-172 Precalciner Fuel Mill System

Amended by A/N 15398, A/N 18535, A/N 21753, A/N 22953, and A/N 25447

Any condition that is preceded by an asterisk is not federally enforceable.

1. The Owner/Operator shall not operate the pneumatic system from trucks to storage unless it is vented to a dust collection system. The S-171 Kiln Mill System shall be abated by A-171 Dust Collector, and the S-172 Precalciner Mill shall be abated by the A-172 Dust Collector. (Basis: Regulation 2-2-212 Cumulative Increase)

2. The owner/operator of S-171 and S-172, shall not exceed the following usage limits in the Pre-calciner and Kiln (S-154):
   Operation with 100 % coal at maximum 29 tons/hr; or

   Operation with 100% Petroleum Coke at maximum 20 tons/hr

   The Owner/Operator may use any combination of coal and petroleum coke other than specified above, provided that the owner/operator can demonstrate that the total fuel consumption does not exceed 4,960,000 MMBTU/yr (1,600,000 tons/yr clinker x 3.1 MMBtu/ton).

   For calculation purposes, the coal's heat content is assumed to be 25 MMBTU/ton and coke's heat content is assumed to be 29 MMBTU/ton. The values may change depending on each shipment received.

   (Basis: Cumulative Increase).

3. Deleted, (inappropriate PSD analysis trigger level for lead per Regulation 2-2-306)

4. Deleted, (inappropriate PSD analysis trigger level for beryllium per Regulation 2-2-306)

*5. The Owner/Operator of S-154 shall not exceed 1.06 pounds of hexavalent chromium per any consecutive 12-month. (Basis: Toxics)

6. Deleted, (Part 8 replaces quarterly composition analysis of coke)

7. The Owner/Operator of S-154, S-171 and S-172 shall calibrate, maintain, and operate District-approved continuous volumetric flow meters on 4 of the 32 kiln (S-154) exhaust dust collectors (A-141, A-142) and on the fuel grinding mills exhaust dust collectors (A-171 and A-172) as suggested by the manufacturer's recommendation. (Basis: Regulation 2-6-503)

*8. The Owner/Operator of S-154 shall conduct a source test at the exhausts of Dust Collectors (A-141, A-142, A-171 and A-172) at least once per calendar year to demonstrate subsequent compliance with Part 5. The test should be conducted with the raw mill on and the raw mill off. The Owner/Operator shall also test for trace metals contents (Sb, As, Be, Cd, Cr^{+6}, total Cr, Cu, Hg, Mn, Ni, P, Pb, Se, V, Zn), benzene, Hydrochloric Acid (HCl) and total hydrocarbon (THC) at least once per calendar year. The Owner/Operator shall submit the source test results to the District Source Test Section and Engineering Divisions no later than 60 days after the source test. Lehigh may use the same concentrations from A-141 and A-142 if repeated source tests demonstrate that the concentrations from A-171 and A-172 are lower than the concentrations from A-141 and A-142. (Basis: Periodic Monitoring, Regulation 1-502)

9. The Owner/Operator shall obtain approval for all source test procedures from the District's Source Test Manager prior to conducting any tests. The Owner/Operator shall comply with all applicable testing requirements for continuous emissions monitors as approved by the District's Source Test Manager. The Owner/Operator shall notify the District's Source Test Manager, in writing, of the source test protocols and projected test dates at least 7 days prior to testing. (Basis: Source test compliance verification and accuracy)

10. The owner/operator shall maintain daily records (calendar day), in a District approved log, for: (1) the amount of coke and coal usage, each separately (2) the coke's heat content and the coal's heat content. The daily throughput of fuel used and daily average volumetric flow rates shall be submitted to the District once each quarter. All records shall be retained for a period of at least five years from the date of entry. This log shall be kept on site and made available to District staff upon request. (Basis: Recordkeeping)

11. The owner/operator shall operate A-154 Lime Slurry Injection System at a level to maintain HCl emissions from S-154 within the range necessary to comply with the applicable Regulation 9-13 and Federal NESHAPs HCl standard. (Basis: Cumulative increase, revised NESHAP Subpart LLL, Regulation 9-13).

12. The owner/operator of the Lime Slurry Injection system (A-154) shall install, operate and maintain a District-approved continuous hydrochloric acid (HCl) emission monitors at the exhausts of Dust Collectors (A-141 and A-142) as suggested by the manufacturer's recommendation. Lehigh shall continuously measure the exhaust flow rates of Dust Collectors A-141, A-142, A-171 and A-172 and combine them to calculate total HCl emissions. (Basis: Regulation 2-6-503, NESHAP Subpart LLL, Regulation 9-13).

13a. The owner/operator shall maintain hourly continuous emission monitoring records for the monitoring system in a form suitable for inspection and approved by the APCO and the EPA administrator. Such records shall include, but are not limited to: (Basis: RACT)

(i) The continuous emission monitoring measurements for HCl expressed in ppm;
(ii) The date, time, and duration of any start-up, shutdown or malfunction in the operation of any of the kiln systems or the emission monitoring equipment; and,

(iii) The results of performance testing, evaluation, calibration, checks, adjustments, and maintenance of the continuous emission monitoring system.

