APPENDIX H
HYDROLOGIC INVESTIGATION

GOLDER

REPORT

Summary of Hydrologic Conditions for Reclamation Planning

Permanente Quarry Reclamation Plan Amendment
Santa Clara County, California

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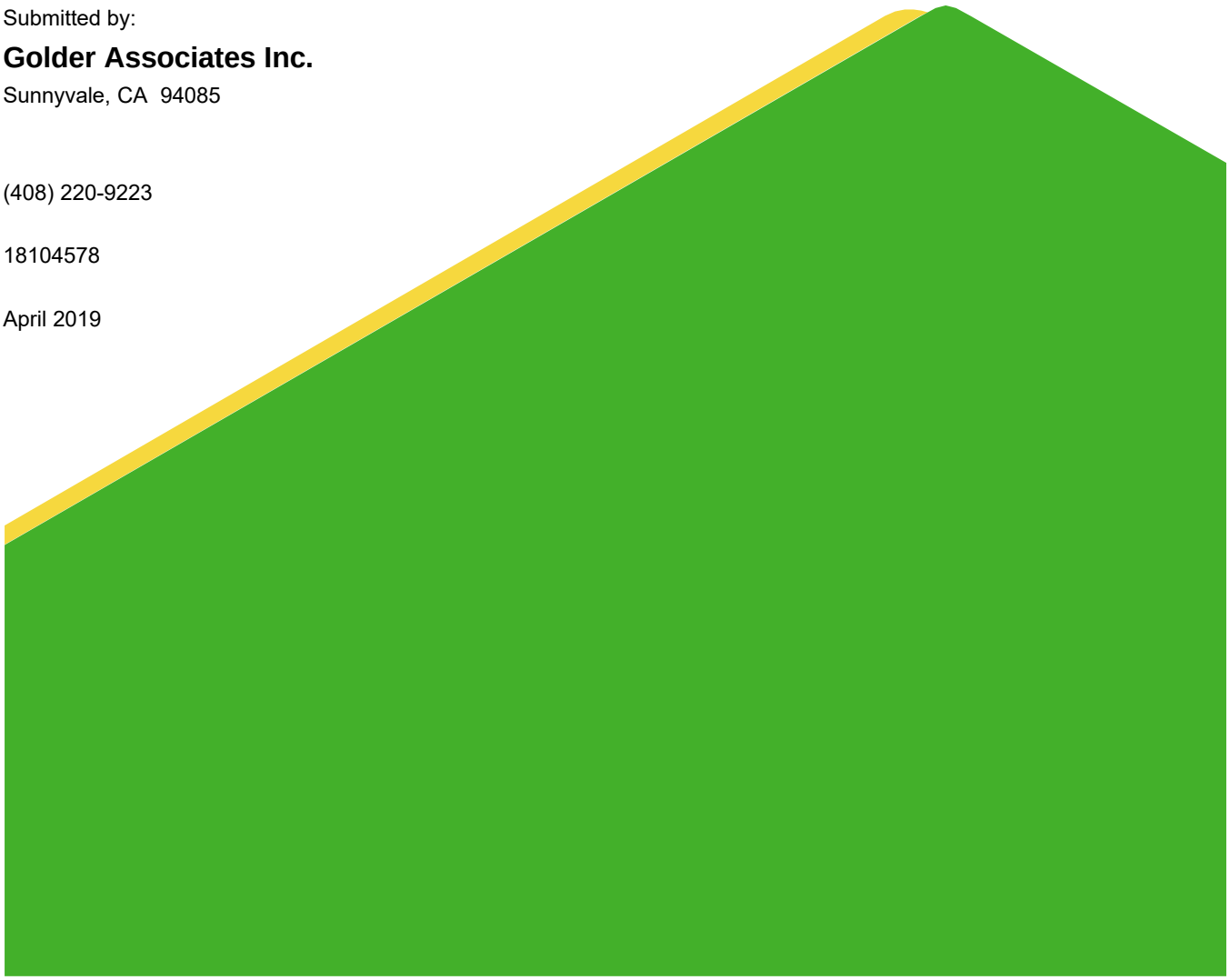

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Executive Summary

Golder Associates Inc. (Golder) has prepared this Hydrologic Investigation for Lehigh Southwest Cement Company (Lehigh) to support its efforts related to the development and reclamation of the existing North Quarry and proposed Rock Plant Reserve located at the Lehigh Permanente Quarry (Permanente Quarry) in Santa Clara County, California.

The objective of this report is to provide an overall characterization of the current hydrologic conditions at the Site, including surface water and groundwater quality, and to evaluate the proposed project (Project) to ensure that the Project is implemented in a manner that complies with California's Surface Mining and Reclamation Act ("SMARA") and protects the surface water and groundwater receptors. Lehigh has prepared an application to update the existing Reclamation Plan. The modifications are designed to incorporate backfill materials that would be superior to the approved Reclamation Plan while updating reclamation planning for continued mineral production. The Project will be multi-beneficial as it provides an alternative solution for grading of the North Quarry North Highwall, continues to provide local source of minerals, and provides a superior mechanism for meeting applicable water quality standards upon closure of the North Quarry and the Western Materials Storage Area (WMSA) as required by newly imposed Waste Discharge Requirements (WDRs). The Project comprises four interrelated but independent activities at the Site:

1) Incorporate development and reclamation of the Rock Plant Reserve (a new area of mining within the vested property). Future resource development would focus on an approximately 31-acre mining area in the southern portion of the Site to the southwest of the Rock Plant. Ground and storm waters generated from this activity would be treated via the Site's treatment system prior to discharge. The reclamation of the Rock Plant Reserve entails covering the final floor with one to two feet of non-limestone material to provide a cover layer to support vegetation. The final condition of this area would leave little exposed limestone surface and is not anticipated to present a significant risk to water quality.

2) Regrade and mine the upper slopes of the North Quarry North Highwall to recover limestone and eliminate the need for a large fill buttress. The regrading of the upper slopes of the North Highwall will not result in a significant change with respect to the ultimate pit depth and backfill elevation from the existing Reclamation Plan as the ultimate pit depth (440 amsl) and backfill elevation (990 amsl) are unchanged. The regrading of the upper slopes will allow for an alternative solution for slope stability while producing greenstone that could be used as a superior backfill material for the North Quarry as compared to solely using the materials stored in the WMSA.

3) Leave the majority of the WMSA in place and complete its reclamation and revegetation sooner than under the approved Reclamation Plan. Leaving the WMSA in place is a preferred approach with respect to water quality based on data collected since 2012, which indicates that disturbing the entirety of the WMSA may result in additional environmental impacts. Selected portions of the WMSA will be regraded or covered to ensure non-limestone material is present at the surface to reduce the potential for selenium or other constituents to become entrained in storm water, and to improve the aesthetic appearance of the stockpile. The details of the closure process will be developed and approved through the Preliminary and Final Closure Plan process mandated by the WDRs

4) Backfill the North Quarry using a combination of imported fill that meets site-specific acceptance criteria and greenstone overburden, with small volumes of WMSA material potentially incorporated into the backfill, all aimed at protecting water quality. Backfilling primarily with greenstone and imported suitable surplus soil will

provide more certainty in achieving water quality standards rather than solely relying on WMSA material as the backfill source as prescribed in the existing Reclamation Plan. Under this Project, some limestone will remain exposed to precipitation in the upper northern wall of the North Quarry after backfilling because backfilling and re-soiling will not cover all areas that have been historically exposed by mining, but this area can be effectively managed. Although there is some evidence that exposed limestone diminishes in reactivity over time, these exposures may continue to be a source of selenium. However, the exposures are relatively limited in extent and primarily located along the northern wall of the North Quarry. Furthermore, Lehigh intends as part of the Project design to install benches, vegetated areas, and related BMPs to reduce peak runoff flow rates and the volume of runoff that directly reaches receiving waters. With these changes, it is expected that long-term water quality objectives will be achieved in a shorter period of time than under the existing Reclamation Plan.

In June 2012, Santa Clara County (County) approved the current Reclamation Plan for the Quarry pursuant to SMARA. Under this plan, Lehigh would reclaim the existing North Quarry mining pit by backfilling with approximately 48 million tons of overburden that is currently stockpiled in the WMSA. This approach to backfilling the North Quarry was based on hydrologic investigations occurring between 2008-2012 and, combined with other reclamation and management techniques, was intended to allow the North Quarry to meet regulatory requirements, among other project goals. Backfilling with WMSA material has not yet commenced.

Since 2012, significant additional site-specific data has been developed regarding the hydrologic conditions at the North Quarry, including the underlying mechanisms affecting surface water and groundwater quality. Additional data has also been generated to evaluate use of the WMSA materials as the sole source of backfill material for the North Quarry. Lehigh commissioned an expanded set of investigations in this period to meet sampling and reporting obligations under the County's 2012 Conditions of Approval (COA) and to comply with more recent investigatory requirements imposed by the San Francisco Bay Regional Water Quality Control Board (Water Board). The Water Board's requirements included a comprehensive ground and surface water monitoring investigation of the WMSA, commencing initially under Water Code section 13260 and presently continuing under WDRs (Provision 3) issued in 2018. A regional selenium monitoring study is also ongoing pursuant to Water Board orders under Water Code section 13267. The data developed through these investigations has allowed Lehigh to refine its approach to reclamation backfilling in furtherance of achieving long-term water quality objectives.

Based on the results of these investigations, the following hydrologic conditions are currently present at the Site:

- Surface water and groundwater quality has been monitored intensively since 2012. The primary constituent of concern (COC) is selenium, though Lehigh evaluates both surface and groundwater quality for a variety of constituents. Selenium occurs primarily in association with the sulfides present in limestone and is released following sulfide oxidation. Following sulfide oxidation, water infiltration is the primary transport mechanism for selenium transport. Selenium water quality standards are derived from the Water Board's Basin Plan (as well as applicable federal regulations) and are the basis of the Water Board Environmental Screening Levels (ESLs). The water quality objective for selenium in federally-recognized surface waters is 5 µg/L (chronic) and 20 µg/L (acute), which is based on the protection of aquatic habitat. The drinking water maximum contaminant level (MCL) applicable to regional ground waters as well as surface waters used for municipal and drinking water supply is 50 µg/L. The aquatic habitat water quality objective is more stringent because it must protect aquatic species, and the bioaccumulation potential of selenium.

- The WMSA stockpile, based on soil borings completed after 2012, contains an estimated 32% limestone (23% limestone waste rock and 9% fines). The borings also indicate that the materials comprising the stockpile are predominantly dry. Field observations and monitoring data suggest that infiltration through the stockpile to the original ground surface and underlying groundwater is limited.
- Groundwater flow beneath the WMSA is controlled by the pre-stockpile topography and two main ridges that formed the side canyon prior to placement of the overburden material in the WMSA. The predominant east-west ridgeline acts as a groundwater divide just north of the WMSA, and groundwater south of this ridgeline flows south towards Permanente Creek.
- Quarterly sampling of groundwater wells in the WMSA from 2015 through June 2018 reveals 11 of 14 wells with selenium concentrations meeting the surface water quality standard of 5 µg/L and all meeting the groundwater standard of 50 µg/L. Elevated concentrations are primarily in locations with recent disturbance related to site operations, indicating that leachability is highest where limestone-enriched material is recently disturbed and exposed (*e.g.*, by groundwater monitoring wells, WMSA-DMW-4 and -11). Dissolved selenium in WMSA surface runoff samples collected in 2013/2014 ranged from 0.7 µg/L to 30 µg/L. Lehigh is currently addressing those values by treating the storm water until closure activities render the surface runoff of sufficient quality to discharge directly to Permanente Creek without the need for active treatment.
- Lehigh has installed an innovative water treatment system to treat quarry and other process waters prior to discharge to Permanente Creek pursuant to a National Pollutant Discharge Elimination System (NPDES) permit. The treatment system is successfully reducing concentrations of selenium discharged to levels below the surface water quality standard of 5 µg/L and below the more stringent discharge requirements set forth in the facility's individual NPDES permit.

This expanded body of data permits a more refined assessment of the water quality effects associated with backfilling the North Quarry solely using WMSA material. WMSA materials in their present state do not appear to be significantly affecting groundwater quality underlying the WMSA, based on post-2012 investigations and monitoring. Data collected demonstrates that the WMSA was placed at grade (thus, not in direct contact with ground water), and the overburden is largely dry. Much of the material has been buried at depth for many years and is exposed to limited oxygen, thus, reducing the occurrence of sulfide oxidation and selenium mobilization via water contact. Much of the overburden material appears not to be exposed to the wet-dry cycle that tends to maximize the generation of selenium. While certain areas, mainly in more recently disturbed overburden, show elevated concentrations of selenium, these areas are localized and can be managed by regrading, removal, or capping to protect water quality.

Minimization of WMSA Backfill Material for the North Quarry

The Project as defined above represents an important improvement as compared to the 2012 Reclamation Plan because it minimizes the use of backfill material sourced from the WMSA, rather than using backfill material exclusively from the WMSA. Relocating all of the WMSA material to the North Quarry would have re-exposed limestone in the overburden and present risks to surface water and groundwater quality, as the material would be exposed to air and water during the process of excavation and placement, making the material more reactive. By limiting use of WMSA material to elevations where saturation is expected to occur more quickly, or where water is not expected to infiltrate in any significant way, will reduce or eliminate the threat. Further, evaluation of surface water runoff generated by the WMSA (which currently flows into the North Quarry and is treated before discharge) demonstrates this material is not best suited to act as the uppermost layer of the North Quarry. Surface water

runoff from newly exposed WMSA materials containing limestone is expected to generate selenium at levels comparable to WMSA runoff samples collected in 2013 (range of 0.7 µg/L to 30 µg/L).

Once backfilling is completed, materials in the Quarry will saturate with a combination of upwelling groundwater, surface water, and direct precipitation. Backfilled material, to a point, will become fully saturated by rising water. However, in the interim, materials within the newly saturated zone, if their origin is solely the WMSA, could leach selenium into groundwater until full saturation occurs, as they may become oxygenated and subject to a seasonal wet-dry cycle. Eventually anaerobic conditions will become established in the backfilled materials as the water level continues to rise and mitigate selenium leachate from forming. Anaerobic conditions may not be achieved, particularly in the upper elevations of the backfill, concurrently with groundwater levels reaching equilibrium.

Achieving Water Quality Standards for North Quarry Using Alternative Backfill Materials

WDRs adopted by the Water Board in 2018 pose a related consideration. The WDRs govern the management and disposal of materials at the site to protect surface water and groundwater quality. The WDRs prohibit placing materials in the North Quarry that would result in the creation of a new waste management unit (WMU) (*i.e.,* the Quarry as a new WMU) without Water Board approval and a demonstration that such activity will not adversely impact water quality. The Water Board has formally designated stockpiled WMSA overburden materials as a Group B waste (*i.e.*, a nonhazardous waste with pollutant concentrations that could exceed water quality objectives or degrade waters of the state) and determined that these materials have the potential to adversely impact groundwater quality. Pursuant to the WDRs, Lehigh must submit a Preliminary Closure Plan for the Site in June 2019 that includes some of the same type of analysis set forth here, and the Preliminary Closure Plan must include Quarry closure alternatives that will minimize water quality impacts. Lehigh is in the process of undertaking the analysis dictated by the WDRs, and on that basis, seeks to modify the Reclamation Plan so that the Reclamation Plan's requirements related to the backfilling project comport with what Lehigh will propose to the Water Board in the Preliminary Closure Plan under the WDRs.

Alternative earth materials exist in sufficient quantities to assist with backfilling the North Quarry and minimizes the water quality risks associated with moving all of the WMSA materials into a location which could exacerbate metals leaching into groundwater. Substantial volumes of greenstone overburden would be generated by re-grading the north highwall of the North Quarry. Sampling and geochemical analysis of the greenstone indicates that it has a low potential to leach selenium at levels above surface or ground water quality standards and may be used as fill material consistent with Water Board/WDR standards (water quality of seeps situated entirely in North Quarry greenstone is generally good, with selenium values below 5 µg/L). Detection of selenium in leachate (WET) testing of greenstone is lowest compared to other lithologies at the North Quarry, similar to results from wall-washing tests in 2009. In addition, a recent study demonstrates that large quantities of suitable surplus soil are generated in the region by local construction and development projects, and is available for import and use for backfilling and reclamation purposes. Imported fill would be subject to quality protocols specific to the Site and the modified approach to backfilling to ensure that the activity is protective of water quality. A long-term monitoring effort would occur to verify that conditions in the field correspond accurately with modeled predictions.[1]

Based on the data since 2012, Lehigh is proposing to amend the Reclamation Plan to allow for alternative sources of backfill materials other than just the WMSA. Reducing or eliminating the amount of WMSA materials utilized as backfill will reduce certain risks to water quality that are disfavored by the Site's WDRs. A portion of those suitable materials will be generated via the regrading and mining of the upper slopes of the north highwall of

[1] Notably, not backfilling the North Quarry would result in the creation of a permanent lake.

the North Quarry. Other material will be generated via the more recently identified opportunity of importing suitable surplus soils resulting from regional development and construction projects.

Finally, the Reclamation Plan amendment allows for reclamation of an additional area of mined limestone resources on the property south of the North Quarry.

Lehigh plans the following amendments to reclamation:

- Minimize the use of WMSA material as quarry backfill in favor of other materials that will provide more certainty to achieve long-term water quality goals. To the extent that portions of the WMSA may be used as backfill, such material would be placed at specified elevations in connection with other fill materials, and would be subject to Water Board approval. Remaining portions of the WMSA would be regraded or covered to reduce the potential for selenium and other metals leaching into storm water.
- Complete mining of the North Highwall Reserve and backfill the North Quarry pit with non-limestone materials comprised of greenstone removed from the 1987 slide, and imported fill from offsite construction and land development that are suitable at the Site to ensure long term water quality. A soils management plan will be developed with Water Board oversight to ensure that imported fill is protective of surface and groundwater quality and meet long-term facility goals and Water Board standards.
- Other aspects of the 2012 Reclamation Plan and general reclamation strategy, as they relate to hydrology and water quality, will remain unchanged. Additionally, Lehigh would continue operating the water treatment system under direction from the RWQCB in the interim until water contributions from the reclaimed facility meet applicable surface and groundwater quality standards. This is consistent with the approach taken by the Water Board and other regulatory agencies, which generally favor a reclamation strategy that reduces the need for perpetual active treatment.

1.0 INTRODUCTION

1.1 Objective

Golder Associates Inc. (Golder) has prepared this Hydrologic Investigation for Lehigh Southwest Cement Company to support its efforts related to the development and reclamation of the existing North Quarry and proposed Rock Plant Reserve located at the Lehigh Permanente Quarry (Site) in Santa Clara County, California (Figure 1.1). The Site consists of a cement grade limestone and aggregate mining operation in the unincorporated foothills of western Santa Clara County, approximately two miles west of the City of Cupertino. The Permanente Quarry mining operations occupy a portion of a 3,510-acre property owned by Hanson Permanente Cement, Inc., and is operated by Lehigh Southwest Cement Company (collectively, Lehigh) (Figure 1.2).

Lehigh has prepared an application to update the existing Reclamation Plan. The modifications are designed to incorporate backfill that would be superior with respect to protection of water quality to the approved Reclamation Plan while updating reclamation planning for continued mineral production. The Project comprises four independent but interrelated activities at the Site:

1. Development and reclamation of the Rock Plant Reserve (a new area of mining within the vested property).

2. Regrade and mine the upper slopes of the North Quarry North Highwall to recover limestone and eliminate the need for a large fill buttress.

3. Backfill the North Quarry using a combination of imported fill that meets site-specific acceptance criteria, greenstone overburden, and potentially, West Material Storage Area (WMSA) materials, to protect water quality.

4. Leave the majority of the WMSA in place and complete its reclamation and revegetation more rapidly than under the approved Reclamation Plan.

The objective of this evaluation is to provide an overall summary of the current hydrologic conditions at the Site, including surface water and groundwater quality characteristics that have been further investigated and developed since the Reclamation Plan's adoption in 2012, and to evaluate the Project elements to ensure they are implemented in a manner that complies with SMARA and continues to best protect the surface and groundwater receptors. The report is organized such that technical details regarding the Site geologic and hydrogeologic setting, geochemical data from rock and water testing, and Site modelling efforts are included as appendices to the main body of the report. The body of the report is focused on the rationale for the proposed amendment to the approved Reclamation Plan (*i.e.*, the four activities described above).

1.2 Regulatory Summary

Mining operations take place subject to California's Surface Mining and Reclamation Act (SMARA). SMARA mandates that surface mining operations have an approved reclamation plan that describes how mined lands will be prepared for alternative post-mining uses, and how residual hazards will be minimized. Santa Clara County acts as lead agency under SMARA. The County approved the current Reclamation Plan in 2012. A cement manufacturing plant (Cement Plant) lies adjacent to the quarry operation and also is owned by Hanson and operated by Lehigh. The Cement Plant is a separately permitted industrial use that is not part of the Quarry operations, and is not subject to SMARA's requirements.

Water quality requirements and performance standards for the Site (as it pertains to the storage and placement of mining materials as well as closure of various aspects of the Site) are set forth by the San Francisco Regional Water Quality Control Board (Water Board) via Waste Discharge Requirements (WDRs) issued pursuant to Title 27 of the California Code of Regulations (CCR) (Title 27) and section 13263 of the California Water Code (CWC) on June 13, 2018 (WDRs No. R2-2018-0028 issued to Hanson Permanente Cement Inc. and Lehigh Southwest Cement Company). The WDRs govern activities that generate mining waste at the Site that have the potential to impact groundwater and any hydrogeologically-connected surface waters (in this case, Permanente Creek) for the protection of human health and the environment. This includes current and historical disposal activities, aspects of quarrying operations that generate waste, and reclamation of waste disposal units. Water quality requirements in the WDRs, derived from federal and state law and corresponding water quality objectives (WQOs) contained in the Water Board's water quality control plan (Basin Plan), will meet or exceed SMARA requirements and are expected to be in place beyond closure under SMARA.

The WDRs were issued in 2018, after the approved 2012 Reclamation Plan. The WDRs contain several provisions that require Lehigh to re-evaluate whether the backfill of the North Quarry as originally prescribed by the 2012 Reclamation Plan would satisfy the mandates of the WDRs and is a sound method for achieving closure of the North Quarry. Specifically, Prohibition A.12. states that "Wastes shall not be disposed in any position where they may migrate from the disposal site to adjacent geologic materials, waters of the State, or waters of the United States during disposal operations, closure, and the post-closure maintenance period." Overburden stored in the WMSA is a "mining waste," which has also been characterized by the Regional Board as a Group B mining waste (as defined by Title 27 and Finding 15 of the WDRs), meaning that it has the potential to impact groundwater and hydrogeologically-connected surface water under certain conditions. Further, the WDRs require that by June 30, 2019, Lehigh must submit a Preliminary Closure Plan that details a "description of planned or draft reclamation activities and closure methods, an evaluation of potential impacts to water quality, and an assessment of methods that could be employed to mitigate potential impacts or alternatives" (WDRs at Provision 4). The Preliminary Closure Plan specifically requires Lehigh to evaluate whether WMSA waste materials remain the option for backfilling the North Quarry, and/or if other approaches are sought to be implemented, then Lehigh must:

- Characterize material used for backfill of the North Quarry
- Evaluate the North Quarry as a potential source of pollutants to groundwater and hydrogeologically-connected surface waters, including a fate and transport analysis of constituents of concern, for example, from any materials that may be proposed for use as fill. The evaluation must also include use of potential methods to immobilize contaminants, if necessary.

Lehigh is in the process of undertaking the analysis dictated by the WDRs, and on that basis, seeks to modify the Reclamation Plan to comport the Reclamation Plan's terms to the backfilling project that Lehigh will be proposing to the Water Board in the Preliminary Closure Plan. This will ensure that the project described in the Reclamation Plan is consistent with the project that will ultimately be undertaken to ensure that the upcoming reclamation/closure activities will avoid or minimize impacts to groundwater and any hydrogeologically-connected surface waters per the WDRs.

1.3 Existing Operations

The mining operations at the Site currently comprise approximately 630+/- acres, which consist of surface mining excavations, overburden stockpiling, crushing and processing/manufacturing facilities, access roads,

administrative offices and equipment storage. The Site also includes other predominantly undisturbed areas, either held in reserve for future mining or which buffer operations from adjacent land uses. The main operational areas of the Site are as follows:

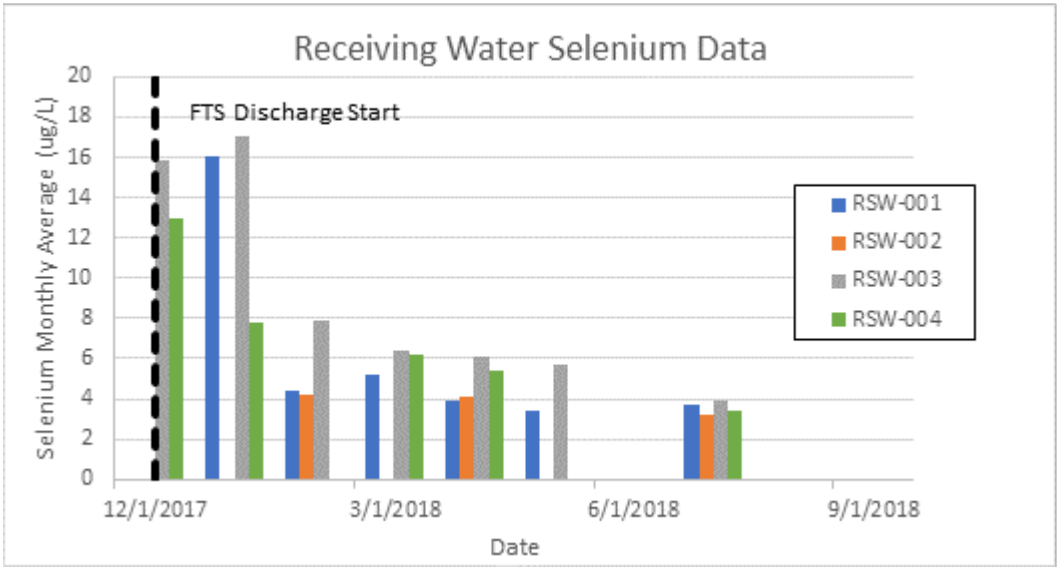
- North Quarry: The North Quarry is where mineral extraction of limestone and aggregate materials currently occurs and has historically taken place. The North Quarry features a large excavation with elevations that currently range from approximately 550 feet to 1,750 feet above mean sea level (amsl). The North Highwall Reserve is an area of remaining limestone to be produced from the North Quarry. Limestone is mined, crushed and used for cement manufacture at Lehigh's adjacent Cement Plant or for aggregate.
- East Materials Storage Area (EMSA): The EMSA is located to the east of the Quarry. Elevations at the EMSA range from 560 feet and 1,270 feet amsl.
- WMSA: The WMSA has been the primary overburden storage area for most of the North Quarry's history. The WMSA includes approximately 140 acres with elevations that range from 1,500 feet to 1,975 feet amsl.
- Rock Plant: The Rock Plant is located in the southeast portion of the Site and is used to process mined material into aggregate products.

1.4 Existing Water Treatment System

Lehigh has installed an innovative treatment system to treat water generated by and stored in the North Quarry and cement plant water from the Reclaim Water System, prior to discharge to Permanente Creek under an existing discharge permit. The treatment system was installed to meet the individual NPDES permit surface water effluent limits. An interim treatment system (ITS) was commissioned in October 2014 and phase 1 of the final treatment system (FTS) was commissioned on October 1, 2018 (called FTS-Upper); the second phase of the final treatment system started commissioning in 2019 (called FTS-Lower). Currently, all of the water from the North Quarry (including storm water that runs off the WMSA into the Quarry), Cement Plant, and Pond 30 is treated prior to discharge to Permanente Creek.

The FTS has been effective in reducing concentrations of parameters; 2018 data has met the NPDES permit effluent limits that includes limits for selenium, pH, turbidity, TSS, chlorine, settleable matter, TDS, hexavalent chromium, thallium, mercury, and acute toxicity. A significant decrease in selenium content was noted in Permanente Creek downstream of the North Quarry discharge point (EFF-001) since the FTS was operational as noted below in Figure 1.3.

Figure 1.3: Receiving Water Selenium Data



1.5 Site Overview

A detailed Site overview and conceptual site model are provided in Appendix A. The Site is situated in the foothills of the rugged, northwest-trending Santa Cruz Mountains segment of the California Coast Ranges and is bisected by the east-flowing Permanente Creek (Figure 1.4). The majority of the Site is underlain by complexly deformed and faulted rocks of the Franciscan Assemblage (Figure 1.5). The major faults in the Site vicinity are shown on Figure 1.6. The eastern portion of the Site, including portions of the Cement Plant and the EMSA, are underlain by Plio-Pleistocene rocks of the Santa Clara Formation, which in turn overlie the Franciscan bedrock. Overlying the bedrock are modern alluvial deposits associated with Permanente Creek (restricted to the eastern portion of the property), and relatively shallow surficial deposits comprised of soil and colluvium.

Groundwater in rugged upland bedrock terrain, such as the Santa Cruz Mountains where the Site is located, typically flows from topographic highs, which act as groundwater divides, to topographic lows forming drainage basins or watersheds (USGS, 1983). Perennial streams in mountainous terrain (absent a lake or snowpack in the headwaters), receive flow throughout the year because of baseflow from groundwater. In unconfined to semi-confined systems, groundwater flow typically follows the local, original topography. Drainage basins are typically comprised of smaller sub-basins. In mountainous terrain similar to the physical setting of the Site, sub-basins are created from side canyons and smaller ridges typically trending normal to the dominant ridges. On the portion of the Site underlain by the WMSA, this drainage pattern is no longer evident, as the current topography has been altered from the original topography to facilitate the storage of overburden and related materials. However, a review of aerial photographs and historical topographic maps indicates that the ground surface was not altered (*i.e.,* mined or otherwise significantly graded) in the WMSA prior to placement of overburden.

The Site consists of generally low hydraulic conductivity bedrock in an area of pronounced local relief. Groundwater flow is predominantly controlled by local- to intermediate-scale systems, linking recharge in topographically higher areas to discharge within adjacent or nearby topographically lower areas (Freeze, 1979). Groundwater predominately recharges along local ridges and elevated terrain, and predominantly discharges to local drainages and lower terrain where the water table is intersected. The key characteristic of this type of system

is the occurrence of a shallow water table in the local drainages that in turn provides a location for groundwater to discharge locally.

2.0 PROPOSED PROJECT DISCUSSION

The Project is an amendment to the approved reclamation plan. It will be multi-beneficial as it includes an alternative solution for slope stability of the North Quarry North Highwall, a continued local source of in-demand minerals, and provides a superior environmental solution for backfilling the North Quarry that will increase certainty in meeting applicable water quality standards and reduce "interim" impacts that could occur during the reclamation process. The existing Reclamation Plan, approved in 2012, calls for backfilling the North Quarry with material currently stored in the WMSA to an elevation of at least 990 ft amsl, which is equal to the anticipated steady-state groundwater elevation. Since 2012, a significant amount of additional data has been developed, derived from the numerous and intensive regulatory-driven investigations and other data gathering exercises undertaken by Lehigh from 2013 to date. These investigations and data gathering exercises were performed to further evaluate the Site's soil/stored materials, groundwater, and surface water. Based on these data, and with the WDR mandates in mind, Lehigh has concluded that using the WMSA as the sole source of backfill is not the most environmentally preferable option for backfilling the North Quarry, for the reasons described herein.

2.1 Rock Plant Reserve

The Rock Plant Reserve is located on the north side of a topographic divide that separates Monte Bello Creek to the south from Permanente Creek to the north (Figures 2.1 and 2.2). The planned mining will consist of a cut slope into the north-facing slope of the area with a proposed ultimate quarry floor elevation of 915 feet amsl. Groundwater level in the Rock Plant Reserve is approximately 1,075 feet amsl (GT-2-14, Figure 2.3). A groundwater divide is present in the vicinity of the topographic divide with an estimated long-term average groundwater elevation of about 1,550 feet amsl based on water level measurements at monitoring location HG-5. The catchment of the Rock Plant Reserve is estimated to be 50 acres. The area of the low-point (channelized area) of the Rock Plant Reserve at 915 feet amsl is estimated to be approximately 2.4 acres. The channelized area ties into a natural drainage to the east that flows to the north into the Rock Plant area.

Baseline water quality conditions in the vicinity of the Rock Plant Reserve were characterized based on the results of water quality sampling over a two-year period (HG-series wells, 2009 to 2011), and recent sampling (September 2018) of well GT-2-14 in the Rock Plant Reserve. The GT-2-14 groundwater data was similar to the HG-series of wells in 2009-2010 (Appendix B). Metals were detected at low levels (*e.g.,* selenium at 1.4 micrograms per Liter (µg/L)). These data remain a valid representation of baseline conditions for the Rock Plant Reserve because the area has remained in an undeveloped condition since these data were collected.

2.1.1 Operations

The Rock Plant Reserve is designed to divert potential run-on from upland areas to reduce the amount of storm water entering the quarry; storm water and direct precipitation from within the proposed quarry footprint will be directed to collect at the quarry floor. No impacts to Monte Bello Creek are anticipated because of the nature of the proposed quarry development and its location to the north of the groundwater divide that contributes baseflow to Monte Bello Creek. Overall impacts to Permanente Creek are expected to be minimal as any groundwater seepage into the Rock Plant Reserve during operations will be managed and treated, along with storm water runoff and direct precipitation, as process water within the Site's existing Reclaim Water System and returned to Permanente Creek after being treated via Lehigh's Final Treatment System.

Quarry water quality in the Rock Plant Reserve during operations will depend on several factors such as: the types and relative amounts of rock units exposed in the quarry, dilution of storm water runoff by direct precipitation, and geochemical reactions that may attenuate metals by precipitation or surface adsorption. It is assumed that water quality at the North Quarry will be an analog for Rock Plant Reserve water quality. The pH of storm water runoff into the Rock Plan Reserve quarry is expected to be circum-neutral to alkaline. TDS concentrations are expected to be in the range of 10s to 100s of mg/L, and dissolved metals are expected to be present at detectable levels (see Appendix B). However, storm water generated during Rock Plant Reserve operations will be treated prior to its discharge to receiving waters (Permanente Creek) to ensure that it will meet applicable regulatory criteria.

The quality of any groundwater that enters the Rock Plant Reserve during mining activities is expected to be within the ranges of the baseline water quality (*e.g.*, GT-2-14, Figure 2.4) to the quality measured in the North Quarry dewatering wells (Appendix B). The pH is expected to be circum-neutral to alkaline. Total dissolved solids (TDS) concentrations are expected to range from hundreds to thousands of milligrams per Liter (mg/L) (TDS concentrations in baseline groundwater and the North Quarry dewatering wells has ranged from 120 to 1,500 mg/L). Metals are expected to be present at detectable levels (Appendix B). However, as with the storm water inputs into this quarry, this water will be treated prior to its discharge to receiving waters (Permanente Creek), so as to meet applicable regulatory criteria.

2.1.2 Reclamation

The proposed reclamation of the Rock Plant Reserve entails covering the final floor with one to two feet of non-limestone material to provide a cover layer to support vegetation. Inflows to the Rock Plant Reserve will include direct precipitation and groundwater inflow. Storm water from the undeveloped, upper portion of the drainage will be diverted from entering the Rock Plant Reserve post-reclamation. An open water body (*i.e.*, quarry lake) is not planned based on the design of the mining and reclamation. The groundwater outflow from the reclaimed Rock Plant Reserve is expected to equal the predicted steady-state groundwater inflow of approximately 29 to 38 gpm; this will discharge as seepage from the cut slope based on an analytical model developed (Marinelli and Niccoli (2000)) to estimate the groundwater flow in the Rock Plant Reserve at full development for steady-state conditions. Details of the model setup, input parameters, and assumptions are included in Appendix C. As greenstone is primarily present along the cut slope, it is anticipated seepage emanating from the cut slope will behave similarly to the North Quarry 750-seep where the seepage rate is temporally dependent with lower flow rates during the dry season. Minimal changes to groundwater levels are anticipated.

The exposed high wall will be primarily comprised of greenstone; therefore, it is anticipated that less sulfide minerals and sulfide oxidation weathering products (source of sulfate and metals) will be mobilized following reclamation. As shown by the geochemical characterization results from testing various quarry materials, some samples of greenstone can be enriched in total metals compared to limestone (Figure 2.5). However, based on laboratory-based leachability testing (Figure 2.6) and North Quarry water quality monitoring at the 750-Seep where seepage enters the North Quarry through fractured greenstone, metals concentrations are anticipated to be much lower than seepage that contacts limestone. As the surfaces of the Rock Plant Reserve are reclaimed, the quality of surface runoff from storm water and groundwater are expected to improve to be similar to groundwater from GT-2-14 and the 750-seep, which meet water quality objectives (*e.g.*, selenium less than 5 µg/L). Until water quality objectives are met, the water will continue to be managed and treated under a NPDES permit prior to discharging to Permanente Creek.

2.2 North Highwall Reserve

The North Highwall Reserve represents the continued excavation and concurrent reclamation of the North Quarry (Figure 2.1). Greenstone would be recovered from the historical slide and development, which can be used as backfill in the North Quarry or be placed in the WMSA.

2.2.1 Operations

During operations, there will be minimal changes to groundwater and surface water management for the North Quarry. The North Quarry floor elevation was 525 feet amsl during water year (WY) 2018. Based on proposed development plans, the ultimate quarry floor elevation will be 440 feet amsl, consistent with the existing Reclamation Plan. The North Quarry floor will have a surface area footprint of approximately 93 acres. The current active dewatering system consisting of extraction wells and sump pumps will continue to manage water as the North Quarry is fully developed. Concurrent backfilling of certain portions of the North Quarry will occur where feasible.

A water balance model was prepared for the North Quarry to present the nature and magnitude of the hydrological components influencing North Quarry water management during WY 2018 and to verify the predictions from the numeric model. The water balance accounts for inflows (groundwater, precipitation, runoff, reclaim water), outflows (discharge amount and evaporation) and the change in storage volumes within a defined hydrologic system (North Quarry) during a specific period (WY 2018). Appendix C contains a detailed description of the various components of the analyses and hydraulic properties. Figure 2.7 is a semi-log plot of the water balance estimated for the North Quarry. The WY 2018 water balance for the North Quarry is summarized in Table 2.1. During WY 2018, the estimated total amount of inflow (*i.e.,* precipitation, surface water runoff, Pond 11 discharge, and groundwater) into the North Quarry was 48,049,950 ft^3 (1,103 acre-ft). The total surface water runoff that entered the North Quarry during WY 2018 was estimated to be 4,345,763 ft^3 (99.8 acre-ft). The total estimated amount of groundwater that entered the Quarry was 39,283,518 ft^3 (902 acre-ft) with an annual average flow rate of 559 gpm. The average groundwater flow into the Quarry between mid-July and the end of September (*i.e*., when no pumping occurred) was estimated to be 326 gpm, which is in line with the predicted modeled conditions of 371 gpm for floor elevation of 440 ft amsl.

As the North Highwall Reserve is along the north wall of the current North Quarry, the surface water runoff and groundwater inflow during the operational period will be similar to the current circumstances, as will the outflow of quarry groundwater to Permanente Creek. Therefore, the water quality in the North Quarry during the operational period is expected to remain similar to current conditions. The metals/metalloids that are typically mobile under neutral pH conditions and present in the North Quarry dewatering well water and quarry water discharge are likely to remain at similar concentrations at these locations during the time required to mine the North Highwall Reserve. However, the water will be treated prior to its discharge to receiving waters (Permanente Creek) to meet applicable regulatory criteria.

Water quality in Permanente Creek adjacent and downstream of the North Quarry is expected to continue to improve, and to attain water quality standards, during continued operation of the North Quarry as quarry discharge water will continue to be treated before it is discharged to Permanente Creek.

2.2.2 Reclamation

The planned reserve development and reclamation for the North Highwall is similar to the current 2012 Reclamation Plan for the North Quarry, where the ultimate quarry floor elevation will be 440 feet amsl and the backfill level will be 990 feet amsl, and therefore, the proposed plan does not significantly change the model

parameters of the numerical groundwater flow model (Golder, 2011). The results of the modeled conditions predict a steady-state groundwater inflow of 371 gpm to the North Quarry at the end of mining when the quarry floor elevation is 440 feet amsl and a steady-state post-reclamation average annual groundwater inflow to the North Quarry of 80 gpm. The predicted annual average post-reclamation water table elevation in the North Quarry is 990 feet amsl; this represents the low-point elevation of the ultimate grading plan for the North Quarry and thus will result in the water table being close to or daylighting at ground surface. The predicted average annual groundwater discharge to the middle reach of Permanente Creek is 0.79 cfs.

Reclamation is expected to occur concurrently for the North Highwall Reserve area and continue for the North Quarry after the end of mining until a backfill elevation of 990 feet amsl is reached. The North Quarry will capture surface water runoff from the total catchment area of the North Quarry during reclamation, which includes the WMSA and North Quarry footprint. Runoff during post-reclamation will only be captured by the footprint of the North Quarry area because the runoff from the WMSA area will drain to Permanente Creek separately. Water quality is discussed under Section 2.3.2.

When the North Quarry dewatering system is no longer needed, groundwater levels will begin to recover, filling in the void spaces of the backfill material in the North Quarry until the water table reaches a steady-state equilibrium where recharge is balanced by discharge. The water table may daylight at the surface in the low elevations of the post-reclamation ground surface of the North Quarry and then flow via the shallow subsurface or ground surface towards Permanente Creek. The recovery rate of the groundwater in the North Quarry area will be largely influenced by the amount of total inflows (*i.e.,* precipitation, surface runoff, and groundwater flow) to the quarry area during backfilling, the backfilling rate, and the amount of recharge to the overall groundwater system. Annual climatic variability will influence the overall rate of groundwater level rise within the North Quarry backfill.

The estimated total average annual inflow to the North Quarry at equilibrium is 174 gpm (Appendix C). Some groundwater is expected to discharge to Permanente Creek and or to downgradient groundwater units. After equilibrium is reached and the Quarry is backfilled to elevation of 990 feet amsl, during periods of intense rainfall and during seasonal high groundwater conditions, there is a potential for surface water to flow from the reclaimed North Quarry to Permanente Creek.

2.3 North Quarry Backfill

The North Quarry will be backfilled to 990 ft amsl to ensure a pit lake is not present at reclamation (Figure 2.1). Based on the additional data developed since 2012, and with the WDR mandates in mind, the data indicates that using the WMSA as the sole source of backfill is not the most environmentally preferable option for backfilling the North Quarry. Instead, the primary use of other supplemental earth materials is expected to provide an environmentally superior solution that will lead to less uncertainty regarding compliance with water quality-related mandates, and reduce the potential need for additional controls/mitigation measures for final closure. The supplemental earth materials include on-site greenstone overburden generated by the proposed mining, and imported fill (S3) generated from off-site sources.[2]

[2] S3 meaning “suitable surplus soil”, as defined for purposes of this evaluation, consists of soil, rock, sand, and broken concrete generated at a construction site during demolition, excavation, or grading that is not retained and reused at the site where the material is generated. S3 will meet the regulatory definitions of a non-hazardous, non-designated waste per Federal and/or California regulations and not contain other potential contaminants that could adversely affect water quality or ecological receptors associated with exposure pathways. An example of S3 would be the soil and rock generated by excavating land for construction of a new regional development, as has been recently exemplified by a tech-based campus. Availability of S3 material is defined and addressed in the Suitable Surplus Soil Availability Study report.

2.3.1 Operations

The characterization of on-site greenstone indicates that these materials are suitable for use as backfill material pending approval by the Water Board (see Appendix D for a detailed summary of the characterization results). However, sources are limited, and insufficient quantities of greenstone will be produced from mining operations to backfill the entire North Quarry. It has been determined that surplus soil from regional construction would be beneficial in backfilling the North Quarry. The use of imported fill will be superior as it will allow for the specification of the type and chemical composition of the backfill material to ensure that water quality impacts are minimized during placement and in a saturated state once North Quarry dewatering activities cease and groundwater levels are restored. By doing so, attainment with water quality objectives and the WDR mandates can be achieved with greater certainty, with limiting interim impacts, and in an expedited timeframe. An imported soils management plan will be developed for approval by the Water Board to govern the procurement and placement of the imported fill. That plan will outline a systematic approach for acceptance of the material based, in part, on the CalEPA's Information Advisory on Clean Imported Fill Material guidance document (DTSC, 2001). The management plan will contain acceptance criteria based on Water Board Environmental Screening Levels (ESLs) and potential exposure pathways, and outline the required geotechnical and geochemical characterization of the material prior to selection, acceptance, and placement to ensure quality of the material. The material will not contain construction debris, asphalt, or other potential contaminants that could adversely affect water quality. Further, pursuant to the Closure Plan required by the WDRs, monitoring and verification of expected outcomes will occur, which will be reviewed by the Water Board and, informationally, by other regulatory agencies (WDRs at Provision 5).

Additional characterization of the WMSA has been completed since 2012 (see Appendix E). This expanded body of data permits a more refined assessment of the water quality effects associated with backfilling the North Quarry solely using WMSA material. By implementing the 2012 Reclamation Plan "as approved," there is a greater potential that the backfilling activities will cause the water quality underlying the North Quarry to deteriorate and lead to a more ubiquitous problem. Once backfilling of the North Quarry is completed, materials in the North Quarry will saturate with a combination of groundwater, surface water, and direct precipitation. At various levels within the North Quarry (and at various timeframes), anaerobic conditions will become established in the backfilled materials and mitigate selenium leachate production. Anaerobic conditions may not be achieved in the upper elevations of the backfill, concurrently with groundwater levels reaching equilibrium. Thus, the prudent approach to use of any WMSA materials is to use them strategically during the North Quarry backfilling process, if needed, to ensure optimum conditions exist to minimize leaching of constituents, such as selenium.

2.3.2 Reclamation

It is assumed that the backfill material will be primarily composed of greenstone and imported fill. During this time, the North Quarry water level will be managed to ensure placement can occur under dry conditions. Water quality in the reclaimed North Quarry will primarily depend on the interaction of storm water runoff with materials that remain exposed above the water level and the long-term water quality associated with the backfill materials. For this reason, Lehigh is committed to securing appropriate materials to place at the high elevation/surface of the North Quarry. In general, for most constituents, peak concentrations are expected to occur during the early period of groundwater level recovery in the North Quarry as sulfide oxidation weathering products (source of sulfate and metals) are flushed from the quarry walls. The flooding of the backfill materials will essentially cease the oxidation of sulfide minerals present in the submerged quarry walls, thereby eliminating these sources of sulfate and metal loading.

As the groundwater level within the North Quarry increases, the quality of the water in the backfilled Quarry will dominate the overall water quality, and short-term variations due to changes in the relative inflows (*i.e.,* relative volumes of precipitation, groundwater inflow, and surface runoff diverted from the WMSA) are expected to diminish.

During the backfilling, water will be contained within the North Quarry and not discharged to Permanente Creek without being processed through the Final Treatment System because groundwater flow will be inward to the quarry pit. Over time, water quality in Permanente Creek adjacent to the North Quarry is expected to become more like water quality at the monitoring location SW-1 and WMSA-SW-A and WMSA-SW-B (Appendix B) upstream of the WMSA and North Quarry in upper Permanente Creek as equilibrium in the groundwater level is reached. As the North Quarry is flooded and reducing environments are re-established, deep groundwater in the backfilled quarry is anticipated to have the water quality of regional groundwater (*e.g.,* wells EW-1 and EW-3, Appendix B).

Shallow groundwater quality (*i.e*., the pore water in the upper portion of backfill material that is influenced by infiltration from the surface) may vary seasonally as inflows change. Some features of the North Quarry that influenced water quality during operations and reclamation will have less of an influence on water quality in the post reclamation period, including the 850-Seep, which are not expected to act as influent sources for metals and sulfate after groundwater reaches a static level. Sulfide minerals present mainly on the northern portion of the North Quarry wall above the final groundwater elevation (*i.e.*, limestone in the exposed highwall is estimated to cover approximately 33 acres of the North Quarry catchment area) are expected to continue to be a source of sulfate and metal loading to water after backfilling and the water level reaches elevation 990 ft amsl. This surface water will run down the quarry walls and infiltrate the backfill material to mix with the North Quarry water (*i.e.,* groundwater in the backfill material). Where vegetated soil covers are established, the peak runoff flow rates will be substantially lower than in the operational period, and the quality is expected to improve due to reduced exposure and attenuation of runoff and metals, sulfate, and other constituents.

Once the North Quarry is backfilled and groundwater returns to regional groundwater levels, selenium concentrations in the North Quarry water are predicted to be less than 5 µg/L (Appendix F). This was calculated by applying a selenium concentration of 30 µg/L for runoff emanating from the exposed limestone highwall area based on wall washing and STLC results, 1 µg/L for direct precipitation on the backfilled material, 2 µg/L for groundwater inflow into the North Quarry, and 2.5 µg/L for greenstone/graywacke exposed areas during an average precipitation year. In addition to the selenium concentrations, it was assumed that the contribution of each component is fully mixed and that other sources of selenium are not present. Additional verification and monitoring will be completed to validate these assumptions. Treatment is currently required for water discharged from the North Quarry to Permanente Creek to meet water quality standards for selenium; once the proposed backfilling project is complete, or geochemical conditions allow Lehigh can evaluate ceasing active treatment for this area of the facility.

2.4 WMSA Final Contours

Greenstone and earth materials may be added to the WMSA during mining activities to an approximately 2,060 feet amsl final elevation (Figures 2.1 and 2.2). Once the WMSA reaches this design elevation, WMSA surfaces will be regraded to 3H:1V slopes or less to improve geotechnical stability and surface water management (Stantec, 2019). Topsoil and other amendments will be placed on the slopes, and vegetation planted in a manner consistent with the revegetation plan component of the proposed Reclamation Plan amendment. The pre-SMARA

slopes will be reclaimed following the existing Reclamation Plan, as this amendment has no impact on the pre-SMARA slopes.

2.4.1 Operations

As noted previously, WMSA materials in their present state do not appear to be significantly affecting groundwater quality, based on post-2012 investigations and monitoring. The potential addition of greenstone to the surface of the WMSA is not expected to pose a risk to groundwater or surface water. The regrading of the WMSA may have a short-term impact to groundwater quality if significant amounts of limestone-containing material already present in the WMSA are disturbed. This would be more likely to occur in areas where the thickness of the overburden is less (*e.g.*, along the eastern portion of the WMSA). Lehigh will take measures to minimize the amount of disturbance and surface exposure of material that may contain limestone by ensuring the final cover material does not contain significant quantities of limestone. Storm water runoff will likely have levels of metal present as noted in the 2014 sampling (Appendix B). However, Lehigh will continue to direct runoff to the North Quarry during the operational period where the runoff will be treated prior to discharge.

2.4.2 Reclamation

Selected portions of the WMSA will be regraded or covered to ensure non-limestone material is present at the surface to reduce the potential for selenium or other constituents to become entrained in storm water. At reclamation, storm water will no longer be directed to the North Quarry, but instead to Permanente Creek, as runoff is anticipated to be similar to the values observed at the EMSA cover. As part of the Reclamation Plan conditions of approval, samples were collected in the wet months of March/April 2016, 2017, and 2018 from the EMSA where a non-limestone cover (*i.e.*, a 1-foot cover composed of rock other than limestone) had been placed (Golder, 2017; Golder, 2018). Low levels of selenium (*i.e.*, <5 µg/L) were measured in the majority samples collected from areas where water collected on the surface (*i.e.*, ponded water) or in runoff samples that had contacted the non-limestone cover (Appendix B). The average concentration of the 70 cover samples collected was 2.5 µg/L. The data demonstrates that runoff in contact with the cover material will not generate elevated levels of selenium.

Based on the groundwater monitoring program and material characterization, there appears to be limited groundwater areas within the WMSA that are impacted from the material placement. In undisturbed areas within the WMSA, groundwater quality generally meets water quality standards. An area located in a pre-SMARA slope is in the process of being characterized under the WDRs. The water quality protection measures for this area will be developed and approved through the Preliminary and Final Closure Plan process mandated by the WDRs and the amended Reclamation Plan, which is expected to mirror the work that will be implemented under the WDRs to achieve final closure.

3.0 SUMMARY AND RECOMMENDATIONS

Lehigh proposes to amend the existing approved Reclamation Plan to better protect long-term water quality. The primary modifications related to water quality are backfilling of the North Quarry primarily with mined greenstone overburden and imported fill and minimizing backfilling by solely using existing overburden materials contained in the WMSA. The planned operations address several inter-related issues regarding water quality standards related to closure of the North Quarry and the WMSA as required by newly imposed Waste Discharge Requirements. The planned operations have the benefit of not disturbing the entombed overburden in the WMSA (with associated reduction of risk related to disturbance of limestone materials), while providing backfill for the

North Quarry that is non-limestone bearing and will therefore present less risk to surface water and groundwater quality over time.

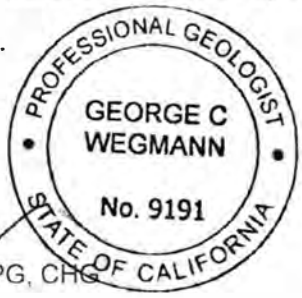
If the Reclamation Plan is modified to incorporate the planned operations, we recommend that the terms of the updated Reclamation Plan include the following principles:

- Recognize the primacy role of the Water Board in determining Site closure activities that are based on water quality protection.
- Recognize that Reclamation Plan provisions for Site closure must be flexible enough to follow the process and be consistent with the Preliminary and Final Closure process set forth in the facility WDRs.
- Recognize the role of the Water Board in determining suitable North Quarry backfill materials for the protection of water quality. Incorporate imported soil management criteria into the Reclamation Plan as a COA after the Water Board has approved.
- Allow for closure monitoring to adapt to be consistent with monitoring plans approved by the Water Board.