13b. The owner/operator shall maintain hourly continuous emission monitoring records for the Hg monitoring system in a form suitable for inspection and approved by the APCO and the EPA administrator. Such records shall include, but are not limited to:

(i) The continuous emission monitoring measurements for mercury expressed in ppm (1-hour average);
(ii) The production rates of clinker (tons/hr and tons/month);
(iii) The emission rates of Hg in lb/hr (for each hour of the month, the maximum 1-hour average during month, rolling 3-hr average, and rolling 30- day average) and lb/yr (30-day rolling average and 12-month rolling average);
(iv) The date, time, and duration of any start-up, shutdown or malfunction in the operation of any of the kiln systems or the emission monitoring equipment; and,
(iv) The results of performance testing, evaluation, calibration, checks, adjustments, and maintenance of the continuous emission monitoring system.
(Basis: H&S Code 44300 et seq.)

14a. The owner/operator shall maintain the HCl CEMS records at the facility for at least five years. These records shall be made available to the APCO or the EPA Administrator upon request. (Basis: Cumulative Increase)

14b. The owner/operator shall maintain the mercury (Hg) CEMS records at the facility for at least five years. These records shall be made available to the APCO or the EPA Administrator upon request. (Basis: H&S Code 44300 et seq.)

15a. The HCl Continuous Emission Monitor System (CEMs) shall meet the requirements of District Manual of Procedures, Volume V, Continuous Emission Monitoring, Policy and Procedures. (Basis: Regulation 1-522, 1-602; Manual of Procedures, Volume V)

15b. The mercury Continuous Emission Monitor System (CEMs) shall meet the requirements of District Manual of Procedures, Volume V, Continuous Emission Monitoring, Policy and Procedures. (Basis: Regulation 1-522, 1-602; Manual of Procedures, Volume V, H&S Code 44300 et seq.)

*16. The owner/operator of S-154, S-171 and S-172 shall not emit more than 88 lbs/yr (12-month rolling average) and 0.064 lb/hr ((3-hour rolling average) of total mercury during normal operation. These mercury limits may be revised based on a new stack or other modifications that Lehigh will be making, which could affect the Health Risk Analysis results. (Basis: H&S Code 44300 et seq., Regulation 9-13).

17. The owner/operator of the Activated Carbon Injection System (A-156) shall install, operate and maintain District approved continuous mercury (Hg) emission monitors at the exhausts of Dust Collectors (A-141 and A-142) as suggested by the manufacturer's recommendation. (Basis: H&S Code 44300 et seq.).

*18. Deleted, interim mass balance for mercury before CEM is installed.

*19. Deleted, interim mass balance for mercury before CEM is installed

20. The owner/operator of the Hg CEMs must submit a monitoring plan to the District for approval. All operating parameters must be specified within 90 days of CEMs startup. (Basis: H&S Code 44300 et seq.)

End of Conditions

APPENDIX S:

PERMANENTE QUARRY - BOULDER REMOVAL ACTIVITIES REPORT

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Memorandum

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Date: October 31, 2013

Subject: PERMANENTE QUARRY - BOULDER REMOVAL ACTIVITIES REPORT

Project Description

The Santa Clara County Final Conditions of Approval contained provisions for Lehigh Permanente Quarry to remove boulders from the Permanente Creek Restoration Areas that meet certain requirements. A boulder removal team performed boulder removal activities from within Permanente Creek on Friday, September 6, 2013 to meet the requirements of the Conditions of Approval.

Conditions of Approval Requirements

Conditions of Approval (COA) number 39 of the Santa Clara County Final Conditions of Approval, consistent with the "Best Management Practice for Removal of Limestone Boulders from Permanente Creek" (Attachment J to the RPA) specifies the measures to be taken to remove limestone boulders within Permanente Creek Restoration Areas. According to Attachment J of the RPA "Best Management Practice for Removal of Limestone Boulders from Permanente Creek", boulders which meet the following criteria need not be removed:

- has the potential to significantly destabilize the creek channel or increase the mobilization of sediment in surface waters

- an evaluation indicates the boulder is not a significant source of selenium

Prior Boulder Removal Actions

In August of 2012, a number of boulders were identified as being limestone (Beiber 2012). Of those, fifty-three boulders were further identified that were capable of removal without using mass extraction techniques that would destabilize the creek.

During the fall of 2012, various techniques for removing boulders from the creek were assessed, and it was determined that all techniques that may be employed would require heavy equipment and/or sustain significant environmental damage to Permanente Creek and the habitats within. The least environmentally damaging method was removal with hand tools where feasible.

In October 2012, a study was completed to assess the potential water quality impact of rainfall leaching selenium from the boulders in the inventory by comparing potential selenium leaching rates with water flow in the streambed (Knapp 2012). The study resulted in the finding that the impact of leaching of selenium from the identified boulders into the annual precipitation amount is too low to be stated with any confidence and far less than the current applicable California water quality objective for chronic conditions of 5.0 micrograms/liter of selenium.

Boulder Removal

Although the amount of selenium leaching from boulders into creek waters is not considered a significant source, Lehigh attempted to removal boulders as feasible. Because hand removal was identified as potentially the only non-damaging method, boulders that were capable of being removed by hand were targeted. Boulder 23 as identified in the Beiber report (2012) was identified as being the most capable of being removed as it was small in size and was not substantially buried in the creek substrate. Thus removal of this boulder was feasible without damaging the creek. Boulder 23 was located in the middle of the creek and within 10 feet of the creek thalweg. The 100-year floodplain limit in this area was approximated at 80 feet away.

The boulder removal team attempted various methods of removal using hand tools and manpower. The boulder could not be lifted and carried out because boulder 23 (one of the smallest identified) weighs at least 800 pounds. A person of average strength can lift approximately 50 to a maximum of 100 pounds safely and without mechanical assistance in the best circumstances. This is the basis for many workplace safety standards. Therefore, a team of 8 people would barely be strong enough to pick up a boulder of that weight, and it would likely create unsafe working conditions to do so in uneven terrain, loose soils and thick vegetation.

The boulder was able to be rolled a bit at a time with the use of large pry bars, but with extreme difficulty on anything other than a firm and flat surface. Pry bars were not of much use since the ground below the boulder was comprised of loose soil which did not provide decent leverage or footholds. When attempting to move the boulder uphill, the boulder proved to be very hard to move and required an unrealistic amount of effort and unsafe conditions as using a pry bar required a worker to be positioned below the boulder.

The third method attempted facilitated the use of a 2-ton cable puller (AKA, come-along) and tow straps using nearby trees as anchor points. The boulder was dragged across the creek bed in the direction of the cable puller assembly and depended on the locations of available anchor points (large trees). This method resulted in some success. The boulder removal team was able to drag the boulder across the creek bed and into the riparian undergrowth, as far away from the creek thalweg as possible. Moving boulder 23 to the final resting spot required at least 2 hours.

The final resting place of boulder 23 is 50 feet away from the creek centerline and outside the ordinary flow of the creek, although it is still within the 100-year floodplain. The resting spot was just below the place where boulder cluster #25 exists. A large log prevented the team from moving the boulder any further. The boulder removal team had the ability to go to the northern slope or the south slope with the boulder, but decided that the northern slope, towards the quarry, made more sense because of the moderate slope. Additionally, the quarry on the northern bank was the origin of the material and this bank already exhibited some degree of disturbance. The boulder removal team did not want to impact the southern bank, nor attempt to traverse the steep incline on that side of the creek. Had the boulder been able to be dragged further, impacts to the creek bed and habitat were probable as small 2-foot vertical steps would need to be traversed and notches in these steps would result from dragging the boulder over/through them.

Because some success was had with boulder 23, nearby boulders were assessed for removal as well. Boulder 24 was located near boulder 23 and was of a slightly larger size. The boulder removal team was able to use the same technique to move this boulder, but not as far without causing damage to the creek bed. The WRA team was able to move this boulder a distance of approximately 20 feet, which was outside the ordinary high water mark by approximately 5 feet, but not within 50 feet of the 100-year floodplain limit.

At the locations where boulders 23 and 24 were dragged, the drag mark did not go all the way through the topsoil. The vegetation was able to be moved out of the way and any soil disturbance was repaired with the use of hand tools. Erosion due to moving of the boulders is not expected..

Summary

Although boulders were difficult to remove by hand from the creek, attempts were made to do so without substantially damaging the creek habitat. Success in moving the boulders out of the ordinary high water mark was successful, thus limiting the exposure of the creek waters to the boulders that were moved. However the boulders could not be moved outside the 100-year floodplain.

The boulder removal team could not lift a small-sized boulder as it was far too heavy for removal for a hand crew, especially in rough and sloped terrain. Moving the boulders outside of the 100 year floodplain is not feasible with manual lifting labor alone. Conditions such as terrain, vegetation, slope, anchor points, and location compared to the 100-year floodplain line all played a part. Moving the boulders farther would require more effort, removal of inline obstacles such as fallen logs using chainsaws and removal of other vegetation and would likely cause damage to the creek and banks due to dragging the boulders over steps in the creek profile.

References

Bieber, David. 2012. Permanente Creek Limestone Boulder Survey Report. Geocon Project No. S9325-06-09. Geocon Consultants, Rancho Cordova, CA.

Knapp, Gregory. 2012. Lehigh Permanente Quarry Reclamation Plan Amendment Condition of Approval Boulder Removal Water Quality Impact Analysis. Lehigh Hanson Region West Environmental Affaris, San Ramon, CA.