4.0 CLOSING

This report has been prepared and reviewed by the undersigned.

Golder Associates Inc.



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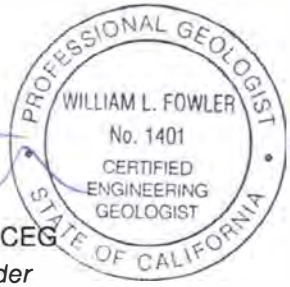

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List of Acronyms and Abbreviations

ABA acid base accounting
amsl above mean sea level
ANP acid neutralization potential
AN acid neutralization
bgs below ground surface
CAM 17 California Title 27 metals
COA Santa Clara County's 2012 Conditions of Approval
County Santa Clara County
CCR California Code of Regulations
CWC California Water Code
CY cubic yard
EMSA eastern materials storage area
ESLs San Francisco Bay Regional Water Quality Board Environmental Screening Levels
FTS final treatment system
GAMA Groundwater Ambient Monitoring and Assessment Program
gpm gallons per minute
ITS interim treatment system
Lehigh Lehigh Southwest Cement Company
NPDES National Pollution Discharge Elimination System
NPR neutralization potential ratio
mg/L milligram per Liter
RWQCB San Francisco Bay Regional Water Quality Control Board
Title 27 California Code of Regulations (CCR) 27
TTLC total threshold limit concentration
S3 imported suitable surplus soils
SBFZ Sargent-Berrocal Fault Zone
Site Approximately 630+/- acres of surface mining excavations, overburden stockpiling, crushing and processing/manufacturing facilities, access roads, administrative offices and equipment storage
SMARA California's Surface Mining and Reclamation Act
STLC soluble threshold limit concentration
SVOCs semivolatile organic compounds
µg/L microgram per Liter
VWP vibrating wire piezometers
VOCs volatile organic compounds
WDR waste discharge requirements
WET waste extraction test
WMSA western materials storage area
WMU waste management unit
XRD X-ray diffraction

Tables

Table 2.1

North Quarry Water Balance (Water Year 2018)

Component	Units	Total
Precipitation	cu ft	295,178
	acre-ft	6.8
	gpm (ave)	4
Surface Runoff	cu ft	4,345,763
	acre-ft	99.8
	gpm (ave)	62
Pond 11 Discharge to North Quarry	cu ft	4,125,491
	acre-ft	94.7
	gpm (ave)	59
Groundwater Inflow	cu ft	39,283,518
	acre-ft	902
	gpm (ave)	559
Total Inflow	**cu ft**	**48,049,950**
	acre-ft	**1,103**
	gpm (ave)	**684**
Evaporation	cu ft	878,095
	acre-ft	20.2
	gpm (ave)	12
Quarry Pumping	cu ft	24,603,862
	acre-ft	564.8
	gpm (ave)	350
Net Change in Quarry Storage	cu ft	11,703,575
	acre-ft	268.7
	gpm (ave)	167
Total Outflow + Change in Storage	**cu ft**	**37,185,532**
	acre-ft	**854**
	gpm (ave)	**529**

Figures



0 2.5 5 10 15
Miles

REFERENCES

Spatial Reference:
NAD 1983 StatePlane California III FIPS 0403 feet

Base Maps
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PROJECT

PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT
SANTA CLARA COUNTY, CALIFORNIA

TITLE

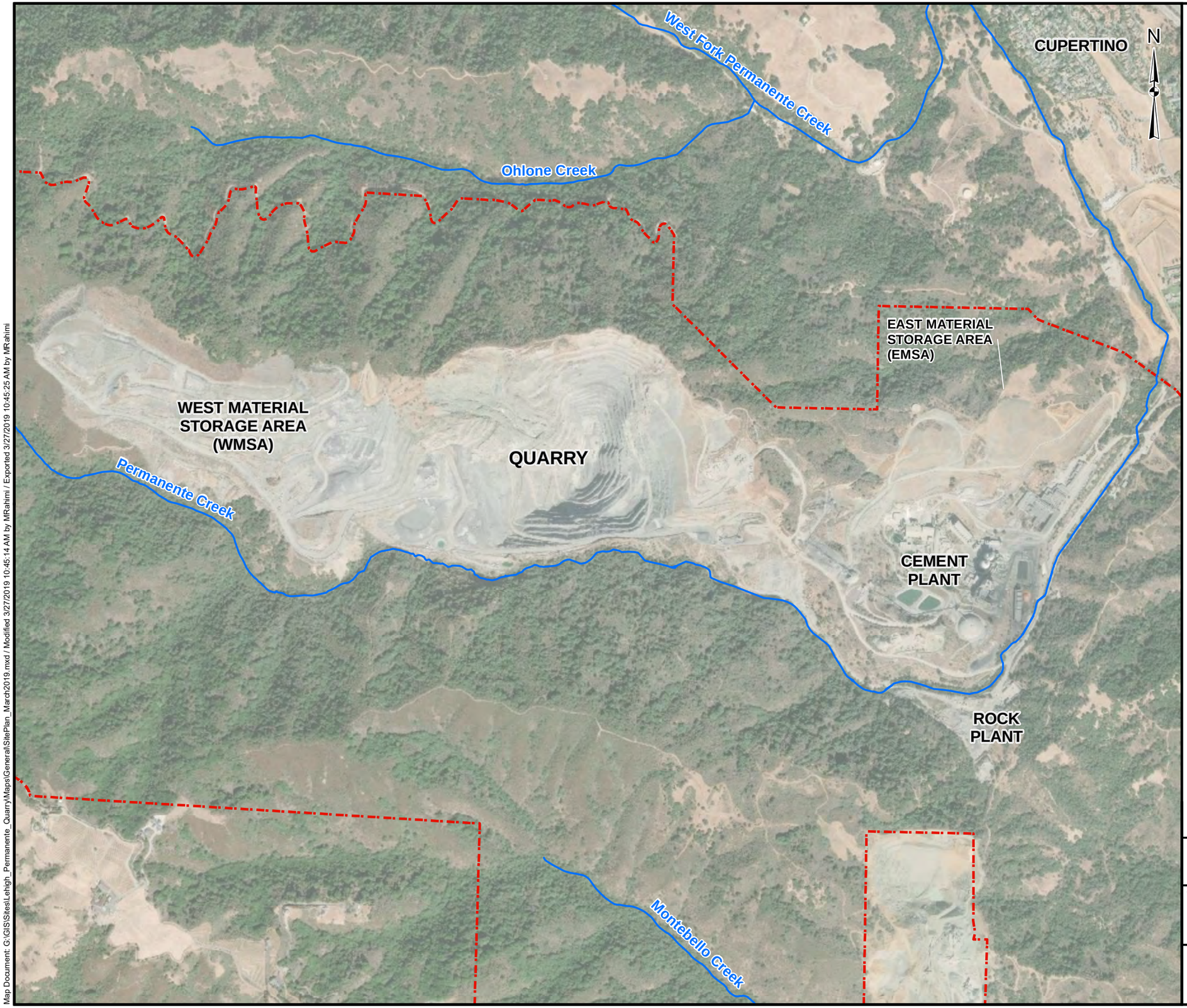
REGIONAL LOCATION MAP

GOLDER

PROJECT No.		063-7109-913	FILE No.	SiteLocMap
DESIGN	DLM	1/28/2010	SCALE: AS SHOWN	REV. 0
GIS	DLM/MM	5/6/2014		
CHECK	GW	5/6/2014		
REVIEW	BF	5/6/2014		

FIGURE 1.1

Map: G:\GIS\Sites\Lehigh_Permanente_Quarry\Maps\General\SiteLocMap.mxd | Modified: 5/6/2014 9:27:33 AM | Plotted: 8/27/2018 4:01:58 PM by mrahimi



LEGEND

- Stream
- Property Boundary

NOTES

1) Locations based on conversion from local coordinates or Google Earth placement.

REFERENCES

1)Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
2) Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
3) Potential Areas of Concern locations are based on Figure 2 from EMCON's Environmental Evaluation Report, Kaiser Aluminum & Chemical Corporation Permanente Facility, 1993.
4) February 13, 1991, "Cleanup and Facility Decommissioning Report for Kaiser Aluminum and Chemical Corporation 23333 Stevens Creek Boulevard, Cupertino, California, Peregren Environmental Group

1,200 0 1,200
Feet

PROJECT
PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT
SANTA CLARA COUNTY, CALIFORNIA

TITLE
SITE OVERVIEW

GOLDER

PROJECT No.		063-7109	FILE No.	SitePlan_March2019.mxd
DESIGN	DZF	10/31/2013	SCALE: AS SHOWN	REV. 0
GIS	DZF	3/27/2019		
CHECK	GW	3/27/2019		
REVIEW	GW	3/27/2019		

FIGURE 1.2

Map Document: G:\GIS\Sites\Lehigh_Permanente_Quarry\Maps\General\SitePlan_March2019.mxd / Modified 3/27/2019 10:45:14 AM by MRahimi / Exported 3/27/2019 10:45:25 AM by MRahimi

N

Half Moon Bay
Atherton
SAN FRANCISCO BAY
ALAMEDACOUNTY
SANTACLARACOUNTY
Woodside
West Menlo Park
SAN MATEO COUNTY
Ladera
Sky Londa
Portola Valley
Los Altos Hills
SANTA CLARA VALLEY
Los Trancos Woods
San Gregorio
PACIFIC OCEAN
Redwood Terrace
La Honda
Monta Vista
Cupertino
San Jose
SANTA CRUZ MOUNTAINS
Loma Mar
Pescadero
Monte Sereno
SANTA CRUZ COUNTY
Lexington Hills
Boulder Creek

LEGEND

Facility boundary

REFERENCES

ESRI:World_Shaded_Relief
(http://services.arcgisonline.com/arcgis/services)
Spatial Reference:
NAD 1983 StatePlane California III FIPS 0403 Feet

0 5 10
Miles

PROJECT

PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT
SANTA CLARA COUNTY, CALIFORNIA

TITLE

REGIONAL TOPOGRAPHIC SETTING

GOLDER

PROJECT No.		063-7109	FILE No.	
DESIGN	DLM	2/8/2010	SCALE: AS SHOWN	REV. 0
GIS	DLM	2/8/2010		
CHECK	GW	2/8/2010		
REVIEW	WLF	2/8/2010		

FIGURE 1.4

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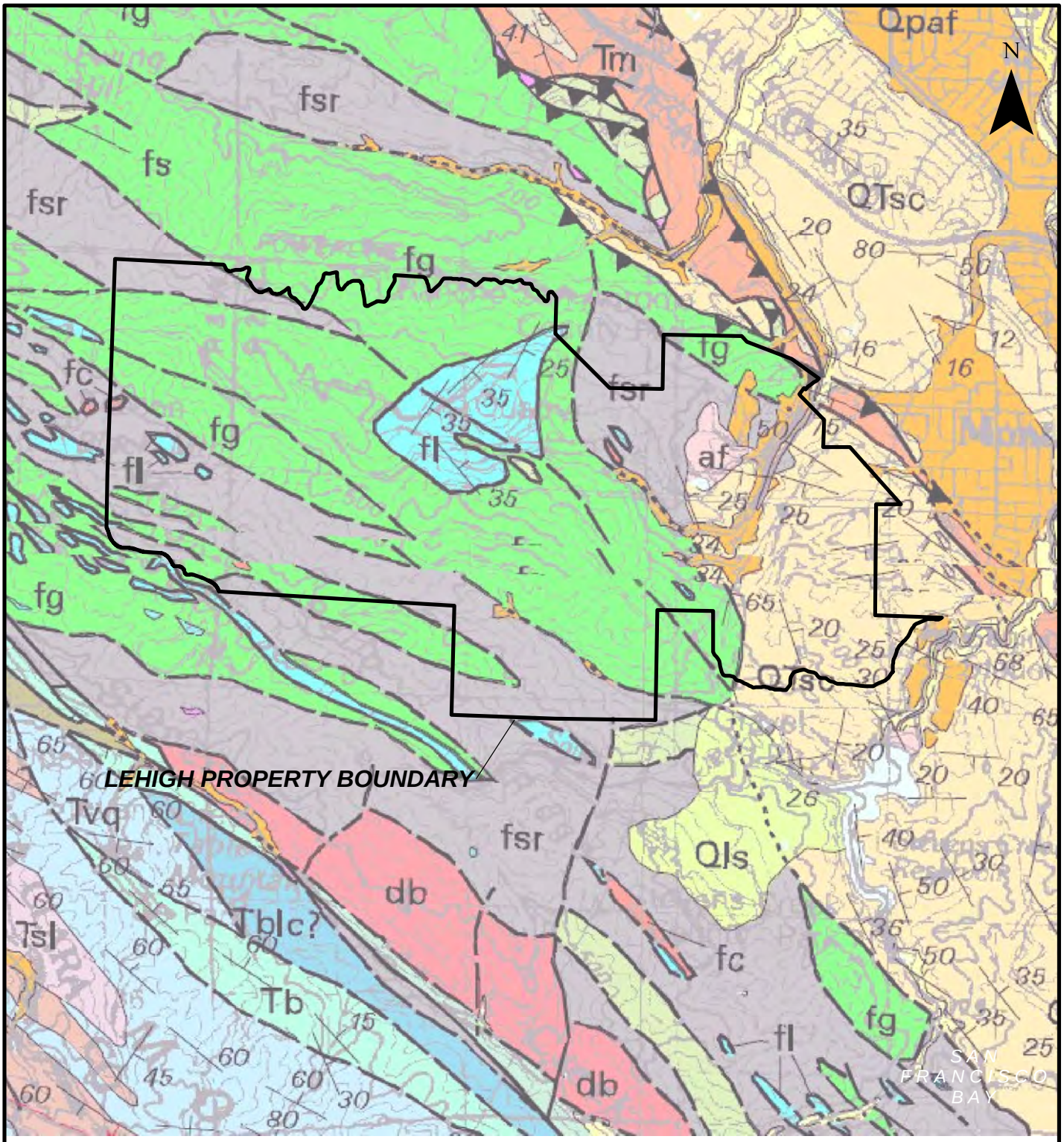

REFERENCES

US Geological Survey, Geologic Map and Map Database of the Palo Alto 30' x 60' Quadrangle, California; Brabb, E.E., R.W.Graymer, and D.L., Jones, 2000. MF Studies Map MF-2332.
(http://pubs.usgs.gov/mf/2000/mf-2332/mf2332m.pdf)

PROJECT

PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT
SANTA CLARA COUNTY, CALIFORNIA

TITLE

REGIONAL GEOLOGIC MAP

GOLDER

PROJECT No.		063-7109	FILE No.	
DESIGN	DLM	1/28/2010	SCALE: AS SHOWN	REV. 0
GIS	DLM	1/28/2010		
CHECK	GW	1/28/2010		
REVIEW	WLF	1/28/2010		

FIGURE 1.5

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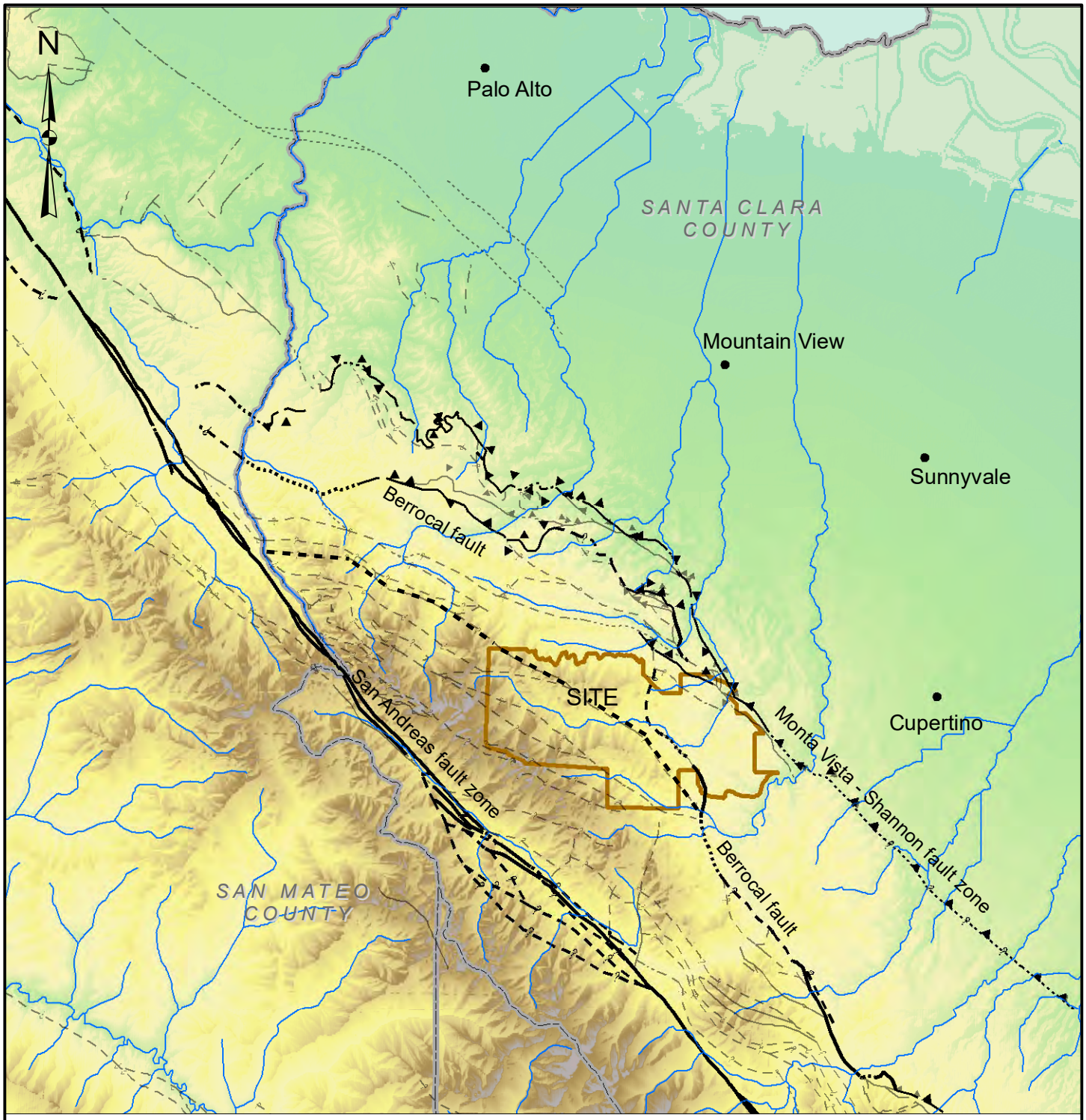

Legend

- Stream
- *Fault (surface expression):*
- Certain
- Concealed
- Inferred
- Thrust (teeth in dip direction)

Dashed where approx., querried where uncertain; dotted where concealed.

0 1 2 Miles

Fault source: Brabb, et. al. (2000)

REV.	DATE	DES	REVISION DESCRIPTION	GIS	CHK	RVW

PROJECT

PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT
SANTA CLARA COUNTY, CALIFORNIA

TITLE

REGIONAL GEOTECTONIC MAP

GOLDER

PROJECT No.		063-7109	FILE No.
DESIGN	DLM	3/13/2009	SCALE: AS SHOWN REV. 0
GIS	DLM	3/13/2009	
CHECK	WLF	3/25/2009	**FIGURE 1.6**
REVIEW	WLF	3/25/2009	

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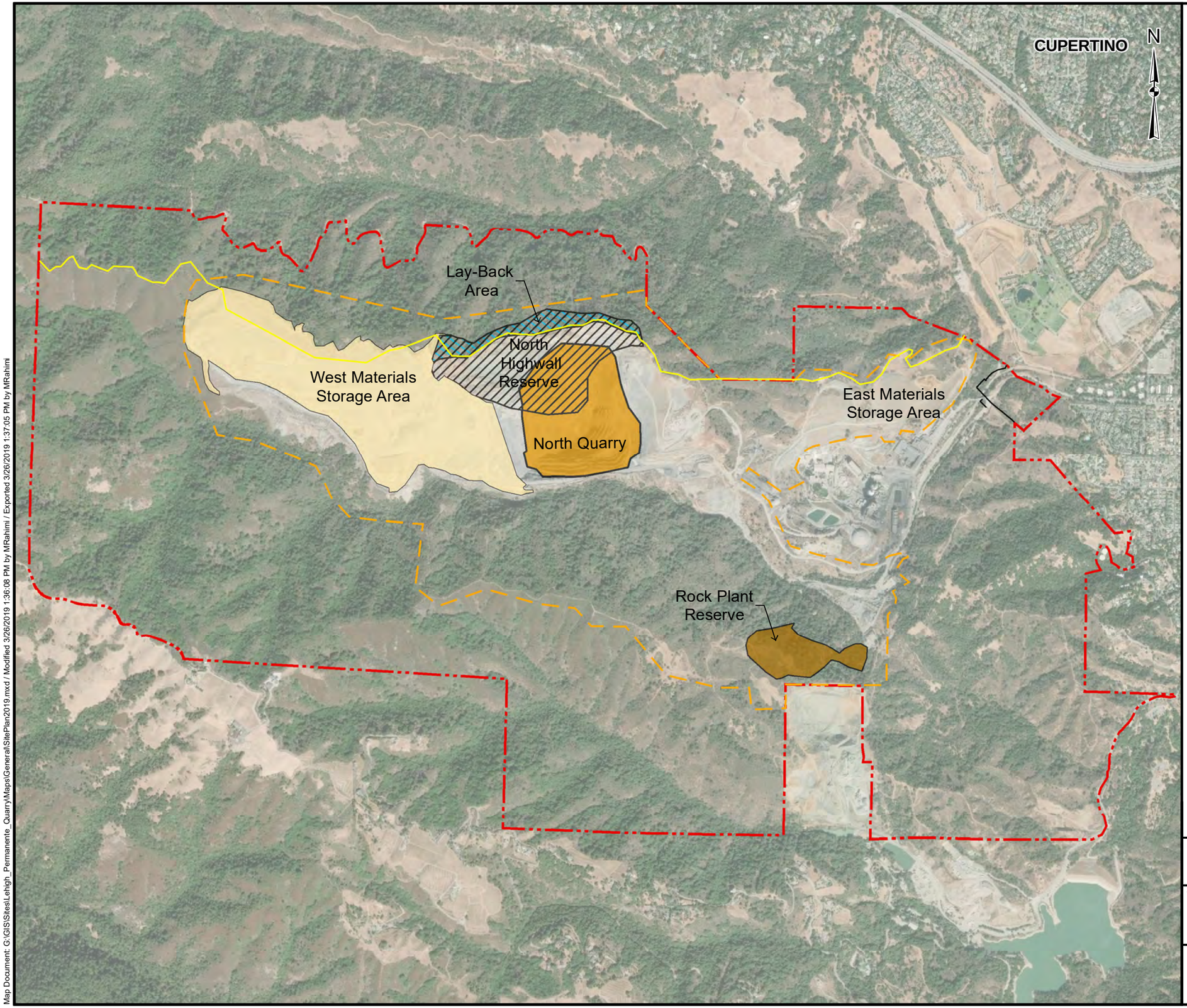


LEGEND

- Property Boundary
- Amended Reclamation Boundary
- Final Permanente Ridge
- Assessor's Parcel Boundary
- Rock Plant Reserve (±31 acres)
- North Highwasll Reserve (+101 acres)
- Lay-Back Area (±20 acres)
- North Quarry Backfill (± 93 acres)
- West Materials Storage (WMSA) (±218 acres)

NOTES

1) Locations based on conversion from local coordinates or Google Earth placement.

REFERENCES

1)Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
2) Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
3) Potential Areas of Concern locations are based on Figure 2 from EMCON's Environmental Evaluation Report, Kaiser Aluminum & Chemical Corporation Permanente Facility, 1993.
4) February 13, 1991, "Cleanup and Facility Decommissioning Report for Kaiser Aluminum and Chemical Corporation 23333 Stevens Creek Boulevard, Cupertino, California, Peregren Environmental Group

1,200 0 1,200
Feet

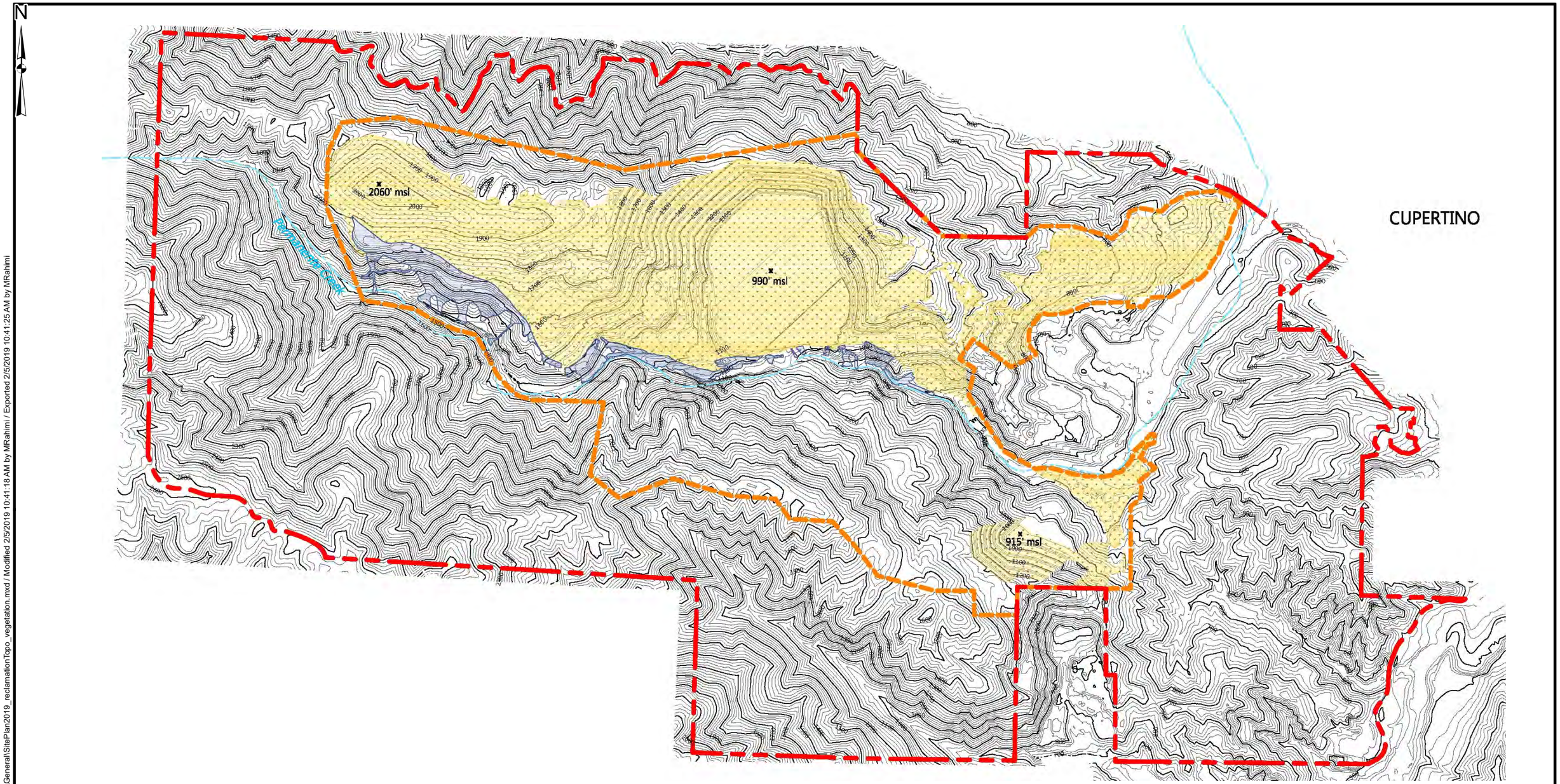
PROJECT
PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT
SANTA CLARA COUNTY, CALIFORNIA

TITLE
PROJECT OVERVIEW

GOLDER

PROJECT No.		063-7109	FILE No.		SitePlan2019.mxd
DESIGN	DZF	10/31/2013	SCALE:	AS SHOWN	REV. 0
GIS	DZF	3/26/2019	**FIGURE 2.1**		
CHECK	GW	3/26/2019			
REVIEW	GW	3/26/2019			

Map Document: G:\GIS\Sites\Lehigh_Permanente_QuarryMaps\GeneralSitePlan2019.mxd / Modified 3/26/2019 1:36:08 PM by MRahimi / Exported 3/26/2019 1:37:05 PM by MRahimi



LEGEND

- Property Boundary
- Amended Reclamation Boundary
- Permanente Creek
- Revegetation Treatment Area
- Permanente Creek Reclamation Area (PCRA)

REFERENCES

1) Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet

NOTES

1) Locations based on conversion from local coordinates or Google Earth placement.
2) Project areas from Benchmark

PROJECT
PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT
SANTA CLARA COUNTY, CALIFORNIA

TITLE
RECLAIMED TOPOGRAPHY

GOLDER

PROJECT No.		063-7159	File: 2019_reclamationTopo_vegetation.mxd
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GIS	DZF	2/5/2019	
CHECK	GW	2/5/2019	**FIGURE 2.2**
REVIEW	GW	2/5/2019	

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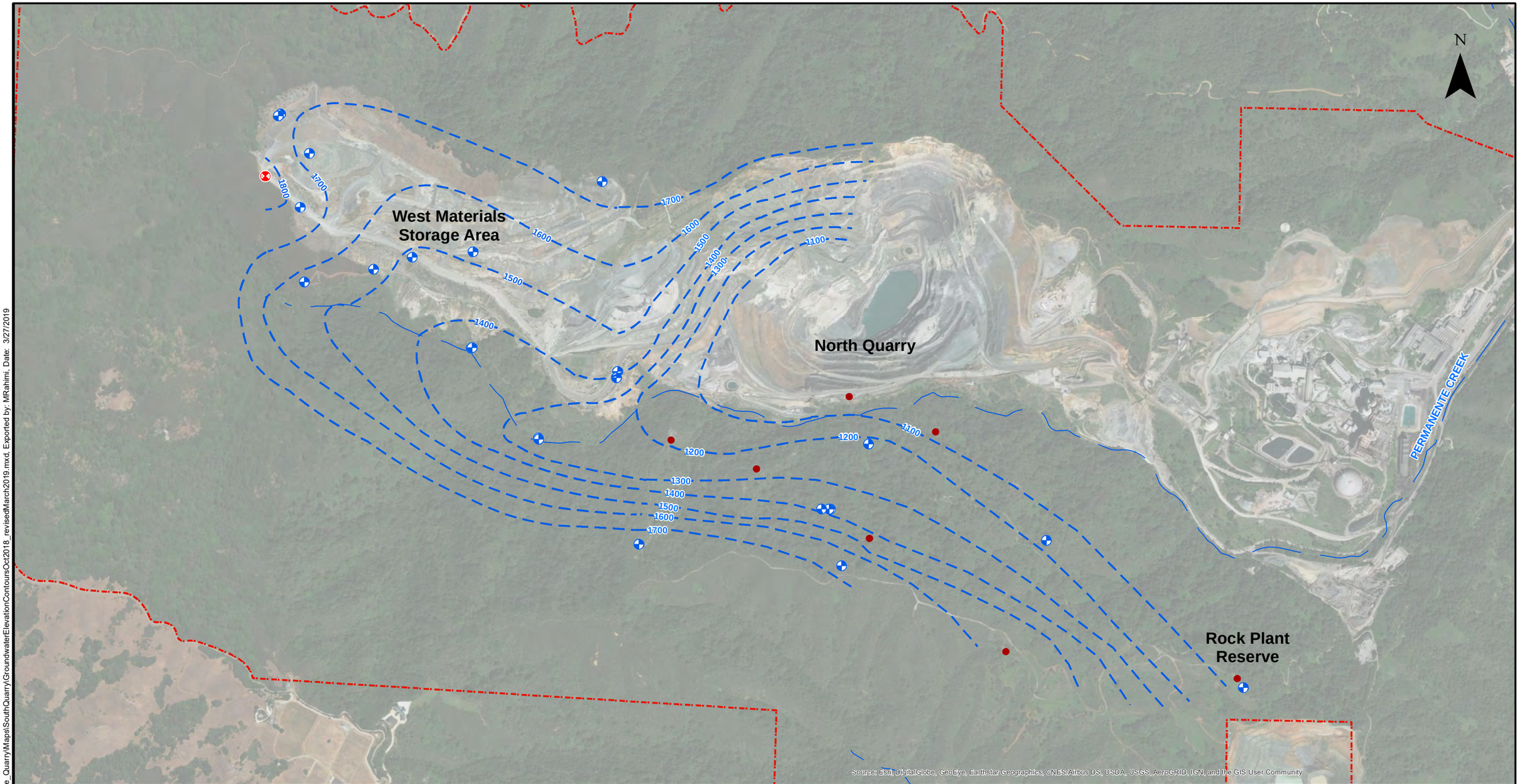


LEGEND

- Monitoring Well
- Piezometer
- VWT Piezometer
- Property Boundary

REFERENCES

Spatial Reference:
NAD 1983 StatePlane California III FIPS 0403 Feet

0 1,000 2,000
Feet

PROJECT

PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT
SANTA CLARA COUNTY, CALIFORNIA

TITLE

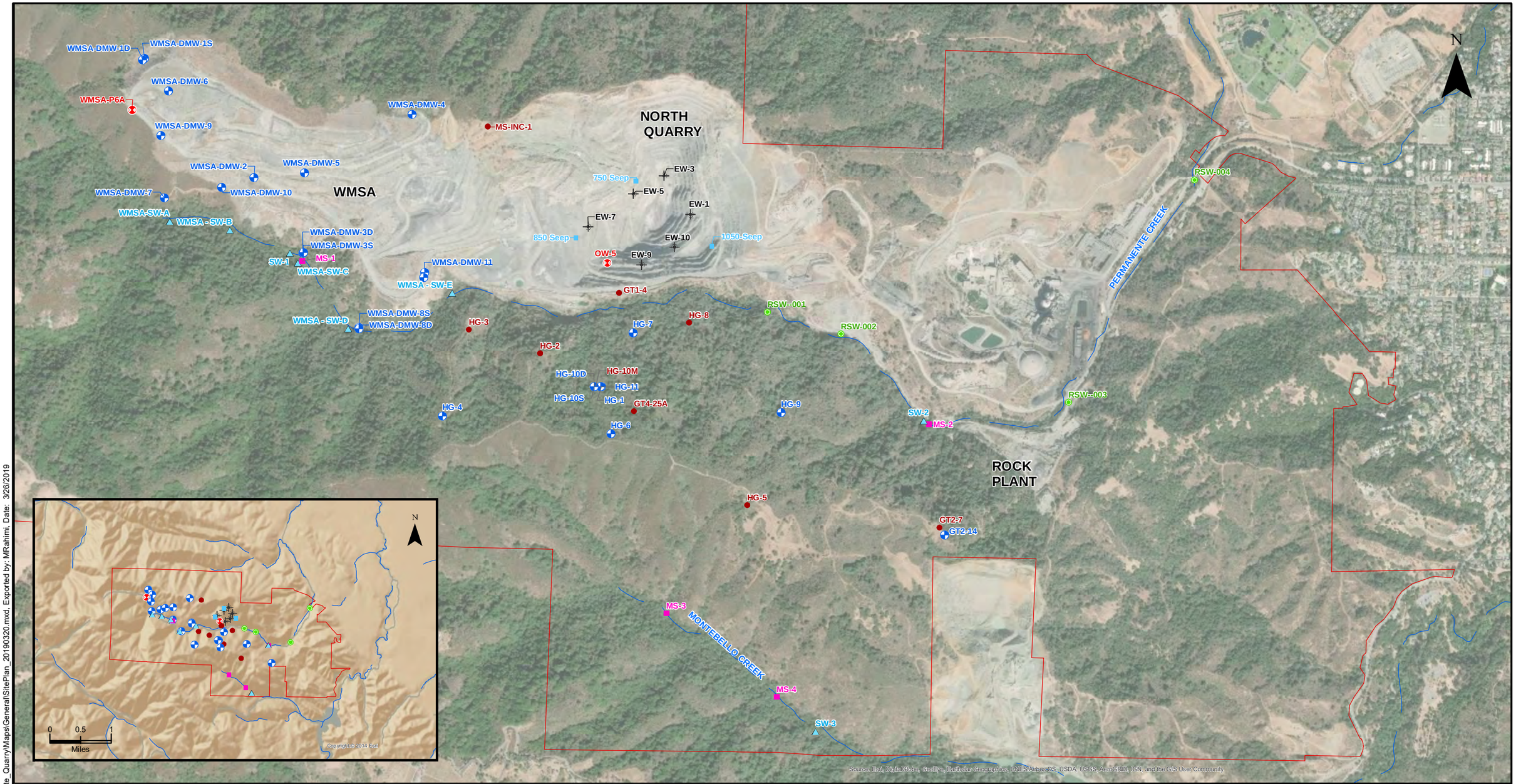
GROUNDWATER ELEVATION CONTOURS (SEPTEMBER 2018)

GOLDER

PROJECT No.		1776210	FILE No.	
DESIGN	MR	3/27/2019	SCALE: AS SHOWN	REV. 0
GIS	MR	3/27/2019		
CHECK	GW	3/27/2019		
REVIEW	WLF	3/27/2019		

Figure 2.3

Document Path: G:\GIS\Sites\Lehigh_Permanente_Quarry\Maps\SouthQuarry\GroundwaterElevationContoursOct2018_revisedMarch2019.mxd, Exported by: MRahimi, Date: 3/27/2019



Document Path: G:\GIS\Sites\Lehigh_Permanente_Quarry\Maps\General\SitePlan_20190320.mxd, Exported by: MRahimi, Date: 3/26/2019

LEGEND

- Groundwater Monitoring Well
- Piezometer
- Vibrating Wire Transducer
- Surfacewater Sampling Location
- Discharge-Receiving Water location
- Surfacewater Station
- Extraction Well
- Seep
- Drainage Line
- Property Boundary

REFERENCES

Spatial Reference:
NAD 1983 StatePlane California III FIPS 0403 Feet

0 1,000 2,000
Feet

PROJECT

PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT
SANTA CLARA COUNTY, CALIFORNIA

TITLE

SAMPLE LOCATIONS

GOLDER

PROJECT No.		1776210	FILE No.		
DESIGN	MR	3/26/2019	SCALE: AS SHOWN	REV.	0
GIS	MR	3/26/2019			
CHECK	GW	3/26/2019			
REVIEW	WLF	3/26/2019			

Figure 2.4

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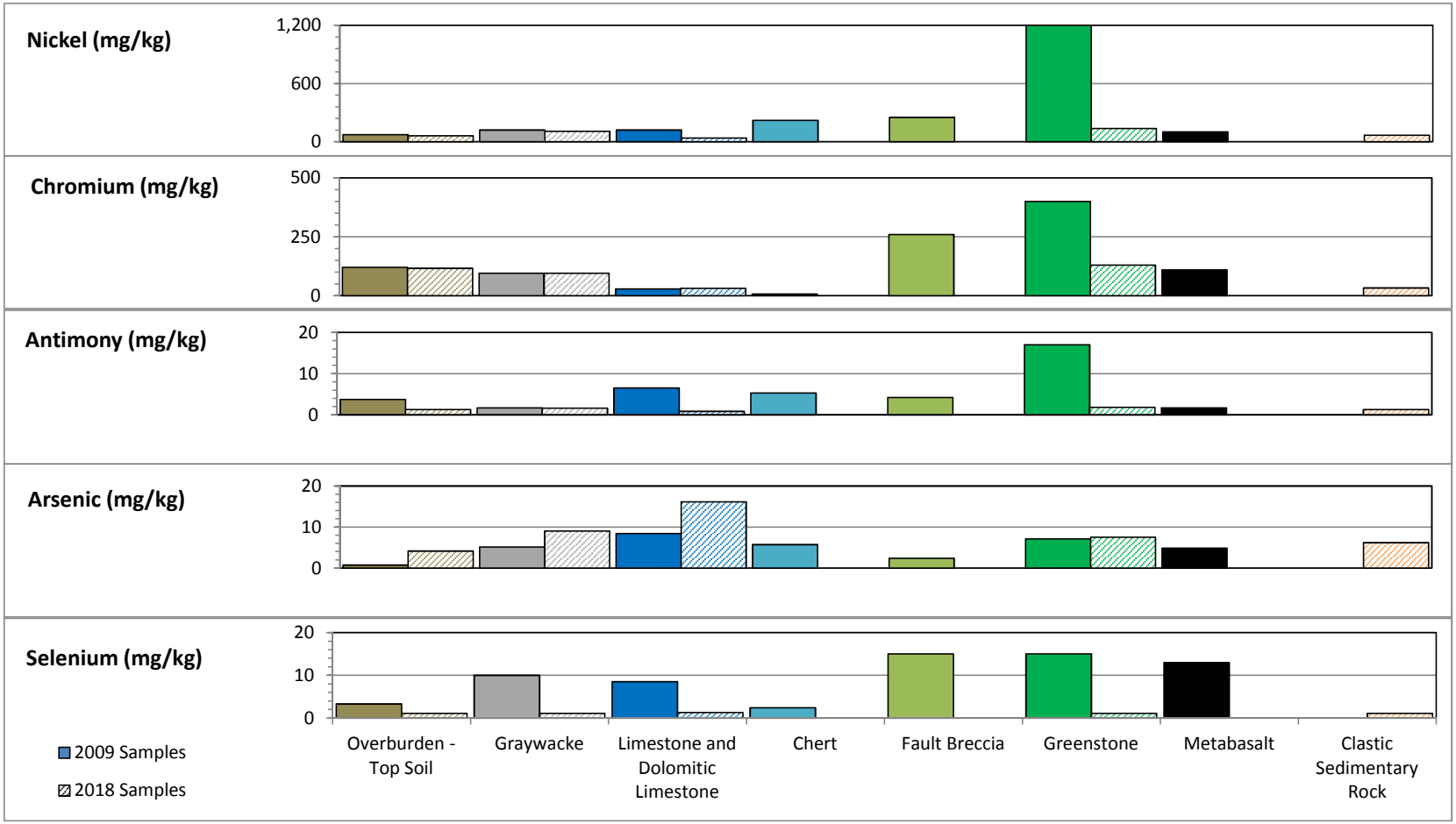

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CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT

TITLE
Overburden (Rock and Soil) and Ore - Elemental Composition

PROJECT NO.	CONTROL	REV.	FIGURE
18104578		A	2.5

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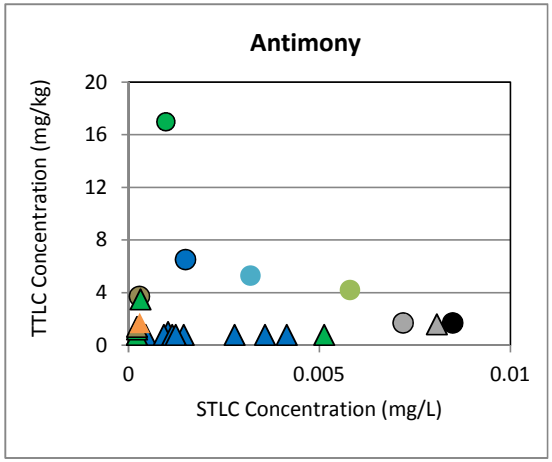

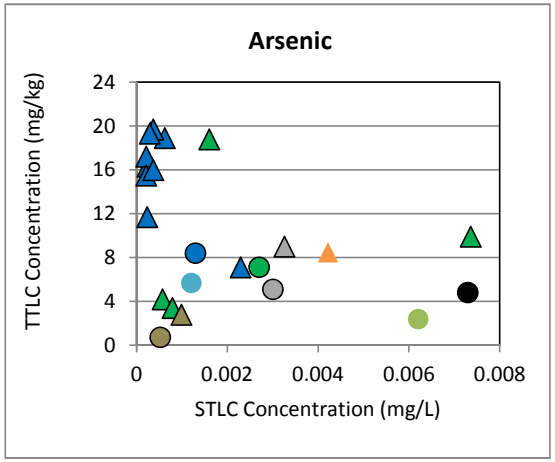

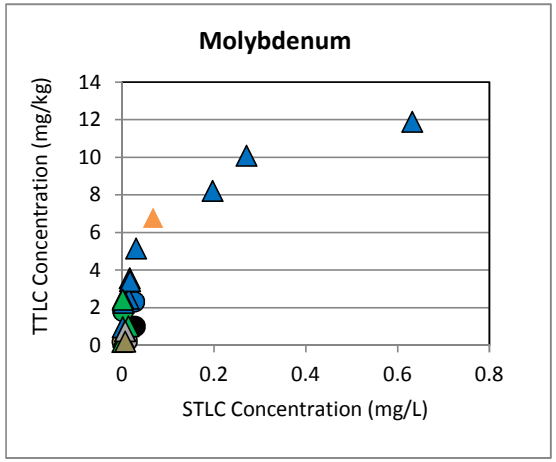

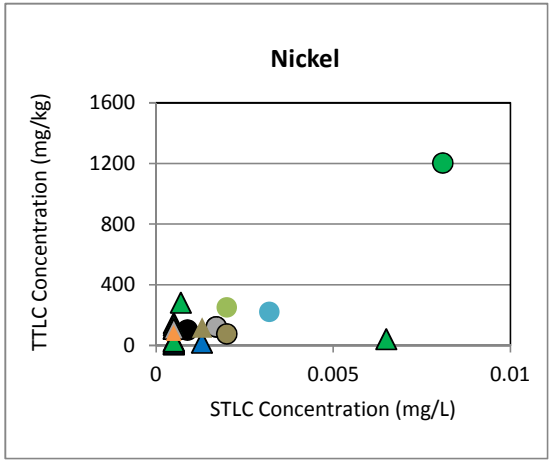

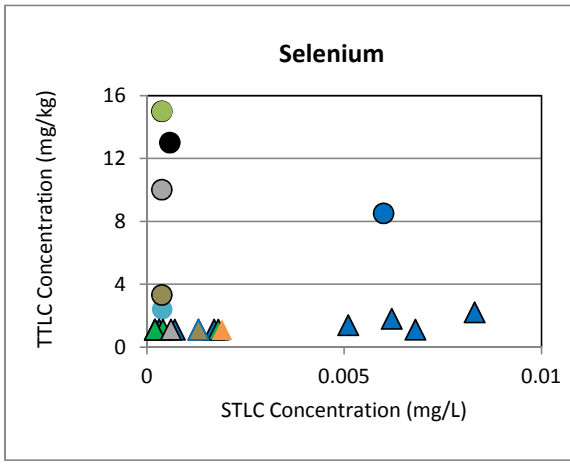



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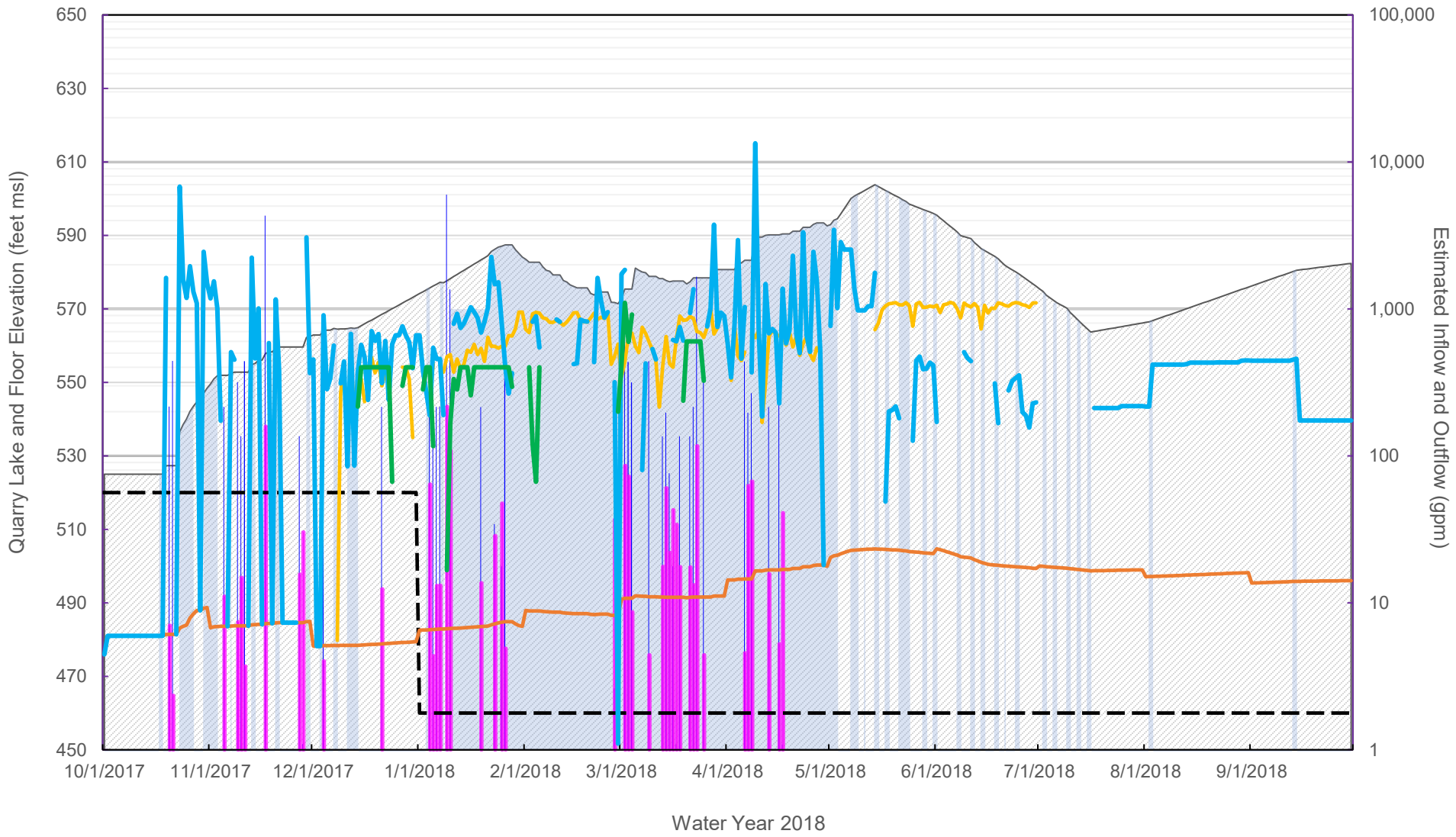
CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT

TITLE
Overburen (Rock and Soil) and Ore - TTLC vs. STLC

PROJECT NO.	CONTROL	REV.	FIGURE
18104578		A	2.6



LEGEND

- Quarry Lake Elevation
- Quarry Lake (Measured)
- Surface Water Runoff
- Precipitation
- Quarry Floor Elevation
- Evaporation
- Quarry Pumping
- Groundwater Inflow
- Pond 11

CLIENT
LEHIGH SOUTHWEST

CONSULTANT
GOLDER

PROJECT
PERMANENTE QUARRY RECLAMATION PLAN AMENDMENT
SANTA CLARA COUNTY, CALIFORNIA

TITLE
NORTH QUARRY WATER BALANCE (WY 2018)

PROJECT NO.	PHASE	REV.	FIGURE
18104578		A	2.7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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Appendix A

Site Setting and Conceptual Site Model

SITE OVERVIEW AND CONCEPTUAL SITE MODEL

Regional Setting

The Site is situated in the foothills of the rugged, northwest-trending Santa Cruz Mountains segment of the California Coast Ranges and is bisected by the east-flowing Permanente Creek. Topography in the area consists of moderately to steeply-sloped terrain with rounded ridges and drainages. Relief at the Site ranges from about 2,000 feet along the higher ridge crests to less than 500 feet amsl along the eastern portions of Permanente Creek. Average overall slope angles are typically around 25˚. The steepest natural slopes are on the order of 40˚ over smaller slope heights (100 to 200 feet) and generally correspond to limestone outcrops.

Geologic Setting

The majority of the Site is underlain by complexly deformed and faulted rocks of the Franciscan Assemblage. The eastern portion of the Site, including portions of the Cement Plant and the EMSA, are underlain by Plio-Pleistocene rocks of the Santa Clara Formation. Overlying the bedrock are modern alluvial deposits associated with Permanente Creek (restricted to the eastern portion of the property), and relatively shallow surficial deposits comprised of soil and colluvium. The following provides an overview of the primary geologic units at the Site..

Franciscan Terrane

The following information regarding the Franciscan rocks as exposed in the North Quarry has been excerpted from Foruria (Foruria, 2004). Cement-grade limestone and aggregate are extracted from the intricately folded and faulted limestones and metabasalts (greenstones). These rocks are part of the Permanente Terrane of the Jurassic-Cretaceous age Franciscan Assemblage. The Franciscan Assemblage represents a subduction zone assemblage of highly deformed, variably metamorphosed, marine sedimentary rocks with oceanic crust-related submarine basalt (greenstone), chert, and limestone. This limestone-metabasalt assemblage reaches a minimum total thickness of approximately 1,100 feet and dips to the southeast.

Major stratigraphic horizons within the Franciscan rocks of the Site are separated by low-angle faults forming a structurally imbricated thrust stack of layered and folded rock units. The Franciscan rocks are tectonically juxtaposed against an overlying section of undated, continentally-derived graywackes, shales, and argillites. The deformed thrust stack is a gently folded, northeast-trending, southeast dipping sequence in the eastern area of the North Quarry and transitions southwestward to a series of en-echelon, northwest-trending, southeast-plunging, anticlinal and synclinal folds in the western area of the North Quarry. High angle faults crosscut the Franciscan rocks, dissecting the rocks along prominent north-south and northwest-southeast orientations. A major through-going regional fault, the northwest strand of the Berrocal fault, crosses through the western end of the North Quarry.

Santa Clara Formation

The Santa Clara Formation overlies a portion of the Franciscan Complex rocks in the north-central portion of the Site. The Santa Clara Formation is a continental fluvial and alluvial deposit that is composed of unconsolidated to semi-consolidated conglomerate, sandstone, siltstone, and claystone (Vanderhurst, 1981). The age of the Santa Clara Formation ranges from late Tertiary to Pleistocene. Uplift of the Coast Ranges during this time resulted in increased erosion of the mountains and deposition of the Santa Clara Formation. The contact between the Franciscan rocks and Santa Clara Formation is considered to be

unconformable, with the Santa Clara Formation deposited on an eroded Franciscan terrain (Rogers and Armstrong, 1973).

Subsequent uplift of the nearby foothills along the Monte Vista fault, which lies along the margin of the valley floor to the east of the Site, has resulted in deformation of the Santa Clara Formation. In addition, faulting within the uplifted geologic terrane between the Monte Vista and Berrocal faults has juxtaposed the Santa Clara formation in fault contact with older Franciscan rocks in the western portion of the EMSA. To the east of the unnamed fault, the deformed Santa Clara formation overlies the Franciscan with south-southwest trending dips of up to 50 degrees (Rogers and Armstrong, 1973).

Surficial Deposits

Surficial deposits include modern unconsolidated alluvial deposits along the active stream channel of Permanente Creek. These deposits are comprised of a poorly-sorted mixture of cobbles, gravels, sand, silt and clay. Deposits range from a few inches thick in the upper reaches of the watershed where erosion has cut the channel down into bedrock, to tens of feet thick where the channel widens and deepens as it approaches the flatter terrain of the Santa Clara Valley. Colluvial deposits also exist throughout the Site on natural slopes including areas underlying overburden (e.g., EMSA and WMSA). The natural slopes in general are overlain with approximately one to two feet of soil and colluvial materials, which thickens to several feet to perhaps tens of feet thick in the larger natural swales in the region. Where colluvial materials were encountered in exploratory activities they were described as predominantly clayey sand with gravel to clayey gravel, with some gravelly clay. Gravel size was up to 3-inches. In general, at the time of the investigations, the colluvium was dry and ranged from loose to very stiff or dense. Several ancient landslides have been mapped by various investigators in various areas of the Site and throughout the broader foothills region.

Structural Setting

The San Andreas Fault zone is located approximately two miles southwest of the Site. The Sargent-Berrocal Fault Zone (SBFZ), part of the Santa Cruz Mountains front-range thrust fault system, parallels the San Andreas to the east and forms the eastern-most structural boundary to the Permanente Terrain. Near the North Quarry, the SBFZ consists of two northwest-trending, sub-parallel faults, namely the northeastern-most Monta Vista Fault Zone and the southwestern-most Berrocal Fault Zone (Sorg and McLaughlin, 1975). The Monta Vista Fault Zone is located approximately one mile to the northeast of the North Quarry. A strand of the Berrocal Fault Zone lies beneath the adjacent Cement Plant area to the south of the EMSA, and extends west to other portions of the Site (Mathieson, 1982; Sorg and McLaughlin, 1975).

Hydrogeologic Setting

The North Quarry is entirely within the Franciscan Terrane. The Franciscan Terrane is a highly-chaotic assemblage of rocks, or mélange, comprised primarily of altered meta-volcanic rocks (*i.e.,* greenstone), graywacke and meta-graywacke units separated by zones of highly sheared matrix oftentimes comprised of mudstone or shale (Blake and Jones, 1981). In the area of the North Quarry, the “blocks” in the matrix are primarily comprised of limestone (with chert interbeds) and some graywacke which are “floating” in the highly sheared greenstone matrix. Most major structural boundaries in the Franciscan are fault boundaries as contrasted with depositional geologic contacts.

The occurrence of groundwater in the Franciscan is almost exclusively within secondary openings such as joints, fractures, shear zones and faults. In general, groundwater occurs under unconfined conditions;

however, the structural conditions also locally create perched and semi-confined conditions. The hydraulic properties of the Franciscan are variable. Most published values for hydraulic conductivity of the Franciscan are 1 x 10^{-5} to 1 x 10^{-6} cm/sec. Well yields are typically low, in the range of a few gallons per minute (gpm) to tens of gpm; groundwater from wells is used for domestic supply. Specific yields are low, being less than 3% (DWR Bulletin, 1975).

Groundwater Flow and Occurrence

The premise of the current conceptual site model is that groundwater in rugged upland bedrock terrain, such as the Santa Cruz Mountains where the Site is located, typically flows from topographic highs, which act as groundwater divides, to topographic lows forming drainage basins or watersheds. Perennial streams in mountainous terrain (absent a lake or snowpack in the headwaters), receive flow throughout the year because of baseflow from groundwater. In unconfined to semi-confined systems, groundwater flow directions typically mimic local topography. Overall, the Site is separated from the Santa Clara Valley Groundwater Basin, the main groundwater basin to the north and east of the Site, by several faults which comprise the Shannon-Monte Vista fault zone (Hanson, 2004). The fault zones are fundamental geologic and hydrogeologic boundaries between the basement bedrock units at the Site and the much younger water-producing alluvial basin deposits located downgradient of the Site. Natural recharge to the Santa Clara Valley Groundwater Basin occurs primarily as infiltration from streambeds (*i.e.,* losing streams) that exit the upland areas within the drainage basin and from direct infiltration of precipitation that falls on the basin floor.

Drainage basins are typically comprised of smaller sub-basins. In mountainous terrain similar to the physical setting of the Site, sub-basins are created from side canyons and smaller ridges typically trending normal to the dominant ridges. On the portion of the Site underlain by the WMSA, this drainage pattern is no longer evident, as the current topography has been altered from the original topography to facilitate the storage of overburden and related materials. However, a review of aerial photographs and historical topographic maps indicates that the ground surface was not altered (*i.e.,* mined or otherwise significantly graded) in the WMSA prior to placement of overburden from the North Quarry. As the original ground surface was not significantly altered prior to creating the WMSA, the sub-basin drainage pattern is still the predominant geomorphic indicator as to how groundwater flows beneath the WMSA prior to discharging into the larger basin comprising the upper Permanente Creek watershed.

The hydrostratigraphy of the North Quarry area consists of a heterogeneous groundwater system within low to moderately permeable greenstone, limestone, and graywacke. Groundwater flow generally mimics surface topography, with recharge occurring at higher elevations and prominent ridges, and discharge occurring in low-lying areas, streams, and in the North Quarry. Groundwater flow is preferentially within the more fractured and rigid limestone blocks, but the limestone is limited in extent and compartmentalized, resulting in a groundwater flow system that is overall controlled by limited groundwater recharge, because of the climatic conditions and overall movement through the less permeable greenstone. Groundwater flow is under a downward component of hydraulic gradient below the hillsides and an upward component of hydraulic gradient in the valley bottoms.

Recharge to the groundwater system is estimated to range between 2 to 8 inches (Golder, 2011) and is primarily from the infiltration of precipitation, but also locally from infiltration of surface runoff. Areas with flatter slopes or areas in topographic lows receive more recharge than steeper topographical areas; this is because there is more runoff in areas of steeper slopes and more run-on in flatter areas. Runoff from the

steeper slopes may also accumulate in local topographic depressions, resulting in localized increased infiltration.

Groundwater discharges to surface water bodies, such as Permanente Creek and its tributaries, where the groundwater table intersects ground surface. Areas of discharge are southeast of the existing North Quarry, where the groundwater intercepts Permanente Creek in the topographically low areas. Groundwater discharge to streams typically sustains baseflow in the dry season.

Figure 2.3 presents the recorded groundwater elevations and interpreted groundwater level contours and flow directions in North Quarry, WMSA, and south of Permanente Creek as measured in September 2018. Due to access issues, groundwater levels were not measured at several locations during that period; however, the period-of-record range of groundwater levels were considered when generating the groundwater contours near wells that were not measured in September 2018. The period of record range was determined appropriate to use as a surrogate based on the historical record from other groundwater monitoring data and the steep hydraulic gradients at the Site.

The regional-scale direction of groundwater flow is interpreted to be from southwest to northeast from the topographic high at Black Mountain toward the Santa Clara Valley. Groundwater flow is predominantly controlled by local- to intermediate-scale systems, linking recharge in topographically higher areas to discharge within adjacent or nearby topographically lower areas. Based on the higher hydraulic conductivity in the limestone compared to the greenstone and unweathered graywacke, groundwater flow is preferentially within the more permeable limestone units of the units comprising the Franciscan Formation. However, because the limestone units are of limited extent (truncated by greenstone and graywacke), the overall groundwater flow system is controlled by faults, the limited groundwater recharge, and the lower hydraulic conductivity units.

Groundwater flow in the WMSA is controlled by the pre-stockpile surface topography and the two main ridges that formed the side canyon prior to the placement of the overburden material in the WMSA. The predominant ridgeline that runs from west to east acts a groundwater divide just to the north of the WMSA. Groundwater south of this ridgeline flows to the south and southeast toward Permanente Creek and follows the former canyon drainage axis. The southwestern ridge, which forms the southern WMSA boundary, acts as another divide to flow. Groundwater was not encountered in the overburden material within the WMSA when the monitoring wells were installed in 2015. Figures A2 and A3 contain hydrographs of the monthly average groundwater elevations measured in monitoring wells and VWPs from February 2008 through September 2018.

Groundwater near the North Quarry either flows toward and into the North Quarry or into local drainages, depending on the geometry of the local surface topography relative to the quarry. It is inferred that with greater depth, the influence (hydraulic gradient) of the local surface topography dissipates, and the influence of the hydraulic sink associated with the North Quarry increases, resulting in a transition of groundwater flow controlled by local surface topography to groundwater flow controlled by the North Quarry. The results are analogous to the transition between local groundwater flow systems and intermediate groundwater flow systems (Toth, 1963). Vertical groundwater flow is generally downward beneath the elevated terrain where the groundwater is recharged and upward beneath the portions of Permanente Creek with perennial flow, and also in the North Quarry, which is below the original groundwater table and resulting in groundwater seepage into the North Quarry.

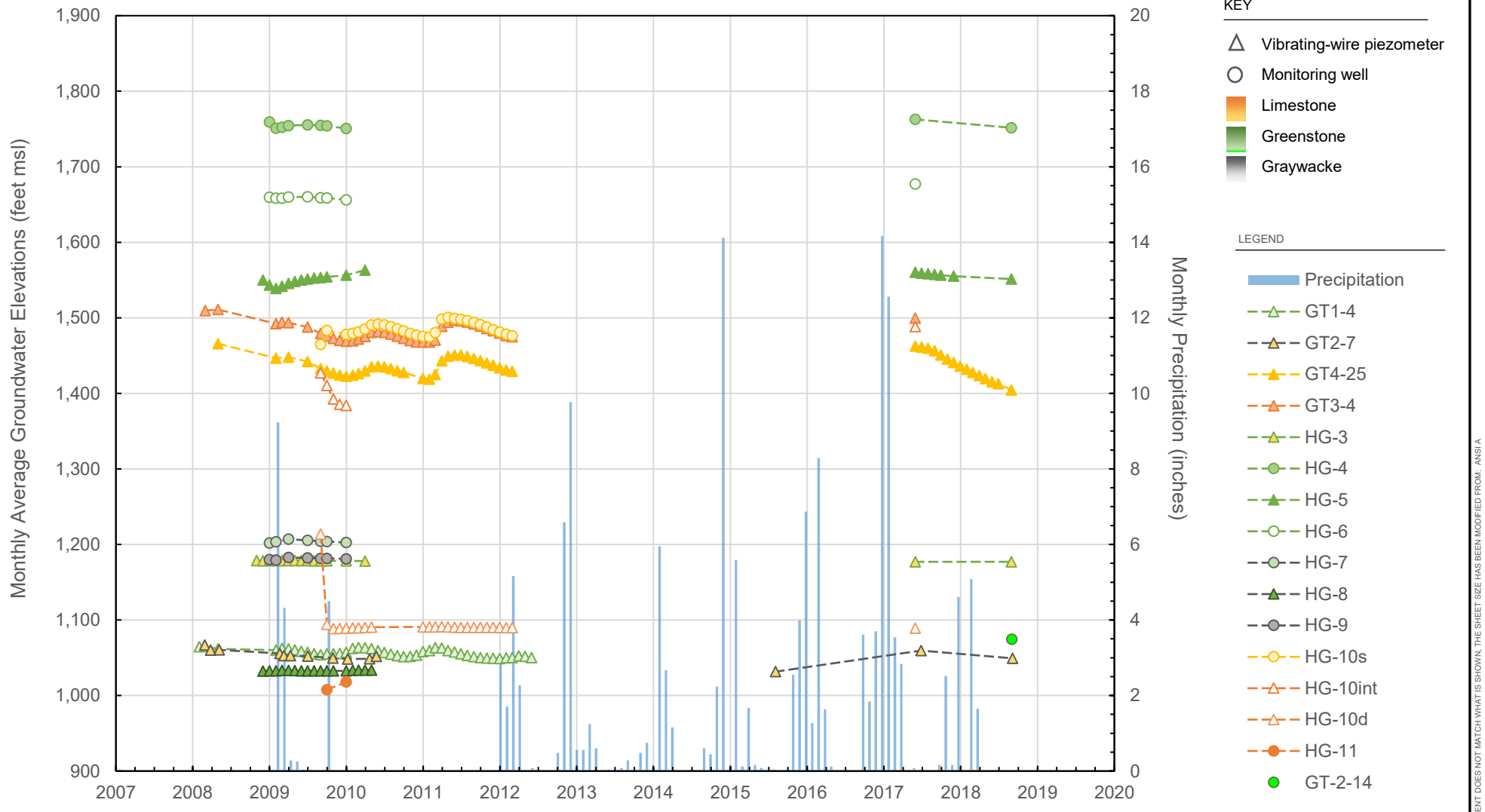
The Site is separated from the Santa Clara Valley Groundwater Basin, the main groundwater basin to the north and east of the Site, by several faults which comprise the Shannon-Monta Vista fault zone. The fault

zones are fundamental geologic and hydrogeologic boundaries between the basement bedrock units at the Site and the much younger water-producing alluvial basin deposits located downgradient of the Site.[1] Natural recharge to the Santa Clara Valley Groundwater Basin occurs primarily as infiltration from streambeds (i.e., losing streams) that exit the upland areas within the drainage basin and from direct percolation of precipitation that falls on the basin floor.[2]

Recharge to the overall groundwater system is primarily from the infiltration of precipitation, but also locally from infiltration of surface runoff discharged to surface waters. As precipitation occurs in the uplands, a certain percentage of water infiltrates through the ground surface to the subsurface, while the remainder is lost to surface water runoff and some to evaporation. Areas with flatter slopes or areas in topographic lows receive more recharge than steeper topographical areas. This is because there is more runoff in areas of steeper slopes. Runoff from the steeper slopes may also accumulate in local topographically depressions, resulting in localized increased infiltration.

[1] Hanson, R.T., Li, Zhen, and Faunt, C.C., 2004, Documentation of the Santa Clara Valley regional ground-water/surface water flow model, Santa Clara County, California: U.S. Geological Survey Scientific Investigations Report 2004–5231).
[2] Santa Clara Valley Groundwater Basin, San Francisco Bay Hydrologic Region. California's Groundwater Bulletin 118, Update 2/27/04.

Appendix A Figures



No precipitation data 1/1/08 to 2/19/09 and 10/20/09 to 1/1/12

LEGEND

CLIENT
LEHIGH SOUTHWEST

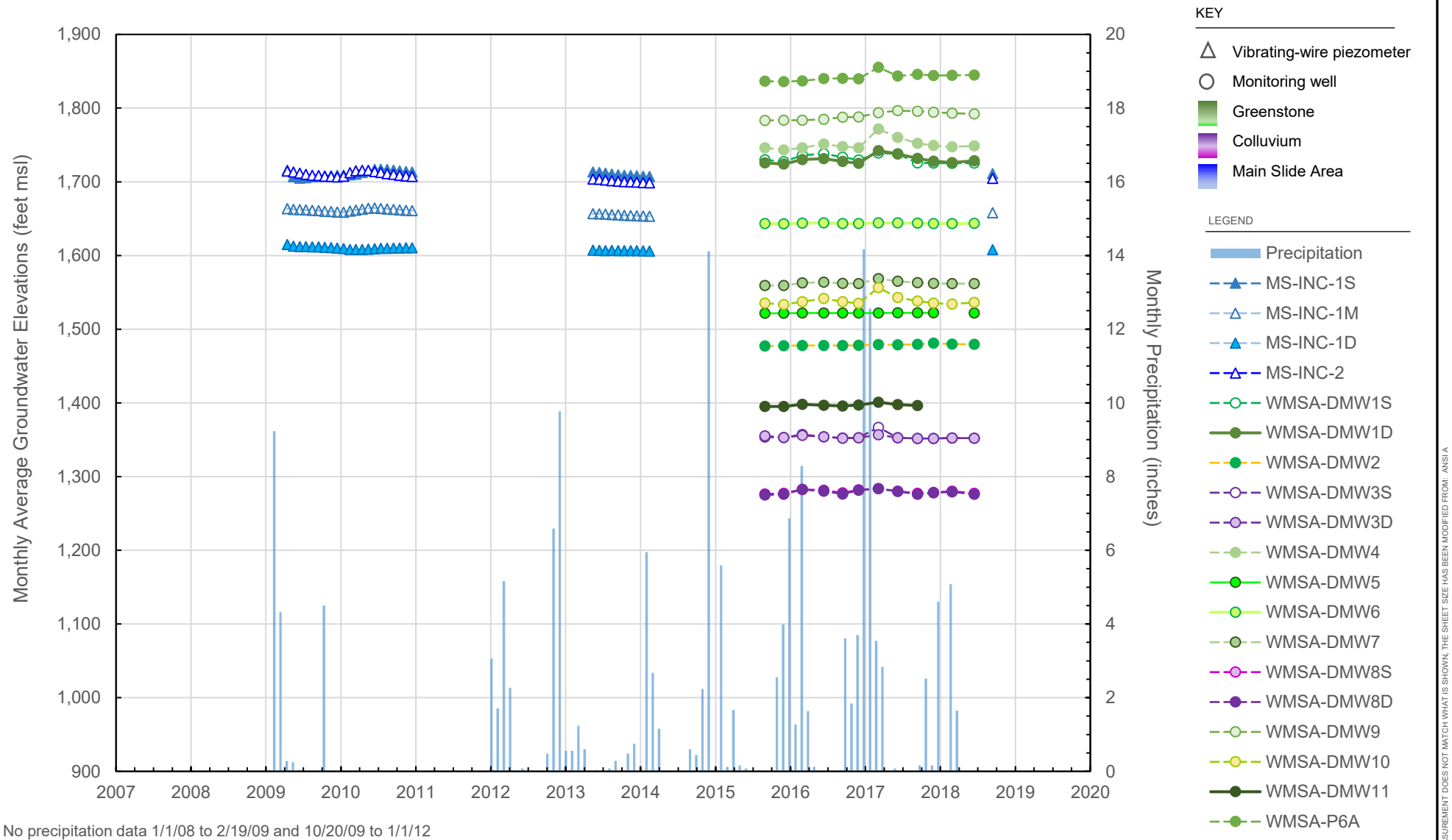
CONSULTANT
GOLDER

PROJECT
PERMANENTE QUARRY
SANTA CLARA COUNTY, CALIFORNIA

TITLE
MONTHLY AVERAGE GROUNDWATER ELEVATIONS AND MONTHLY PRECIPITATION
SOUTH OF PERMANENTE CREEK/ROCK PLANT AREA

PROJECT NO.	PHASE	REV.	FIGURE
177621001		A	A1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



No precipitation data 1/1/08 to 2/19/09 and 10/20/09 to 1/1/12

LEGEND

CLIENT
LEHIGH SOUTHWEST

CONSULTANT
GOLDER

PROJECT
PERMANENTE QUARRY
SANTA CLARA COUNTY, CALIFORNIA

TITLE
MONTHLY AVERAGE GROUNDWATER ELEVATIONS AND MONTHLY PRECIPITATION
WMSA AND NORTH QUARRY AREA

PROJECT NO.	PHASE	REV.	FIGURE
177621001		A	A2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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Appendix B

Geochemical Data Summary

TABLE B-1
Groundwater, Surface Water and Mine Water Quality Results

		HG-4	HG-4	HG-4	HG-4	HG-4	HG-4	HG-4	HG-6	HG-6	HG-6	HG-6	HG-6	HG-6	HG-6	HG-7	HG-7	HG-7 DUP	HG-7	HG-7	HG-7	HG-7	HG-9	HG-9
		9-Feb-09	14-Apr-09	26-Oct-09	4-Jan-10	26-May-10	30-Nov-10	3-May-11	9-Feb-09	14-Apr-09	29-Oct-09	4-Jan-10	26-May-10	30-Nov-10	3-May-11	15-Apr-09	27-Oct-09	27-Oct-09	29-Dec-09	26-May-10	30-Nov-10	3-May-11	9-Feb-09	15-Apr-09
Dissolved Metals																								
Aluminum (Al)	µg/L	<38	<38	<38	<38	<38	<26	<26	<38	<38	<38	<38	<38	<26	<26	<38	<38	<38	<38	<38	<26	<26	<38	<38
Antimony (Sb)	µg/L	0.43	<0.23	0.17	<0.17	0.13	0.32	0.36	<0.23	<0.23	<0.17	<0.17	<0.087	0.32	<0.087	0.62	<0.17	<0.17	0.27	0.13	0.093	<0.087	0.47	0.67
Arsenic (As)	µg/L	2.8	3.5	9.4	8.7	13	13	13	2.6	2.0	0.62	0.62	0.81	<0.61	1.2	4.2	2.2	2.4	2	1.8	<0.61	1.5	1.1	1.5
Barium (Ba)	µg/L	39	21	14	7.4	6.2	5.9	6.2	120	130	240	250	230	240	250	120	120	120	110	120	120	110	30	22
Beryllium (Be)	µg/L	0.064	0.061	<0.18	<0.18	<0.14	<0.14	<0.14	0.052	<0.046	<0.18	<0.18	<0.14	<0.14	<0.14	<0.046	<0.18	<0.18	<0.18	<0.14	<0.14	<0.14	0.064	<0.046
Boron (B)	µg/L	-	250	270	260	260	270	250	-	60	46	64	69	86	69	27	<9.7	<9.7	21	27	31	23	-	21
Cadmium (Cd)	µg/L	0.2	0.052	<0.13	<0.13	<0.070	<0.07	<0.07	0.014	0.017	<0.13	<0.13	<0.070	<0.07	<0.07	0.013	<0.13	<0.13	<0.13	<0.070	<0.07	<0.07	0.053	0.040
Chromium (Cr)	µg/L	<0.64	4.0	20	<0.55	<0.85	<0.85	<0.85	<0.64	3.2	<0.55	<0.55	<0.85	<0.85	<0.85	0.94	2.1	1.4	<0.55	<0.85	<0.85	<0.85	0.68	1.9
Hexavalent Chromium (Cr VI)	µg/L	<0.7	<0.7	<0.70	<0.70	-	-	-	<0.7	<0.7	<0.70	<0.70	-	-	-	<0.7	<0.70	<0.70	<0.70	-	-	-	1.4	<0.7
Copper (Cu)	µg/L	3.6	3.1	7.7	0.8	0.81	1.1	1.3	0.58	0.93	<0.68	<0.68	0.6	0.48	0.66	0.43	<0.68	<0.68	<0.68	0.37	0.42	<0.35	4.0	0.67
Iron (Fe)	µg/L	<7.2	33	13	16	14	27	26	<7.2	21	46	34	<9.3	22	18	330	310	310	290	350	320	310	<7.2	<7.2
Lead (Pb)	µg/L	0.28	0.26	0.76	<0.054	<0.16	<0.16	0.26	<0.019	0.12	<0.054	<0.054	<0.16	<0.16	<0.16	0.038	<0.054	<0.054	<0.054	<0.16	<0.16	<0.16	<0.019	0.038
Manganese (Mn)	µg/L	120	90	110	19	8.2	4.5	5.7	46	58	33	41	36	47	54	320	330	320	320	310	330	320	17	6.7
Mercury (Hg)	µg/L	<0.016	<0.016	-	-	-	-	-	<0.016	<0.016	-	-	-	-	-	<0.016	-	-	-	-	-	-	<0.016	<0.016
Mercury (Hg) by 1631	µg/L	0.0126	0.0226	0.0135	0.0106	-	-	-	0.00631	0.00234	0.00064	0.00068	-	-	-	0.0677	0.0235	0.0221	0.0135	-	-	-	0.0244	0.00384
Molybdenum (Mo)	µg/L	31	43	45	33	48	38	30	3.6	2.5	1.3	2.5	1.8	3.1	1.4	0.74	0.62	0.54	0.81	8.9	1	0.67	3.7	3.2
Nickel (Ni)	µg/L	3.8	7.7	24	1.3	1.8	1.3	2.4	0.86	2.1	0.54	0.47	1.4	1.5	1.6	3.1	1.7	1.7	2.6	12	2.9	3.5	2.9	2.6
Selenium (Se)	µg/L	0.27	0.32	1.1	3.9	1.1	0.76	0.24	<0.23	<0.23	<0.38	<0.38	<0.23	<0.23	<0.23	<0.23	<0.38	<0.38	<0.38	<0.23	<0.23	<0.23	0.9	0.73
Silver (Ag)	µg/L	<0.028	<0.028	<0.065	<0.065	<0.042	<0.042	<0.042	<0.028	<0.028	<0.065	<0.065	<0.042	0.6	<0.042	<0.028	0.81	0.42	<0.065	<0.042	0.54	<0.042	<0.028	<0.028
Thallium (Tl)	µg/L	0.088	0.20	0.23	<0.11	<0.046	0.29	<0.046	0.1	<0.054	<0.11	<0.11	<0.046	0.095	<0.046	0.17	<0.11	<0.11	<0.11	<0.046	<0.046	<0.046	<0.054	0.19
Vanadium (V)	µg/L	-	-	11	<1.2	2.5	1.6	2.8	-	-	<1.2	<1.2	<0.92	<0.92	<0.92	-	<1.2	<1.2	<1.2	<0.92	<0.92	<0.92	-	-
Zinc (Zn)	µg/L	19	4.8	32	<1.9	1.6	7.2	21	3.2	5.2	2.4	<1.9	6.8	150	180	1.3	<1.9	3	<1.9	6	8.4	30	19	8.7
Calcium (Ca)	mg/L	100	73	21	14	8.3	5.1	3.9	37	38	39	37	38	38	38	110	110	110	100	110	110	110	88	100
Magnesium (Mg)	mg/L	21	13	3.8	2.4	1.3	0.71	0.52	70	75	77	72	73	72	73	42	43	45	41	44	43	43	29	31
Sodium (Na)	mg/L	340	370	300	260	230	190	170	18	17	17	17	18	18	17	21	21	21	20	22	22	22	31	21
Potassium (K)	mg/L	9.6	8.8	7.1	6.3	5.3	4	3.4	2	1.7	1	1.1	1.2	1.2	1.1	0.93	0.93	0.91	0.94	1	0.95	0.92	3.2	2.4
Silicon (as SiO_2)	mg/L	37	33	35	33	36	41	42	59	61	67	62	62	66	64	25	26	26	23	24	25	24	18	22
Total Recoverable Metals																								
Total Recoverable Aluminum (Al	µg/L	6,100	1,800	4,800	3,500	80	380	180	2,900	2,900	230	75	290	35	26	39,000	36,000	47,000	17,000	230	3100	230	1,500	750
Total Recoverable Antimony (Sb	µg/L	1.1	<0.23	<0.20	<0.20	0.2	0.48	0.46	0.3	<0.23	<0.20	<0.20	0.1	0.35	0.26	0.56	0.47	0.44	0.48	0.15	0.21	0.13	0.76	<0.23
Total Recoverable Arsenic (As)	µg/L	2.6	3.7	8.4	11	12	12	13	2.5	2.6	<1.1	<1.1	<0.61	<0.61	1	15	9.7	11	5	1.2	0.68	0.93	1.1	1.5
Total Recoverable Barium (Ba)	µg/L	250	27	21	13	6.4	6.6	6.2	180	140	270	250	240	240	250	490	330	350	250	120	130	120	59	28
Total Recoverable Beryllium (Be	µg/L	0.064	<0.060	<0.20	<0.20	<0.22	<0.22	<0.22	<0.060	<0.060	<0.20	<0.20	<0.22	<0.22	<0.22	1.0	0.81	0.94	0.36	<0.22	<0.22	<0.22	0.1	<0.060
Total Recoverable Boron (B)	µg/L	-	260	280	270	260	250	250	-	71	60	66	75	74	74	220	12	17	28	27	28	24	-	110
Total Recoverable Cadmium (Cd	µg/L	0.49	0.077	0.17	0.12	<0.090	<0.09	<0.09	0.15	0.077	<0.11	<0.11	<0.090	<0.09	<0.09	0.75	0.28	0.35	0.16	<0.090	<0.09	<0.09	0.17	0.075
Total Recoverable Chromium (C	µg/L	45	14	86	30	0.83	2.3	1.6	22	14	<0.64	<0.64	1.5	<0.82	<0.82	430	320	360	130	1.2	23	1.7	6.5	<1.6
Total Recoverable Copper (Cu)	µg/L	28	4.1	19	7.7	6.9	2.8	1.9	12	4.8	1.3	<0.66	1.7	0.85	0.96	51	35	36	14	2.4	3.1	0.86	12	4.1
Total Recoverable Iron (Fe)	µg/L	12,000	3,400	9,800	6,400	130	680	320	5,800	5,500	460	160	610	100	110	84,000	53,000	69,000	22,000	710	4000	640	3,200	1,900
Total Recoverable Lead (Pb)	µg/L	4	0.26	1.2	1.3	0.67	0.52	0.31	0.96	0.18	<0.19	0.72	0.21	<0.12	<0.12	13	8.3	9	3.2	0.2	0.6	<0.12	1.6	0.15
Total Recoverable Manganese (	µg/L	290	94	180	73	8.2	13	6.9	160	100	44	42	91	52	51	1,300	1,100	1,200	620	340	380	340	88	41
Total Recoverable Mercury (Hg)	µg/L	0.042	<0.016	<0.016	<0.016	-	-	-	<0.016	<0.016	<0.016	<0.016	-	-	-	<0.016	0.058	0.092	0.022	-	-	-	0.018	<0.016
Total Recoverable Molybdenum	µg/L	37	58	59	57	48	40	33	2.5	1.8	1.4	1.7	1.4	2.1	1.7	2.2	1.9	2	1.8	8.4	0.88	0.74	3.9	1.9
Total Recoverable Nickel (Ni)	µg/L	37	14	67	26	1.8	3.9	2.7	15	10	1.8	1.2	2	1.6	1.7	420	310	350	120	12	25	4.9	7.8	4.8
Total Recoverable Selenium (Se	µg/L	0.94	<0.50	<0.54	1.3	0.79	<0.36	<0.36	<0.50	<0.50	<0.54	<0.54	<0.36	<0.36	<0.36	0.90	<0.54	<0.54	<0.54	<0.36	<0.36	<0.36	1.1	<0.50
Total Recoverable Silver (Ag)	µg/L	0.5	<0.064	<0.088	<0.088	<0.075	<0.075	<0.075	<0.064	<0.064	<0.088	<0.088	<0.075	<0.075	<0.075	0.26	0.14	0.15	<0.088	<0.075	<0.075	<0.075	<0.064	<0.064
Total Recoverable Thallium (Tl)	µg/L	0.15	<0.054	<0.11	<0.11	0.11	0.12	<0.081	<0.054	<0.054	<0.11	<0.11	<0.081	0.09	<0.081	0.14	0.12	0.12	<0.11	<0.081	<0.081	<0.081	<0.054	<0.054
Total Recoverable Vanadium (V	µg/L	-	-	32	11	3.1	1.2	4.5	-	-	<2.6	<2.6	<0.97	<0.97	<0.97	-	91	100	38	<0.97	6.9	<0.97	-	-
Total Recoverable Zinc (Zn)	µg/L	68	58	40	14	9.3	25	16	32	16	8.7	3.2	14	180	180	99	79	86	35	14	84	34	37	19
Total Recoverable Calcium (Ca)	mg/L	140	70	27	18	8.7	5.5	4.6	47	44	41	41	43	42	41	120	130	130	120	120	110	110	97	120
Total Recoverable Magnesium (I	mg/L	31	16	11	7.6	1.4	1.2	0.75	82	88	81	80	82	80	76	91	93	110	64	50	47	45	32	35
Total Recoverable Sodium (Na)	mg/L	390	380	320	260	230	190	180	19	19	17	17	18	20	18	37	24	23	21	24	23	23	38	23
Total Recoverable Potassium (K	mg/L	11	9.3	7.5	6.5	5.2	4.3	3.7	2.2	1.9	1.1	1.1	1.2	1.4	1.1	5.4	5.2	5.7	3.7	1.2	1.6	0.99	3.6	2.8
Pesticides and PCBs																								
Pesticides		ND	ND	-	-	-	-	-	ND	ND	-	-	-	-	-	ND	-	-	-	-	-	-	ND	ND
PCBs		ND	ND	-	-	-	-	-	ND	ND	-	-	-	-	-	ND	-	-	-	-	-	-	ND	ND
VOCs																								
Bromoform	µg/L	<0.24	<0.24	-	-	-	-	-	0.48	<0.24	-	-	-	-	-	<0.24	-	-	-	-	-	-	1.1	<0.24
Chloroform	µg/L	<0.23	<0.23	-	-	-	-	-	<0.23	<0.23	-	-	-	-	-	<0.23	-	-	-	-	-	-	0.94	0.24
Dibromochloromethane	µg/L	<0.23	<0.23	-	-	-	-	-	0.4	<0.23	-	-	-	-	-	<0.23	-	-	-	-	-	-	2.6	0.41
Toluene	µg/L	<0.12	0.41	-	-	-	-	-	0.34	0.24	-	-	-	-	-	0.30	-	-	-	-	-	-	<0.12	0.48

GOLDER

		HG-4	HG-4	HG-4	HG-4	HG-4	HG-4	HG-4	HG-6	HG-6	HG-6	HG-6	HG-6	HG-6	HG-6	HG-7	HG-7	HG-7 DUP	HG-7	HG-7	HG-7	HG-7	HG-9	HG-9
		9-Feb-09	14-Apr-09	26-Oct-09	4-Jan-10	26-May-10	30-Nov-10	3-May-11	9-Feb-09	14-Apr-09	29-Oct-09	4-Jan-10	26-May-10	30-Nov-10	3-May-11	15-Apr-09	27-Oct-09	27-Oct-09	29-Dec-09	26-May-10	30-Nov-10	3-May-11	9-Feb-09	15-Apr-09
SVOCs																								
bis(2-ethylhexyl)phthalate	µg/L	22	4.1	-	-	-	-	-	31	2.5	-	-	-	-	-	<1.1	-	-	-	-	-	-	16	<1.1
General Chemistry																								
Bicarbonate	mg/L	280	250	220	230	210	200	200	470	460	470	460	450	450	450	480	480	480	430	470	470	470	360	410
Carbonate	mg/L	<5.0	<2.5	11	6.9	21	36	38	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Total Alkalinity (as $CaCO_3$)	mg/L	230	210	200	200	210	220	230	380	380	380	380	370	370	370	390	400	390	350	390	380	380	290	340
Chloride	mg/L	51	41	28	25	20	16	15	24	25	25	25	25	24	24	47	46	46	45	47	44	44	46	32
Fluoride	mg/L	0.32	0.39	0.55	0.58	0.46	0.48	0.4	0.073	0.080	<0.010	0.13	0.08	0.18	0.13	0.18	0.2	0.2	0.25	0.18	0.21	0.2	0.30	0.37
Sulfate	mg/L	770	770	500	380	260	170	120	11	15	8.6	16	9.3	9.3	8.4	31	31	30	29	27	28	27	48	38
Hardness (as $CaCO_3$)	mg/L	340	240	69	45	26	16	12	380	400	410	390	400	390	400	440	450	460	430	460	450	450	340	390
Total Dissolved Solids (TDS)	mg/L	1,500	1,500	1,000	880	710	560	550	490	470	460	460	500	450	560	550	530	580	530	560	510	560	480	490
Total Suspended Solids (TSS)	mg/L	190	290	840	70	13	<3.3	<1.2	81	91	3.3	2	4.9	<1.4	<1.2	1,100	840	1,000	400	21	20	7.5	88	34
Residual Chlorine	mg/L	<0.10	<0.10	<0.10	<0.10	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	-	<0.10	<0.50	<0.50	<0.10	-	-	-	<0.10	<0.10
Ammonia (as N)	mg/L-N	0.21	0.28	0.28	0.17	0.24	0.26	0.26	0.084	0.094	0.064	0.057	0.066	0.073	0.06	0.090	0.18	0.042	0.035	0.039	0.038	0.061	0.037	<0.025
Nitrate (as N)	mg/L-N	0.068	<0.026	<0.026	<0.026	<0.014	<0.014	0.019	0.051	<0.026	<0.026	<0.026	0.038	<0.014	0.028	<0.026	<0.026	<0.026	0.026	<0.014	<0.014	<0.014	1.3	0.72
Nitrite (as N)	mg/L-N	0.01	<0.0081	0.014	<0.0081	<0.0081	<0.0081	0.0088	0.012	<0.0081	0.012	0.031	<0.0081	<0.0081	<0.0081	<0.0081	0.0099	0.0094	<0.0081	<0.0081	<0.0081	<0.0081	0.0087	<0.0081
Total Phosphorus	mg/L	0.4	0.37	0.45	0.49	0.54	0.55	0.56	0.12	0.077	<0.016	<0.016	<0.016	<0.016	<0.016	0.64	0.51	0.63	0.21	<0.016	0.026	<0.016	0.19	0.044
Total Sulfide	mg/L	<0.050	0.13	0.24	1	<0.050	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05	<0.05	0.15	<0.25	<0.25	<0.050	<0.050	<0.05	<0.05	<0.050	<0.050
pH	s.u.	8.04	8.12	8.55	8.35	8.95	9.28	9.3	8.00	7.88	7.92	7.87	7.86	7.84	7.77	7.38	7.37	7.4	7.3	7.29	7.31	7.31	7.99	7.64
Electrical Conductivity (@ 25 °C	µmhos/cm	1,900	1,900	1440	1300	1030	844	778	740	725	736	708	716	733	732	839	870	871	880	873	871	860	747	753
Odor	odor units	2	2	2	4	1	1	1	1.0	2.0	none	1	none	none	none	none	none	none	none	2	1	none	1.0	none
Turbidity	NTU	350	540	140	43	17	2.5	4.1	120	56	3.4	2.4	8.5	0.74	1.6	810	210	320	160	12	8.7	31	210	34
Cyanide	mg/L	<0.0032	0.017	<0.0028	<0.0028	-	-	-	<0.0032	0.021	<0.0028	<0.0028	-	-	-	<0.0028	<0.0028	<0.0028	<0.0028	-	-	-	<0.0032	<0.0028
Dioxins	pg/L	<1.2	<0.78	-	-	-	-	-	<0.82	<0.88	-	-	-	-	-	<0.94	-	-	-	-	-	-	<0.54	<0.80
Aquatic Toxicity		pass	pass	-	-	-	-	-	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	-	pass	pass
Asbestos (# of fibers)	# of fibers	ND	ND	-	-	-	-	-	ND	ND	-	-	-	-	-	ND	-	-	-	-	-	-	ND	ND
Oil and Grease	mg/L	-	<1.2	-	-	-	-	-	-	1.4	-	-	-	-	-	<1.2	-	-	-	-	-	-	-	<1.2

		HG-9	HG-9	HG-9	HG-9	HG-9	HG-10	HG-10	HG-10	HG-10	HG-10	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-2	SW-2 Dup	SW-2
		27-Oct-09	29-Dec-09	26-May-10	30-Nov-10	3-May-11	28-Sep-09	4-Jan-10	26-May-10	30-Nov-10	3-May-11	4-Feb-09	2-Apr-09	22-Sep-09	19-Jan-10	29-Dec-10	22-Apr-11	4-Feb-09	4-Feb-09	2-Apr-09
Dissolved Metals																				
Aluminum (Al)	µg/L	<38	<38	<38	<26	<26	<38	<38	<38	<26	<26	<38	<38	<76	<38	<26	<26	<38	<38	<38
Antimony (Sb)	µg/L	<0.17	<0.17	<0.087	<0.087	0.37	<0.17	0.48	<0.087	<0.087	0.45	<0.23	<0.23	<0.17	0.26	<0.087	0.42	6.3	6.1	3.8
Arsenic (As)	µg/L	1.2	1	0.9	<0.61	1.2	<0.52	<0.52	<0.61	<0.61	0.8	0.79	<0.67	<0.52	0.74	<0.61	0.67	4.5	4.8	2.8
Barium (Ba)	µg/L	19	20	19	17	15	150	24	190	180	170	34	91	63	58	86	140	37	35	63
Beryllium (Be)	µg/L	<0.18	<0.18	<0.14	<0.14	<0.14	<0.18	<0.18	<0.14	<0.14	<0.14	<0.046	<0.046	<0.18	<0.18	<0.14	<0.14	<0.046	<0.046	0.059
Boron (B)	µg/L	10	33	35	41	32	33	15	25	26	16	-	55	200	51	78	57	-	-	89
Cadmium (Cd)	µg/L	<0.13	<0.13	<0.070	<0.07	<0.07	<0.13	<0.13	<0.070	<0.07	0.15	<0.013	0.022	<0.13	<0.13	<0.07	<0.07	0.098	0.14	0.055
Chromium (Cr)	µg/L	1.5	<0.55	<0.85	<0.85	<0.85	<0.55	15	<0.85	<0.85	<0.85	<0.64	1.5	<0.55	<0.55	<0.85	<0.85	<0.64	<0.64	<0.64
Hexavalent Chromium (Cr VI)	µg/L	<0.70	<0.70	-	-	-	<0.01	1.9	-	-	-	0.98	<0.7	<0.70	1.2	-	-	0.95	1.2	0.83
Copper (Cu)	µg/L	0.86	<0.68	0.63	0.99	0.77	1.9	2.3	2.1	1.4	3.4	1.2	1.6	4.2	3.1	2.2	1.3	1.3	1.0	1.3
Iron (Fe)	µg/L	<9.3	<9.3	<9.3	<5	<5	<9.3	<9.3	<9.3	<5	5.4	8.1	<7.2	<19	9.7	<5	<5	<7.2	<7.2	18
Lead (Pb)	µg/L	<0.054	<0.054	<0.16	<0.16	<0.16	0.13	<0.054	<0.16	<0.16	0.25	<0.019	0.029	<0.054	<0.054	<0.16	<0.16	0.023	<0.019	<0.019
Manganese (Mn)	µg/L	2.5	0.19	2.6	1.6	3.8	85	0.16	1.1	0.76	8.6	0.33	0.58	0.79	1.9	1.2	1.3	2.2	2.1	3.0
Mercury (Hg)	µg/L	-	-	-	-	-	-	-	-	-	-	<0.016	<0.016	-	-	-	-	<0.016	<0.016	<0.016
Mercury (Hg) by 1631	µg/L	0.00113	0.00105	-	-	-	-	0.0631	-	-	-	0.00078	0.00101	0.00178	0.0547	-	-	0.00141	-	0.00133
Molybdenum (Mo)	µg/L	0.93	2.2	15	1.2	2.5	5	16	5.3	7.7	17	5.7	3.9	3.8	1.8	6.6	2.6	750	740	460
Nickel (Ni)	µg/L	1.6	2.2	12	10	19	10	1.7	6.7	10	4.3	3.3	2.2	4.7	2.3	4.9	3	70	-	110
Selenium (Se)	µg/L	<0.38	<0.38	<0.23	0.27	0.66	<0.38	2.8	<0.23	<0.23	0.23	8.9	7.1	11	1.7	9.5	4.3	80	79	74
Silver (Ag)	µg/L	0.34	<0.065	<0.042	0.92	<0.042	<0.065	<0.065	<0.042	0.26	<0.042	<0.028	0.063	<0.065	<0.065	<0.042	<0.042	<0.028	<0.028	<0.028
Thallium (Tl)	µg/L	<0.11	<0.11	<0.046	<0.046	0.09	<0.11	<0.11	<0.046	<0.046	0.15	<0.054	<0.054	<0.11	0.17	<0.046	0.18	0.16	0.085	<0.054
Vanadium (V)	µg/L	<1.2	<1.2	1.6	<0.92	<0.92	<1.2	1.7	<0.92	<0.92	<0.92	-	-	<1.2	1.8	1.7	1.9	-	-	-
Zinc (Zn)	µg/L	3.2	2.1	15	13	9.9	35	<1.9	2.1	1.8	43	7.2	58	3.4	2.2	<1.6	3.2	12	-	61
Calcium (Ca)	mg/L	110	100	100	100	100	74	57	79	17	4.6	220	160	310	61	150	110	200	200	210
Magnesium (Mg)	mg/L	31	34	32	32	32	35	28	35	20	1.8	85	59	120	28	57	42	38	37	46
Sodium (Na)	mg/L	18	18	19	18	19	16	18	17	24	35	25	19	28	9.6	17	14	25	25	30
Potassium (K)	mg/L	1.7	1.4	1.4	1.3	1.1	0.6	3.5	1.3	3.9	8.6	1.1	1.1	1.5	0.88	1	0.67	1.1	1.1	1.4
Silicon (as SiO_2)	mg/L	23	21	22	23	22	16	6	16	15	12	15	17	17	16	17	18	11	11	12
Total Recoverable Metals																				
Total Recoverable Aluminum (Al	µg/L	160	160	320	230	110	94	38	<38	38	340	<28	85	62	3,700	490	83	32	39	63
Total Recoverable Antimony (Sb	µg/L	<0.20	<0.20	0.1	0.11	<0.085	<0.20	<0.20	0.13	<0.085	0.34	<0.23	<0.23	<0.40	<0.20	0.15	0.38	6.2	6.1	4.0
Total Recoverable Arsenic (As)	µg/L	<1.1	<1.1	<0.61	<0.61	<0.61	<1.1	<1.1	<0.61	<0.61	<0.61	<0.82	<0.82	<2.2	<1.1	<0.61	<0.61	2.4	1.9	2.0
Total Recoverable Barium (Ba)	µg/L	19	23	21	14	16	170	200	230	170	180	38	100	61	100	110	150	40	40	72
Total Recoverable Beryllium (Be	µg/L	<0.20	<0.20	<0.22	<0.22	<0.22	<0.20	<0.20	<0.22	<0.22	<0.22	<0.060	<0.060	<0.40	<0.20	<0.22	<0.22	<0.060	<0.060	<0.060
Total Recoverable Boron (B)	µg/L	16	33	36	36	38	26	15	23	28	19	-	60	290	70	59	49	-	-	90
Total Recoverable Cadmium (Cd	µg/L	<0.11	<0.11	<0.090	<0.09	<0.09	<0.11	<0.11	<0.090	<0.09	0.15	<0.051	<0.051	<0.22	<0.11	0.097	<0.09	0.14	0.16	0.086
Total Recoverable Chromium (C	µg/L	<0.64	<0.64	<0.82	<0.82	2.2	3.5	1.2	<0.82	<0.82	2.5	<1.6	<1.6	<1.3	40	4.7	1.7	<1.6	<1.6	<1.6
Total Recoverable Copper (Cu)	µg/L	1.2	0.92	0.89	1.3	0.89	4.8	11	14	4.4	4.1	1.6	1.6	3.2	15	5.8	4.8	1.4	1.3	1.7
Total Recoverable Iron (Fe)	µg/L	350	350	720	510	240	160	57	<30	9.2	640	<16	46	99	6,600	870	120	87	100	75
Total Recoverable Lead (Pb)	µg/L	<0.19	<0.19	<0.12	<0.12	<0.12	0.26	0.69	<0.12	<0.12	0.28	<0.053	<0.053	<0.38	1.7	<0.12	<0.12	<0.053	<0.053	<0.053
Total Recoverable Manganese (	µg/L	9.5	8.6	15	12	6.1	92	5.2	0.94	1.4	11	0.92	3.3	3.2	130	22	5.6	4.8	4.9	5.5
Total Recoverable Mercury (Hg)	µg/L	0.05	<0.016	-	-	-	<0.016	0.050	-	-	-	<0.016	0.028	<0.016	<0.016	<0.017	-	<0.016	<0.016	0.028
Total Recoverable Molybdenum	µg/L	1.2	1.1	16	1.1	1.5	5.5	6.7	7.1	6.2	20	8.2	3.3	4.5	2	5.5	3.2	770	750	430
Total Recoverable Nickel (Ni)	µg/L	2.1	2.6	12	10	18	11	5.4	6.7	11	5.3	4.3	3.2	5.8	27	8.1	3.6	75	77	120
Total Recoverable Selenium (Se	µg/L	<0.54	<0.54	0.41	<0.36	<0.36	<0.54	<0.54	<0.36	<0.36	0.39	9.2	7.6	9.2	2.3	11	4.2	87	84	74
Total Recoverable Silver (Ag)	µg/L	<0.088	<0.088	<0.075	<0.075	<0.075	<0.088	<0.088	<0.075	<0.075	<0.075	<0.064	<0.064	<0.18	<0.088	<0.075	<0.075	<0.064	<0.064	<0.064
Total Recoverable Thallium (Tl)	µg/L	<0.11	<0.11	<0.081	<0.081	<0.081	<0.11	<0.11	<0.081	<0.081	<0.081	<0.054	<0.054	<0.22	<0.11	<0.081	0.2	<0.054	<0.054	<0.054
Total Recoverable Vanadium (V	µg/L	<2.6	2.8	3.6	3	1.7	4.3	<2.6	1.6	<0.97	2.8	-	-	<5.2	23	3.9	<0.97	-	-	-
Total Recoverable Zinc (Zn)	µg/L	9.9	5.5	19	23	13	40	10	5.2	10	45	6.0	8.4	8.7	18	2.5	4.7	15	16	12
Total Recoverable Calcium (Ca)	mg/L	120	100	110	110	110	87	70	86	76	15	240	180	310	71	170	120	230	230	220
Total Recoverable Magnesium (I	mg/L	33	34	35	33	35	41	32	37	36	1.9	92	64	120	32	62	45	43	43	48
Total Recoverable Sodium (Na)	mg/L	20	19	19	20	20	18	17	21	24	34	26	19	30	10	19	15	27	43	31
Total Recoverable Potassium (K	mg/L	1.9	1.5	1.6	1.6	1.2	0.62	3.7	2	2.2	8.4	1.3	0.89	1.5	1.1	1.1	0.71	1.2	1.2	1.2
Pesticides and PCBs																				
Pesticides		-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-	ND	ND	ND
PCBs		-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-	ND	ND	ND
VOCs																				
Bromoform	µg/L	-	-	-	-	-	-	-	-	-	-	<0.24	<0.24	-	-	-	-	<0.24	<0.24	<0.24
Chloroform	µg/L	-	-	-	-	-	-	-	-	-	-	<0.23	<0.23	-	-	-	-	<0.23	<0.23	<0.23
Dibromochloromethane	µg/L	-	-	-	-	-	-	-	-	-	-	<0.23	<0.23	-	-	-	-	<0.23	<0.23	<0.23
Toluene	µg/L	-	-	-	-	-	-	-	-	-	-	<0.12	<0.12	-	-	-	-	<0.12	<0.12	<0.12

GOLDER

		HG-9	HG-9	HG-9	HG-9	HG-9	HG-10	HG-10	HG-10	HG-10	HG-10	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-2	SW-2 Dup	SW-2
		27-Oct-09	29-Dec-09	26-May-10	30-Nov-10	3-May-11	28-Sep-09	4-Jan-10	26-May-10	30-Nov-10	3-May-11	4-Feb-09	2-Apr-09	22-Sep-09	19-Jan-10	29-Dec-10	22-Apr-11	4-Feb-09	4-Feb-09	2-Apr-09
SVOCs																				
bis(2-ethylhexyl)phthalate	µg/L	-	-	-	-	-	-	-	-	-	-	2	3.2	-	-	-	-	1.8	-	2.1
General Chemistry																				
Bicarbonate	mg/L	420	440	420	420	420	390	290	370	130	70	280	270	290	170	230	280	190	-	180
Carbonate	mg/L	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	8.8	<2.5	15	9.1	<5.0	<2.5	<5.0	<2.5	<5	<2.5	<5.0	-	<2.5
Total Alkalinity (as $CaCO_3$)	mg/L	350	360	350	340	350	320	250	300	130	73	230	220	240	140	190	230	150	150	150
Chloride	mg/L	26	27	27	23	23	14	14	14	14	9.1	23	15	28	9.4	11	11	14	14	12
Fluoride	mg/L	0.36	0.46	0.38	0.39	0.34	0.14	0.11	0.074	0.11	0.051	0.13	0.11	0.12	0.12	0.15	0.13	0.15	0.14	0.085
Sulfate	mg/L	31	26	27	27	25	30	29	34	25	13	650	450	1,100	110	390	220	560	560	600
Hardness (as $CaCO_3$)	mg/L	400	390	390	390	390	330	260	340	120	19	900	650	1,300	270	620	450	650	750	740
Total Dissolved Solids (TDS)	mg/L	450	460	480	460	510	400	340	410	200	120	1,400	890	1,800	350	830	600	1,100	970	1,100
Total Suspended Solids (TSS)	mg/L	6	5.2	4.9	12	2.6	18	7	<1.4	6.9	20	<2.5	0.75	5.2	340	14	<1.4	<2.5	2.2	2.0
Residual Chlorine	mg/L	<0.10	<0.10	-	-	-	<0.10	<0.10	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	<0.10	<0.10	<0.10
Ammonia (as N)	mg/L-N	<0.025	<0.025	0.034	<0.025	0.036	<0.025	0.026	0.052	0.067	0.067	<0.025	<0.050	<0.025	0.038	<0.025	0.028	<0.025	<0.025	<0.025
Nitrate (as N)	mg/L-N	0.91	0.77	0.68	0.86	0.58	0.05	0.029	0.038	<0.014	0.27	4.9	3.3	5.6	0.81	2.4	1.1	0.65	0.67	2.3
Nitrite (as N)	mg/L-N	0.0091	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	0.021	<0.0081	<0.0081	0.013	<0.0081	<0.0081	<0.0081	<0.0081	0.0091	<0.0081	<0.0081	<0.0081	<0.0081
Total Phosphorus	mg/L	0.067	<0.016	0.021	<0.016	<0.016	<0.016	0.036	<0.016	<0.016	<0.016	<0.012	0.031	<0.016	0.26	<0.016	<0.016	<0.012	<0.012	0.025
Total Sulfide	mg/L	<0.050	<0.050	<0.050	<0.05	<0.05	<0.050	<0.050	<0.050	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.05	<0.05	<0.050	<0.050	<0.050
pH	s.u.	7.55	7.44	7.48	7.42	7.43	7.52	8.5	7.9	9.01	9.05	7.97	8.13	7.86	7.07	8.05	8.12	8.30	8.29	8.15
Electrical Conductivity (@ 25 °C	µmhos/cm	752	775	770	757	748	662	533	660	343	215	1,500	1,110	2040	515	1080	808	1,240	1,210	1,210
Odor	odor units	none	none	none	none	none	none	none	none	none	1	none	none	none	4	1	none	none	4	none
Turbidity	NTU	3.6	1.4	6.5	4.2	3	4.6	2.7	2.3	0.31	22	0.38	0.24	2.1	120	11	0.7	2.9	2.4	0.44
Cyanide	mg/L	<0.0028	<0.0028	-	-	-	<0.0028	<0.0028	-	-	-	<0.0032	0.0034	<0.0028	<0.0028	-	-	<0.0032	<0.0032	0.0036
Dioxins	pg/L	-	-	-	-	-	-	-	-	-	-	<0.64	<0.29	-	-	-	-	<0.64	-	<1.0
Aquatic Toxicity		-	-	-	-	-	-	-	-	-	-	pass	pass	-	-	-	-	pass	-	pass
Asbestos (# of fibers)	# of fibers	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	1	-	-
Oil and Grease	mg/L	-	-	-	-	-	-	-	-	-	-	-	<1.2	-	-	-	-	-	-	<1.2

TABLE B-1
Groundwater, Surface Water and Mine Water Quality Results

		SW-2 Dup	SW-2	SW-2 Dup	SW-2	SW-2 Dup	SW-2	SW-2 Dup	SW-2	SW-2 Dup	SW-2	SW-2 Dup	SW-2	SW-2 Dup	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	North Quarry	West Material Storage Area Runoff	GT-2-14
		2-Apr-09	22-Sep-09	22-Sep-09	20-Jan-10	20-Jan-10	20-Apr-10	20-Apr-10	11-Aug-10	11-Aug-10	29-Dec-10	29-Dec-10	22-Apr-11	22-Apr-11	4-Feb-09	1-Apr-09	22-Sep-09	14-Jan-10	1-Dec-10	22-Apr-11	13-Jan-10	13-Jan-10	10-Sep-18
Dissolved Metals																							
Aluminum (Al)	µg/L	<38	<38	<38	<38	<38	<38	<38	<26	<26	<26	<26	<26	<26	<38	<38	<38	<38	<26	<26	<38	<38	-
Antimony (Sb)	µg/L	4.0	2.4	3.0	0.98	0.99	3.5	3.6	6.2	6	2.5	2.6	2.9	2.8	<0.23	<0.23	<0.17	<0.17	<0.087	<0.087	8.2	0.86	1.1
Arsenic (As)	µg/L	3.4	1.5	2.2	1.5	1.5	2.8	2.5	2	2	1.1	1.4	3.1	2.8	<0.67	<0.67	<0.52	<0.52	<0.61	<0.61	4.5	1.3	3.7
Barium (Ba)	µg/L	66	60	68	43	42	85	86	31	31	70	69	49	49	96	100	170	110	100	120	41	24	41
Beryllium (Be)	µg/L	<0.046	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.046	<0.046	<0.18	<0.18	<0.14	<0.14	<0.18	<0.18	<1.0
Boron (B)	µg/L	91	100	100	36	35	72	73	65	66	82	85	70	69	-	39	67	40	49	37	69	31	-
Cadmium (Cd)	µg/L	0.057	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.070	0.083	0.18	0.1	<0.07	<0.07	0.017	<0.013	<0.13	<0.13	<0.07	<0.07	0.53	<0.13	0.066
Chromium (Cr)	µg/L	<0.64	<0.55	0.58	<0.55	<0.55	<0.55	<0.55	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.64	0.81	<0.55	0.63	<0.85	<0.85	<0.55	<0.55	6.4
Hexavalent Chromium (Cr VI)	µg/L	0.92	<0.70	<0.70	1.2	1.2	-	-	-	-	-	-	-	-	1.4	<0.7	<0.70	1.3	-	-	2.0	-	-
Copper (Cu)	µg/L	1.3	3.3	4.8	1.8	2	1.1	1.3	3.8	4	2.4	2.3	1.4	2	0.7	0.6	2.2	1.4	0.99	1.3	1.5	1.2	<2.0
Iron (Fe)	µg/L	<7.2	<9.3	<9.3	<9.3	<9.3	<9.3	<9.3	<5.0	<5.0	<5	<5	<5	5.4	<7.2	<7.2	<9.3	<9.3	<5	<5	<9.3	<9.3	-
Lead (Pb)	µg/L	<0.019	<0.054	<0.054	<0.054	0.22	<0.054	<0.054	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.019	0.026	<0.054	<0.054	<0.16	<0.16	<0.054	<0.054	0.021
Manganese (Mn)	µg/L	3.0	2.1	2.8	3.9	4.2	4.3	4.6	2.3	2.2	2.4	2.5	3.9	4.1	0.11	0.31	0.73	1.4	2.4	0.97	21	14	-
Mercury (Hg)	µg/L	<0.016	-	-	-	-	-	-	-	-	-	-	-	-	<0.016	<0.016	-	-	-	-	-	-	-
Mercury (Hg) by 1631	µg/L	0.00157	0.00182	0.00173	0.070	0.0662	-	-	-	-	-	-	-	-	0.00072	<0.00020	0.00069	0.00089	-	-	0.0107	-	-
Molybdenum (Mo)	µg/L	490	470	470	83	84	350	350	460	480	300	310	180	180	24	0.91	10	3.6	0.93	0.86	540	120	18
Nickel (Ni)	µg/L	110	44	47	27	27	92	95	130	130	38	38	61	60	1.4	1.0	1.3	0.87	1.6	1.9	160	3.4	7.5
Selenium (Se)	µg/L	76	81	90	13	13	54	54	68	70	47	46	27	29	<0.23	0.7	<0.38	0.45	<0.23	<0.23	82	29	1.1
Silver (Ag)	µg/L	<0.028	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065	<0.042	<0.042	<0.042	<0.042	<0.042	<0.042	<0.028	<0.028	<0.065	<0.065	0.84	<0.042	<0.065	<0.065	<1.0
Thallium (Tl)	µg/L	<0.054	<0.11	<0.11	<0.11	<0.11	0.13	0.13	0.37	0.35	0.11	0.1	0.18	0.13	<0.054	0.1	<0.11	<0.11	<0.046	<0.046	0.39	<0.11	<1.0
Vanadium (V)	µg/L	-	97	110	66	66	94	97	180	180	63	62	61	60	-	-	<1.2	1.9	<0.92	1.5	400	2.6	3.4
Zinc (Zn)	µg/L	71	3.1	4	4.1	4.4	12	12	3.6	3.3	5.3	5	3	3.2	4.7	67	<1.9	<1.9	<1.6	<1.6	120	28	3.6
Calcium (Ca)	mg/L	200	200	210	84	79	170	170	210	200	140	140	140	140	55	58	64	61	58	58	210	160	-
Magnesium (Mg)	mg/L	46	53	55	28	26	43	43	43	43	41	42	44	44	37	34	37	36	36	34	36	42	-
Sodium (Na)	mg/L	30	24	24	13	12	22	21	21	21	20	20	19	19	18	14	16	16	16	13	22	24	-
Potassium (K)	mg/L	1.4	1.1	0.89	2.2	2.1	1	1	1.2	1.1	1.5	1.5	1	1	0.55	0.63	0.51	0.63	0.64	0.57	0.85	2	-
Silicon (as SiO_2)	mg/L	12	17	17	13	12	14	14	12	12	14	14	15	15	18	22	23	19	19	21	12	7.4	-
Total Recoverable Metals																							
Total Recoverable Aluminum (Al	µg/L	110	<38	<76	4,900	5,200	52	74	100	290	1400	1200	130	120	<28	<28	<76	72	39	41	720	87,000	-
Total Recoverable Antimony (Sb	µg/L	4.0	2.3	2.2	1.4	1.1	3.4	3.5	6.7	6	3.1	3.4	3.1	2.8	<0.23	0.29	<0.20	0.42	0.29	0.09	7.9	1.6	0.99
Total Recoverable Arsenic (As)	µg/L	2.1	<1.1	1.4	2.2	2.3	1.4	1.2	3	3	1.7	2.3	1.6	1	<0.82	<0.82	<1.1	<1.1	<0.61	<0.61	3.7	21	2.8
Total Recoverable Barium (Ba)	µg/L	76	60	61	180	170	85	89	38	39	130	140	54	53	110	110	160	110	110	120	59	4,200	41
Total Recoverable Beryllium (Be	µg/L	0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.060	<0.060	<0.20	<0.20	<0.22	<0.22	<0.20	1.1	<1.0
Total Recoverable Boron (B)	µg/L	85	110	350	52	54	76	74	81	82	68	71	69	63	-	48	360	39	50	36	70	52	-
Total Recoverable Cadmium (Cc	µg/L	0.099	0.14	0.11	0.49	0.44	<0.11	<0.11	0.099	0.12	0.17	0.28	<0.09	<0.09	<0.051	<0.051	<0.11	0.7	<0.09	<0.09	1.3	5.8	<1.0
Total Recoverable Chromium (C	µg/L	<1.6	0.93	<0.64	25	25	<0.64	<0.64	1.5	<0.82	8.3	8.8	1.5	1.6	<1.6	<1.6	1.1	1.3	<0.82	1.3	6	370	4.1
Total Recoverable Copper (Cu)	µg/L	4.2	2.5	2.2	14	13	1.5	1.5	2.1	2.2	5.3	8.8	1.4	1.4	0.67	0.78	1.3	1.2	0.76	0.87	3.3	170	4.3
Total Recoverable Iron (Fe)	µg/L	120	58	<60	8,300	9,000	77	110	140	450	2200	1900	230	220	<16	30	<60	150	95	68	1,200	160,000	-
Total Recoverable Lead (Pb)	µg/L	<0.053	<0.19	<0.19	2.5	2.3	<0.19	<0.19	<0.12	0.14	0.47	0.4	<0.12	<0.12	<0.053	0.064	<0.19	0.2	0.16	<0.12	0.5	17	0.25
Total Recoverable Manganese (	µg/L	7.2	4	3.7	170	150	6.4	6.9	8.6	13	40	40	8.5	8.5	0.37	0.75	1.1	4.5	2.8	2.5	38	3,000	-
Total Recoverable Mercury (Hg)	µg/L	<0.016	0.02	0.058	0.032	<0.016	-	-	<0.017	<0.017	0.028	0.022	-	-	<0.016	<0.016	0.018	<0.016	-	-	<0.016	1.5	-
Total Recoverable Molybdenum	µg/L	180	470	450	92	94	360	370	580	510	370	390	200	190	16	1.3	1.1	1.1	1	0.73	630	140	18
Total Recoverable Nickel (Ni)	µg/L	120	44	43	77	73	100	100	140	140	57	61	67	67	1.3	1.0	1.5	1.4	1.7	1.8	180	460	10
Total Recoverable Selenium (Se	µg/L	75	71	69	13	13	48	48	73	72	46	49	26	25	<0.50	0.52	<0.54	<0.54	<0.36	<0.36	73	33	1.1
Total Recoverable Silver (Ag)	µg/L	<0.064	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.075	<0.075	<0.075	<0.075	<0.075	<0.075	<0.064	<0.064	<0.088	<0.088	<0.075	<0.075	<0.088	0.89	<1.0
Total Recoverable Thallium (Tl)	µg/L	<0.054	<0.11	<0.11	0.28	0.14	0.15	0.16	0.38	0.33	0.37	0.46	0.25	0.18	<0.054	0.14	<0.11	0.13	0.23	<0.081	0.24	0.79	<1.0
Total Recoverable Vanadium (V	µg/L	-	93	86	100	96	99	100	200	190	82	85	66	63	-	-	<2.6	<2.6	1.2	<0.97	430	350	5.5
Total Recoverable Zinc (Zn)	µg/L	15	10	12	89	85	17	18	6.3	6.5	26	27	9.5	10	7.8	6.0	5.9	5.9	5.8	4.9	140	600	8.7
Total Recoverable Calcium (Ca)	mg/L	200	200	200	100	100	180	180	230	220	160	160	160	150	61	66	31	69	64	62	230	1000	85
Total Recoverable Magnesium (I	mg/L	44	52	53	31	33	44	44	49	48	47	47	48	46	41	39	18	42	40	36	40	160	64
Total Recoverable Sodium (Na)	mg/L	30	24	25	13	13	22	22	27	26	22	22	21	20	19	16	17	17	17	14	23	25	120
Total Recoverable Potassium (K	mg/L	1.1	0.99	0.89	2.7	2.8	1.1	1.1	1.4	1.4	1.8	1.9	1.1	1	0.6	0.72	0.53	0.75	0.69	0.64	1.0	8.2	12
Pesticides and PCBs																							
Pesticides		ND	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-	-	-	-
PCBs		ND	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-	-	-	-
VOCs																							
Bromoform	µg/L	<0.24	-	-	-	-	-	-	-	-	-	-	-	-	<0.24	<0.24	-	-	-	-	-	-	<0.50
Chloroform	µg/L	<0.23	-	-	-	-	-	-	-	-	-	-	-	-	<0.23	<0.23	-	-	-	-	-	-	0.29
Dibromochloromethane	µg/L	<0.23	-	-	-	-	-	-	-	-	-	-	-	-	<0.23	<0.23	-	-	-	-	-	-	<0.50
Toluene	µg/L	<0.12	-	-	-	-	-	-	-	-	-	-	-	-	<0.12	<0.12	-	-	-	-	-	-	<0.50

GOLDER

		SW-2 Dup	SW-2	SW-2 Dup	SW-2	SW-2 Dup	SW-2	SW-2 Dup	SW-2	SW-2 Dup	SW-2	SW-2 Dup	SW-2	SW-2 Dup	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	North Quarry	West Material Storage Area Runoff	GT-2-14
		2-Apr-09	22-Sep-09	22-Sep-09	20-Jan-10	20-Jan-10	20-Apr-10	20-Apr-10	11-Aug-10	11-Aug-10	29-Dec-10	29-Dec-10	22-Apr-11	22-Apr-11	4-Feb-09	1-Apr-09	22-Sep-09	14-Jan-10	1-Dec-10	22-Apr-11	13-Jan-10	13-Jan-10	10-Sep-18
SVOCs																							
bis(2-ethylhexyl)phthalate	µg/L	4.6	-	-	-	-	-	-	-	-	-	-	-	-	2.3	<1.1	-	-	-	-	-	-	<4.0
General Chemistry																							
Bicarbonate	mg/L	180	240	230	170	170	210	210	160	160	200	200	200	200	320	320	310	330	310	300	200	71	-
Carbonate	mg/L	<2.5	<5.0	<5.0	<2.5	<2.5	<5.0	<5.0	<5.0	<5.0	<2.5	<2.5	<2.5	<2.5	<2.5	13	7.1	<2.5	<2.5	5.7	<5.0	<5.0	-
Total Alkalinity (as $CaCO_3$)	mg/L	150	190	190	140	140	170	170	130	130	170	170	160	160	260	270	260	270	260	260	170	58	-
Chloride	mg/L	12	18	18	10	10	12	12	13	13	11	12	11	11	28	16	23	20	21	14	13	25	83
Fluoride	mg/L	0.10	0.17	0.17	0.13	0.13	0.14	0.15	0.13	0.13	0.13	0.14	0.13	0.12	0.18	0.14	0.12	0.099	0.11	0.13	0.14	0.22	-
Sulfate	mg/L	610	550	560	160	160	470	460	590	600	350	350	370	370	28	18	22	23	21	15	550	550	140
Hardness (as $CaCO_3$)	mg/L	690	710	750	320	300	610	610	690	690	530	530	540	540	290	290	310	300	-	280	673	580	480
Total Dissolved Solids (TDS)	mg/L	1,000	1,000	1,000	410	400	820	840	980	980	710	720	730	730	340	360	350	360	370	260	790	900	-
Total Suspended Solids (TSS)	mg/L	2.2	5.2	4	200	190	2.5	1.8	<1.7	<1.7	38	28	4.3	5.1	<2.5	0.86	<2.0	<3.3	<1.7	<1.4	18	3,600	-
Residual Chlorine	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	-	<0.10	<0.10	-
Ammonia (as N)	mg/L-N	<0.025	<0.025	<0.025	0.15	0.07	<0.025	<0.025	<0.025	<0.025	0.093	0.095	<0.025	<0.025	<0.025	<0.025	<0.025	0.027	<0.025	<0.025	<0.025	0.095	-
Nitrate (as N)	mg/L-N	2.3	0.48	0.51	1.4	1.4	1.5	1.5	0.28	0.3	1.8	1.9	0.91	0.89	<0.018	<0.026	0.055	<0.026	<0.014	0.064	0.73	7.6	0.23
Nitrite (as N)	mg/L-N	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	0.04	0.042	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	<0.0081	0.055
Total Phosphorus	mg/L	0.012	<0.016	<0.016	0.29	0.59	<0.016	0.038	<0.016	<0.016	0.071	0.076	<0.016	<0.016	<0.012	<0.012	0.016	<0.016	<0.016	<0.016	<0.016	1.8	-
Total Sulfide	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.05	<0.05	<0.050	-	-
pH	s.u.	8.28	8.24	8.16	7.49	7.55	8.28	8.28	8.21	8.22	8.26	8.29	8.09	8.09	8.18	8.39	8.39	8.27	8.3	8.4	7.94	7.90	7.4
Electrical Conductivity (@ 25 °C	µmhos/cm	1,210	1,270	1250	602	605	1090	1100	1170	1160	942	948	955	958	577	541	589	596	570	522	1,130	1,090	1,323
Odor	odor units	none	2	2	8	4	1	none	4	4	1	1	none	none	2	none	1	none	none	none	-	-	-
Turbidity	NTU	0.48	1.5	1.9	90	100	3.4	2.1	2.9	2.8	55	30	2.1	2.7	0.22	0.36	2.1	0.78	71	0.61	-	-	5.9
Cyanide	mg/L	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	-	-	-	-	-	-	-	-	<0.0032	<0.0032	<0.0028	-	-	-	<0.0028	-	-
Dioxins	pg/L	<0.72	-	-	-	-	-	-	-	-	-	-	-	-	<0.64	<0.31	-	-	-	-	-	-	-
Aquatic Toxicity		pass	-	-	-	-	-	-	-	-	-	-	-	-	pass	pass	-	-	-	-	-	-	-
Asbestos (# of fibers)	# of fibers	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-	-	-
Oil and Grease	mg/L	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	-	-	-	-	-	-	-

GOLDER

Parameter	Hexavalent Chromium (Cr VI)	Mercury (Hg)	Nickel (Ni)	Total Suspended Solids (TSS)	Selenium (Se)	Turbidity	Settleable Matter	Total Dissolved Solids (TDS)
Units	µg/L	µg/L	µg/L	mg/L	µg/L	NTU	mL/L/hr	mg/L
Frequency	1/week	1/week	1/week	1/week	1/week	1/week	1/week	1/week
Sample Type	24-hr	grab	24-hr	24-hr	24-hr	24-hr	24-hr	24-hr
12/3/2014	0.22	0.00134	21	2	93	1.6	0.1	980
12/10/2014	0.28	0.00111	23	1.1	97	0.74	0.1	1,000
12/17/2014	1.6	-	35	4.5	44	3.7	0.1	1,000
12/22/2014	0.12	0.00083	110	10	56	1.3	0.1	1,300
12/29/2014	0.02	0.00286	90	2.3	59	3.2	0.1	1,200
1/7/2015	0.44	0.00201	72	0.67	58	0.84	0.1	1,100
1/14/2015	0.41	0.00241	68	1.4	56	1.6	0.1	1,100
1/21/2015	0.55	0.00198	54	0.99	71	0.87	0.1	1,100
1/28/2015	0.14	0.0024	80	0.88	59	1.6	0.1	1,200
2/4/2015	0.31	0.00159	58	1.2	62	1.0	0.1	1,200
2/11/2015	0.27	0.00114		3.7		1.9	0.1	1,200
2/13/2015	-	-	99		44			
2/19/2015	1.0	0.00157	76	1.4	52	1.7	0.1	1,100
2/25/2015	0.97	0.0015	90	4	40	2.6	0.1	1,100
3/4/2015	0.11	0.00266	72	4.7	44	3.9	0.1	1,100
3/11/2015	0.58	0.00175	87	1.8	52	2.2	0.1	1,100
3/18/2015	0.63	0.00054	80	2.1	44	1.7	0.1	1,100
3/25/2015	0.6	0.00272	92	1.4	46	1.8	0.1	1,100
4/1/2015	0.64	0.00285	100	0.61	46	1.4	0.1	1,100
4/8/2015	0.39	0.00179	100	7.1	47	3	0.1	1,100
4/14/2015	0.22	0.00175	76	1.4	40	1	0.1	940
4/23/2015	0.31	0.00146	59	0.6	39	0.86	0.1	1,000
4/29/2015	0.2	0.00181	56	6.2	46	1.2	0.1	1,000
5/6/2015	0.19	0.00206	62	2.6	37	2.1	0.1	1,100
5/13/2015	0.18	0.00208	62	1.2	37	1.2	0.1	1,000
5/20/2015	0.089	0.00208	43	1.8	43	2.2	0.1	1,000
5/27/2015	0.16	0.00209	41	1.2	51	1.3	0.1	960
6/3/2015	0.22	0.00173	46	0.8	47	1.1	0.1	920
6/10/2015	0.14	0.00167	41	1.3	46	0.95	0.1	1,000
6/17/2015	0.055	0.0017	37	5	47	3.4	0.1	990
6/25/2015	0.055	0.00269	38	0.5	47	1.1	0.1	1,000
6/30/2015	0.068	0.0019	40	1.3	40	0.92	0.1	990
7/1/2015	***No discharge for the month***							
8/1/2015	***No discharge for the month***							
9/1/2015	***No discharge for the month***							
10/10/2015	0.055	0.00094	69	11	25	12	0.1	1,100
10/15/2015	0.055	0.00056	51	1.4	46	6.4	0.1	1,000
10/21/2015	0.055	0.00036	39	3.4	38	12.3	0.1	1,000
10/29/2015	0.05	0.0006	51	5.8	42	9.2	0.1	960
11/4/2015	0.055	0.0007	40	3.9	52	6.1	0.1	960
11/10/2015	0.055*	-	440*	180*	420*	11*	1.5*	860*
11/20/2015	0.055	0.00156	61	10	38	7.0	0.1	940
11/24/2015	0.055	0.00097	53	4.3	44	9.2	0.1	900
12/3/2015	0.055	0.00075	51	1.9	42	29.8	0.1	1,000
12/8/2015	0.055	0.00061	52	5.7	41	24.1	0.1	940
1/1/2016	***No discharge for the month***							
2/1/2016	***No discharge for the month***							

GOLDER

Parameter	Hexavalent Chromium (Cr VI)	Mercury (Hg)	Nickel (Ni)	Total Suspended Solids (TSS)	Selenium (Se)	Turbidity	Settleable Matter	Total Dissolved Solids (TDS)
Units	µg/L	µg/L	µg/L	mg/L	µg/L	NTU	mL/L/hr	mg/L
Frequency	1/week	1/week	1/week	1/week	1/week	1/week	1/week	1/week
Sample Type	24-hr	grab	24-hr	24-hr	24-hr	24-hr	24-hr	24-hr
3/13/2016	0.034	0.00058	73	1.3	39	3.18	0.1	1,300
3/18/2016	1.5	0.00121	150	0.60	74	2.61	0.1	1,200
3/30/2016	1.2	0.00116	35	0.5	75	1.81	0.1	1,200
4/7/2016	0.90	0.00056	110	2.0	72	2.01	0.1	1,300
4/13/2016	1.0	0.00105	110	0.5	67	1.51	0.1	1,200
4/20/2016	0.62	0.00065	120	1.0	67	2.75	0.1	1,200
4/25/2016	0.82	0.00056	110	0.80	60	1.64	0.1	1,200
5/4/2016	0.38	0.00076	120	1.5	60	0.65	0.1	1,200
5/11/2016	0.78	0.00087	100	0.5	55	5.98	0.1	1,100
5/16/2016	0.24	0.00078	110	20	51	2.53	0.1	1,100
5/26/2016	0.22	0.00081	110	0.90	53	2.05	0.1	1,200
6/2/2016	0.21	0.00089	110	0.90	50	1.02	0.1	1,100
6/9/2016	0.28	0.00072	110	0.50	51	2.40	0.1	1,100
6/16/2016	0.30	0.00076	110	1.0	55	1.07	0.1	1,000
6/23/2016	0.32	0.00406	120	0.5	55	3.06	0.1	1,300
6/30/2016	0.13	0.00093	110	1	48	2.20	0.1	1,100
7/7/2016	0.16	0.0007	110	0.50	49	0.94	0.1	1,200
7/13/2016	0.27	0.00003	130	0.50	53	0.50	0.1	1,200
7/20/2016	0.25	0.001	210	0.61	67	1.03	0.1	1,100
7/28/2016	0.27	0.00259	220	0.5	55	7.17	0.1	1,300
8/6/2016	0.07	0.00174	150	1.0	47	1.59	0.1	1,100
8/10/2016	0.06	0.00261	180	0.80	50	1.84	0.1	1,100
8/18/2016	0.03	0.00317	170	2.3	40	5.19	0.1	1,100
8/24/2016	0.17	0.00212	150	1.0	50	2.09	0.1	1,100
8/31/2016	0.06	0.00423	140	0.5	55	1.87	0.1	1,000
9/8/2016	0.034	0.00107	170	0.5	48	-	0.1	1,100
9/15/2016	0.04	0.00531	180	0.90	50	-	0.1	1,000
9/21/2016	0.05	0.00228	160	0.50	46	-	0.1	990
9/28/2016	0.16	0.00088	69	0.50	26	-	0.1	1,000
10/11/2016	0.27	0.00104	49	0.60	32	-	0.1	980
10/18/2016	0.42	0.00678	40	0.50	41	1.73	0.1	1,000
10/25/2016	0.43	0.0192	48	0.50	55	-	0.1	1,100
10/27/2016	-	-	-	-	-	0.3	-	-
11/1/2016	0.31	0.00177	42	2.1	49		0.1	1,000
11/10/2016	0.30	0.00099	50	0.50	39	1.40	0.1	980
11/16/2016	0.32	0.00108	51	0.56	40	0.3	0.1	1,000
11/22/2016	0.38	0.00121	51	0.56	41	0.5	0.1	1,100
11/30/2016	0.45	-	76	0.50	68	0.3	0.1	1,100
12/6/2016	0.26	0.0009	92	0.5	68	0.6	0.1	1,100
12/13/2016	0.20	0.0006	110	0.5	71	1.10	0.1	1,100
12/20/2016	0.19	0.00037	130	0.50	49	0.90	0.1	1,100
12/29/2016	0.38	0.0009	120	0.50	74	-	0.1	1,100
1/7/2017	0.59	0.00108	68	0.5	89	-	0.1	1,100
1/11/2017	0.60	0.00272	33	0.5	70	1.86	0.1	880
1/17/2017	1.2	0.00135	120	0.6	98	2.2	0.1	1,300
1/24/2017	0.96	0.00214	58	0.80	78	0.9	0.1	1,300

Parameter	Hexavalent Chromium (Cr VI)	Mercury (Hg)	Nickel (Ni)	Total Suspended Solids (TSS)	Selenium (Se)	Turbidity	Settleable Matter	Total Dissolved Solids (TDS)
Units	µg/L	µg/L	µg/L	mg/L	µg/L	NTU	mL/L/hr	mg/L
Frequency	1/week	1/week	1/week	1/week	1/week	1/week	1/week	1/week
Sample Type	24-hr	grab	24-hr	24-hr	24-hr	24-hr	24-hr	24-hr
2/1/2017	0.94	0.0009	140	0.5	81	0.22	0.1	1,500
2/9/2017	1.1	0.00126	120	7.0	85	0.6	0.30	1,400
2/14/2017	0.84	0.00148	140	0.5	84	0.6	0.1	1,500
2/24/2017	0.98	0.00127	130	0.5	77	0.5	0.1	1,400
2/28/2017	0.03	0.001	120	1.6	83	0.2	0.1	1,400
3/9/2017	0.1	0.00098	160	0.90	83	0.16	0.10	1,400
3/14/2017	0.086	0.00087	140	0.78	87	0.2	0.1	1,400
3/21/2017	0.20	0.00084	130	0.89	79	0.2	0.1	1,300
3/29/2017	0.53	0.00112	130	0.80	65	0.6	0.1	1,200
4/5/2017	0.56	0.00092	140	0.56	65	0.2	0.10	1,200
4/11/2017	0.40	0.001	130	0.56	61	0.4	0.1	1,200
4/20/2017	0.55	0.00003	120	0.89	75	0.3	0.1	1,200
4/25/2017	0.54	0.00059	130	0.56	67	0.6	0.1	1,200
5/4/2017	0.52	0.00068	110	0.50	64	0.5	0.10	1200
5/10/2017	0.57	0.0011	130	0.56	55	0.3	0.10	1200
5/16/2017	0.56	0.00067	120	0.56	63	0.52	0.10	1200
5/22/2017	0.65	0.00062	130	0.56	64	0.5	0.10	1200
5/31/2017	0.78	0.00071	120	0.56	67	0.82	0.10	1200
6/8/2017	0.69	0.00003	120	0.56	61	0.79	0.10	1200
6/14/2017	0.58	0.00090	120	0.56	64	0.90	0.10	1200
6/20/2017	0.63	0.00079	120	0.56	82	4.8	0.10	1300
6/28/2017	0.52	0.0010	120	0.56	51	1.3	0.10	1100
7/5/2017	0.59	0.000029	110	0.56	51	0.58	0.10	1100
7/12/2017	0.52	0.00064	110	0.56	60	0.50	0.10	1100
7/20/2017	0.36	0.00076	120	0.56	53	0.83	0.10	1100
7/24/2017	0.38	0.00060	160	1.4	51	0.7	0.10	1100
8/2/2017	0.35	0.00068	120	0.56	54	0.5	0.10	1000
8/8/2017	0.32	0.0029	160	1.0	45	0.82	0.10	1000
8/16/2017	0.30	0.0011	140	0.56	55	0.7	0.10	1000
8/24/2017	0.36	0.00089	170	0.56	61	0.7	0.10	980
8/30/2017	0.30	0.0011	140	0.89	40	0.8	0.10	880
9/6/2017	0.35	0.0014	98	0.56	42	8.3	0.10	1000
9/12/2017	0.41	0.0018	130	0.56	47	0.91	0.10	940
9/19/2017	0.31	0.0013	130	0.56	44	0.24	0.10	960
9/26/2017	0.26	0.0017	150	0.56	40	0.30	0.10	960

Notes:

Water quality samples collected at Interim Treatment System sampling point: SP-114-INF

*Results for November 10, 2015 are considered anomalous

red font indicates analysis below detection limit

Appendix B-3
North Quarry Dewatering Wells Water Quality Results

Location	Units	EW-1					EW-3							EW-5						EW-7							EW-9	EW-10		
Date		4/10/2013	4/17/2013	5/3/2013	5/23/2013	6/10/2013	3/7/2013	4/4/2013	4/10/2013	4/17/2013	5/3/2013	5/23/2013	6/10/2013	3/28/2013	4/4/2013	4/10/2013	4/17/2013	5/3/2013	6/10/2013	5/21/2012	5/29/2012	06/04/12	6/25/2012	4/4/2013	4/10/2013	4/17/2013	6/10/2013	5/3/2013	5/23/2013	6/10/2013
Dissolved Metals																														
Calcium (Ca)	mg/L		200	170	160	150	330	220		220	190	170	170	210	180		180	180	170	170	170	170	160	170		150	150	200	180	170
Magnesium (Mg)	mg/L		42	36	30	35	43	33		33	32	30	39	39	36		35	38	39	43	44	42	42	42		50	45	41	37	33
Sodium (Na)	mg/L						19							23									1.7							
Potassium (K)	mg/L						<1.0							<1									1.1							
Silicon (as SiO_2)	mg/L						12							11							17		13							
Total Metals																														
Total Recoverable Antimony (Sb)	µg/L	11	11	7.9	11	18	<20	3.3	3.2	2.7	2.7	3.6	11	6.7	6	5.6	5.5	5.8	5.8	3.6	3.6	3.8	3.7	3.5	3.4	1.5	0.92	3.6	5.4	5.9
Total Recoverable Arsenic (As)	µg/L	8.4	7.8	7	15	14	<2.0	1.8	1.6	1.4	1.4	1.4	1.8	2	2.4	1.8	3.1	1.9	1.8	<0.50	<0.50	1.1	0.58	1	1.2	4.4	0.99	0.61	3.3	12
Total Recoverable Barium (Ba)	µg/L	19	19	21	40	35	36	28	27	28	29	29	32	26	24	24	24	27	30	25	24	34	25	30	59	240	30	51	24	25
Total Recoverable Beryllium (Be)	µg/L	<0.1	<0.10	<0.10	<0.10	<0.10	<10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1	0.27	<0.10	<0.10	<0.10	<0.10
Total Recoverable Cadmium (Cd)	µg/L	0.52	0.43	0.15	0.98	0.66	<10	0.7	0.77	0.59	0.56	3.9	0.73	2.6	2.7	2.6	2.7	2.8	2.8	1.9	1.9	2.7	2.3	3	3.1	4.2	0.24	0.76	2.5	2.7
Total Recoverable Chromium (Cr)	µg/L	<0.5	<0.50	<0.50	7.1	1.2	<50	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	0.81	0.63	<0.5	<0.50	0.66	<0.50	<0.50	<0.50	2	<0.50	<0.5	15	110	<0.50	0.84	<0.50	1.3
Total Recoverable Cobalt (Co)	µg/L	5.3	4.6	2.5	1.8	1.6	<20	1.2	1.1	1	0.8	0.63	1	0.55	0.69	0.54	0.63	0.55	0.49	0.66	0.46	0.79	1.2	0.42	1.9	12	0.43	7.2	3.4	3
Total Recoverable Copper (Cu)	µg/L	<0.5	<0.50	<0.50	1.6	1.9	<100	<0.5	<0.5	<0.50	<0.50	1.1	<0.50	2.1	2	1.8	1.8	1.6	1.1	1.1	1	3.5	1.2	1.4	1.9	34	0.7	2.2	2	8
Total Recoverable Iron (Fe)	µg/L	160	260	170		10,000			<50	56	100		72			<50	<50	52	100	86	120	2,100	89		3,200	29,000	350	3,000		1,600
Total Recoverable Lead (Pb)	µg/L	<0.25	<0.25	<0.25	<0.25	<0.25	<50	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.25	2.1	<0.25	0.31	<0.25	<0.25
Total Recoverable Manganese (Mn)	µg/L						23													<5.0	<5.0	36	<5.0							
Total Recoverable Mercury (Hg)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Recoverable Molybdenum (Mo)	µg/L	400	550	360	340	480	<500	460	440	420	360	340	470	220	210	210	220	220	380	150	160	170	170	130	120	81	120	85	220	210
Total Recoverable Nickel (Ni)	µg/L	120	190	110	83	66	<100	73	69	65	47	39	48	50	53	48	58	44	48	33	35	38	42	51	63	120	21	85	110	88
Total Recoverable Selenium (Se)	µg/L	2.1	1.6	<1.0	<1.0	<1.0	<5	4.7	3.7	2.3	3	6	4.6	86.97	94	88	84	68	97	84	97	100	98	50	59	3.6	57	110	110	110
Total Recoverable Silver (Ag)	µg/L	<0.1	<0.10	<0.10	<0.10	<0.10	<10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Total Recoverable Thallium (Tl)	µg/L	0.24	0.2	0.17	0.2	0.21	<400	<0.1	0.1	<0.10	<0.10	0.11	<0.10	0.27	0.25	0.24	0.25	0.28	0.24	0.14	0.13	0.12	0.18	0.2	0.23	0.39	0.17	0.19	0.41	0.48
Total Recoverable Vanadium (V)	µg/L	69	60	44	110	120	<500	27	26	24	26	34	29	350	330	310	310	460	270	170	180	200	230	220	190	400	46	31	230	530
Total Recoverable Zinc (Zn)	µg/L	240	220	140	340	330	<100	63	58	58	53	64	50	110	120	110	120	110	100	74	80	100	98	150	150	220	44	140	290	280
General Chemistry																														
Bicarbonate	mg/L						300							230							190		190							
Carbonate	mg/L						<5.0							<5							<5.0		<5.0							
Total Alkalinity (as $CaCO_3$)	mg/L						240							190									160							
Bicarbonate Alkalinity (as $CaCO_3$)	mg/L						240							190							160		160							
Carbonate Alkalinity (as $CaCO_3$)	mg/L						<5.0							<5							<5.0		<5.0							
Hydroxide Alkalinity (as $CaCO_3$)	mg/L						<5.0							<5							<5.0		<5.0							
Chloride	mg/L						9.7							13							13		13							
Fluoride	mg/L						0.17							0.18																
Sulfate	mg/L						760							520							440		430							
Hardness (as $CaCO_3$)	mg/L		662	581	520	520	814	674	0	681	602	556	558	696	606	0	592	601	593				565	594			567	672	606	563
Total Dissolved Solids (TDS)	mg/L	1,000	980	830	740	760	1,400	1,100	1,000	1,000	940	910	890	1,000	990	910	980	960	940				810		890		930	1,100	920	880
Total Suspended Solids (TSS)	mg/L	<1	2.6	<1.0	17	35	1.8	<1	<1	2.2	<1.0	<1.0	1.2	1.6	<1	<1	1.8	<1.0	1.8				1.4		3.4		1.9	14	<1.0	1.9
Ammonia (as N)	mg/L-N						0							<0.5									<0.50							
Nitrate (as N)	mg/L-N						<0.20							0																
Nitrate (as NO_3)	mg/L-NO_3						<1.0							<1							2.3		5.8							
Nitrite (as NO_2)	mg/L-NO_2						<0.20							<1							<1.0		<1.0							
Total Phosphorus	mg/L						<0.10																<0.10							
Total Sulfide	mg/L																				<0.10		<0.10							
pH	s.u.				7.29	7.22						7.14	7.07					7.13	7.31		7.55		7.72				7.18		7.15	6.72
Specific Conductance	µmhos/cm				917	970						1,027	1,055					1,095	1,122		1,000		1,100				1,087		240	1,089
ORP	mV				-4.5	-65.4						47.9	25.9					35.1	74.1				320				-4.5		75	160.1
Dissolved Oxygen	mg/L				8.5	3.71						3.49	2.35					8.7	6.71				9.3				7.63		1.73	2.42
Turbidity	NTU				46.2	28.7						2.16	4.59					2.81	2.28		0.37		0.45				5.06		3.01	12.7
Temperature	°C				23.57	22.28						23.81	23.53					22.94	24.47								20.84		19.92	20.14
Cyanide	mg/L						<0.020																0.003							

Location	Method	Unit	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-1D
Sample Date			9/16/2015	12/7/2015	3/3/2016	6/2/2016	9/8/2016	12/1/2016	3/15/2017	6/12/2017	9/11/2017	12/13/2017	3/13/2018	6/20/2018	9/10/2015	12/8/2015	3/14/2016	6/14/2016	9/7/2016	12/6/2016	3/15/2017	6/12/2017	9/11/2017	11/14/2017	3/29/2018	6/27/2018	9/10/2015
Field Parameters																											
Temp		°C	17.9	17.64	16.35	22.04	19.05	15.82	17.74	16.49	18.48	16.84	14.74	18.12	20.18	16.75	16.95	18.92	20.01	16.87	18.14	17.76	19.49	17.46	19.02	19.31	19.92
pH		s.u.	8.41	7.96	7.91	7.86	8.29	8.36	7.82	7.92	7.86	7.93	7.90	7.71	6.7	7.2	7.07	7.08	7.22	7.46	7.02	7.17	7.26	7.22	7.14	7.16	7.25
Electrical Conductivity		µS/cm	667	611	557	557	540	528	543	535	542	539	540	558	1136	1221	1154	1163	1143	1141	1188	1194	1220	1288	1707	1575	1051
Dissolved Oxygen		mg/L	0.58	0.26	0.19	0.55	0.43	0.54	1.52	0.36	0.28	0.32	0.48	0.28	2.41	3.99	0.75	0.43	0.69	2.14	1.22	3.93	5.18	6.61	8.96	6.64	0.36
Turbidity		NTU	76.9	58.7	35.4	3.05	13.4	2.6	4.03	1.99	0.68	1.15	0.94	1.02	638	41.6	48.7	16.4	17	55.4	58.2	44.2	23.60	65.30	8.02	2.41	37
Oxidation Reduction Potential		mV	-20.6	-169.5	-154	-102.2	-141.2	-109.9	-108.4	-89.0	-96.9	-139.7	-109.9	-135.6	157.7	106.6	41.6	17	37.3	31.2	71.3	102.1	115.4	199.3	114.3	182.4	-42.3
Metals, Dissolved																											
Mercury	E1631E	ng/L		0.642	0.294	0.283	0.204	<0.200	<0.200	0.318	<0.200	0.459	0.269	<0.200		0.281	0.27	<0.200	0.201	<0.200	<0.200	0.383	0.486	0.563	0.65	0.815	
Antimony	E200.8	µg/L	<0.080	<0.080	<0.080	0.023	<0.020	<0.020	0.037	0.029	<0.20	<0.40	<0.40	<0.40	<0.080	<0.080	<0.080	0.052	0.068	0.048	0.048	0.067	<0.20	<0.40	<0.40	<0.40	<0.080
Arsenic	E200.8	µg/L	<0.80	<0.80	1.3	1.8	2.7	2.9	3.3	3.7	2.2	2.4	2	1.4	<0.80	<0.80	<0.80	<0.20	0.4	<0.20	<0.20	<0.20	<0.20	<0.40	<0.40	1.1	0.95
Beryllium	E200.8	µg/L	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.10	<0.10	<0.080
Cadmium	E200.8	µg/L	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.050	<0.030	<0.060	<0.12	<0.12	0.1	0.11	<0.080	0.022	<0.050	<0.050	<0.050	0.081	0.053	0.14	0.27	0.2	<0.080
Chromium	E200.8	µg/L	1.7	<0.32	0.71	<0.080	0.082	0.42	<0.080	<0.080	0.4	0.52	<0.80	<01.0	<0.32	0.42	1.4	0.11	0.24	0.41	0.39	0.48	1.1	0.72	1	1.4	<0.32
Copper	E200.8	µg/L	0.65	0.26	0.54	0.35	0.38	<0.050	0.22	0.23	0.58	<0.80	<0.80	<0.80	<0.16	0.37	<0.16	0.16	0.12	1.3	0.24	0.85	<0.40	0.86	<0.80	<0.80	<0.16
Lead	E200.8	µg/L	<0.080	<0.080	0.13	<0.020	<0.020	<0.020	<0.020	<0.020	<0.060	<0.12	<0.12	<0.24	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.020	<0.060	<0.12	<0.12	<0.12	<0.080
Nickel	E200.8	µg/L	1.4	1.3	<0.24	0.48	0.67	0.44	0.18	0.073	0.51	<0.60	<0.60	1.4	5.2	3.5	0.91	0.71	0.92	1.3	5.4	1.8	2.2	5.8	2.9	4	3.4
Selenium	E200.8	µg/L	<0.80	<0.80	<0.80	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	5.7	11	3.7	3.7	3.7	4.3	3.4	8.3	13	15	17	15	15	<0.80		
Silver	E200.8	µg/L	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050	0.17	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.20
Thallium	E200.8	µg/L	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.20	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.080
Zinc	E200.8	µg/L	2.5	<2.0	<2.0	<0.50	1.8	3.4	<0.50	0.71	2.3	<04.0	<04.0	<04.0	<2.0	6.4	3.3	1	0.66	2.2	2.7	5.2	3.8	6.2	16	11	<2.0
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	0.45	0.79	0.92	1.3	<02.0	1.5	
Metals, Total																											
Mercury	E1631E	ng/L	12.3	6.59	3.06	1.62	2.56	0.665	<0.200	0.399	0.234	0.25	0.548	<0.200	219	20.4	7.88	32.9	0.487	5	1.36	1.23	1.16	0.741	3.05	0.0111	4.69
Antimony	E200.8	µg/L	0.15	0.12	<0.080	<0.020	0.021	0.041	0.043	0.045	<0.20	<0.40	<0.40	<0.40	1.3	0.18	<0.080	0.31	0.25	0.14	0.21	0.19	0.46	0.71	<0.40	<0.40	<0.080
Arsenic	E200.8	µg/L	0.89	<0.80	<0.80	2.3	3.3	3.5	3.4	3.6	3.4	4.3	3.4	1.7	5.7	<0.80	1.7	3.6	1.4	1.1	1.2	1.1	3.6	6.7	1.3	1.2	<0.80
Beryllium	E200.8	µg/L	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.10	<0.10	0.18	<0.080	<0.080	0.12	0.037	<0.020	0.038	0.064	0.085	0.34	<0.10	<0.10	<0.080
Cadmium	E200.8	µg/L	0.13	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.050	<0.030	<0.060	<0.12	<0.12	0.96	0.24	<0.080	0.17	0.087	0.086	0.13	0.24	0.31	1.3	0.29	0.29	0.12
Chromium	E200.8	µg/L	52	24	3.5	1.2	3.2	1.96	0.19	<0.080	0.92	1.3	2.4	1.2	27	3.3	6.7	40	12	7.6	11	13	33	100	2.2	3.3	12
Copper	E200.8	µg/L	12	5.6	1	0.68	0.96	0.55	0.35	1.1	0.74	<0.80	<0.80	<0.80	23	2.3	3	15	4.1	33	3.6	5.1	13	41	1.2	2.5	3.4
Lead	E200.8	µg/L	0.19	<0.080	<0.080	<0.020	0.022	0.036	<0.020	<0.020	<0.060	<0.12	<0.12	<0.24	1.3	0.11	0.17	0.87	0.25	0.21	0.31	0.37	0.77	2.6	<0.12	0.15	0.081
Nickel	E200.8	µg/L	34	16	3.4	1.2	1.9	1.2	0.47	1.5	1	<0.60	1.9	2.5	35	6.9	13	47	13	10	12	16	38	130	4.2	5.7	14
Selenium	E200.8	µg/L	<0.80	<0.80	<0.80	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40	<0.40	<0.60	7.7	9.6	3.4	3.6	4.4	6.6	7.6	13	13	16	15	15	<0.80
Silver	E200.8	µg/L	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050	0.38	0.071	<0.050	0.064	0.14	<0.10	<0.10	<0.20
Thallium	E200.8	µg/L	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.20	0.31	<0.080	<0.080	0.06	<0.050	<0.050	<0.050	<0.050	0.07	0.22	<0.10	<0.10	<0.080
Zinc	E200.8	µg/L	13	8.5	<2.0	<0.50	1.5	0.63	0.65	1.3	<02.0	<04.0	<04.0	<04.0	90	18	9.4	41	15	12	13	20	50	160	19	15	<2.0
Cyanide	QC10-204-00-1-X	mg/L			<0.0020	<0.0020	<0.0020	<0.0020	0.0023	<0.0020	<0.0020	0.003	0.0024	<0.0020			<0.0020	0.0024	<0.0020	<0.0020	0.0021	<0.0020	0.0026	<0.0020	<0.0020	<0.0020	
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.050	0.92	<0.050	<0.050	<0.050	0.099	0.45	0.66	0.8	1.5	<0.30	1.6	<0.050
VOCs																											
1,1,1-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1,2,2-Tetrachloroethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,1,2-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1-Dichloroethane	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,2-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloropropane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,3-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,4-Dichlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
2-Chloroethyl Vinyl Ether	E624	µg/L	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.30	<0.30	<0.30	<0.70	<0.70
Acrolein	E624	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0
Acrylonitrile	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40
Benzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30
Bromodichloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40
Bromoform	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30
Bromomethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40
Carbon Tetrachloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30
Chloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40
Chloroform	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
cis-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Dibromochloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Methylene Chloride	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50
Tetrachloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40
Toluene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30
trans-1,2-Dichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40
trans-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trihalomethanes (total)	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Vinyl Chloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
SVOCs																											
Acenaphthene	E625	µg/L	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20							<0.030	<0.030	<0.030	<0.030	<0.20	<0.20							<0.030
Acenaphthylene	E625	µg/L	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030
Acetochlor		µg/L		<0.95	<0.20	<0.20		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20							<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
Anthracene	E625	µg/L	<0.030	<0.030	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030
Benzidine	E625	µg/L	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<0.28	<03.0	<03.0	<03.0		<03.0	<03.0	<03.0	<3.4	<3.4	<3.4	<0.29	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4
Benzo[a]anthracene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040
Benzo[a]pyrene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040
Benzo[b]fluoranthene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040
Benzo[g,h,i]perylene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040
Benzo[k]fluoranthene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040
Benzyl Alcohol		µg/L						<1.4																			
1,1-Biphenyl		µg/L						<0.25																			
Bis(2-chloroethoxy)methane	E625	µg/L	<0.81	<0.81	<0.81	<0.81	<0.81	<0.29	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.30	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81
Bis(2-chloroethyl) Ether	E625	µg/L	<0.14	<0.14	<0.14	<0.14	<0.30	<0.23	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.14	<0.30	<0.24	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14
Bis(2-chloroisopropyl) Ether		µg/L						<0.27												<0.28							
Bis(2-ethylhexyl) Adipate		µg/L						<1.9	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83						<0.50	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83	
Bis(2-ethylhexyl) Phthalate	E625	µg/L	<0.83	<0.83	<0.83	<0.83	<0.83	<0.32	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83	<0.83	<0.83	<0.83	1.2	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83
4-Bromophenyl Phenyl Ether	E625	µg/L	<0.43	<0.43	<0.43	<0.43	<0.43	<0.16	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43	<0.43	<0.43	<0.17	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43
Butylbenzyl Phthalate	E625	µg/L	<0.64	<0.64	<0.64	<0.64	<0.64	<0.28							<0.64	<0.64	<0.64	<0.64	<0.64	<0.29							<0.64
4-Chloroaniline		µg/L						<0.31	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58							<0.58	<0.58	<0.58	<0.58	<0.58	<0.58	
4-Chloro-3-methylphenol	E625	µg/L	<0.58	<0.58	<0.58	<0.58	<0.58	<0.26	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58	<0.58	<0.58	<0.27	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58
2-Chloronaphthalene	E625	µg/L	<0.57	<0.57	<0.57	<0.57	<0.57	<0.24	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57	<0.57	<0.57	<0.25	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57
2-Chlorophenol	E625	µg/L	<0.66	<0.66	<0.66	<0.66	<0.66	<0.25	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66	<0.66	<0.66	<0.26	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66
4-Chlorophenyl-phenylether	E625	µg/L	<0.93	<0.93	<0.93	<0.93	<0.93	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93	<0.93	<0.93	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93
Chrysene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040
Dibenz[a,h]anthracene	E625	µg/L	<0.080	<0.080	<0.080	<0.080	<0.10	<0.10							<0.080	<0.080

Location	Method	Unit	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-10	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-11	WMSA-DMW-1D
Sample Date			9/16/2015	12/7/2015	3/3/2016	6/2/2016	9/8/2016	12/1/2016	3/15/2017	6/12/2017	9/11/2017	12/13/2017	3/13/2018	6/20/2018	9/10/2015	12/8/2015	3/14/2016	6/14/2016	9/7/2016	12/6/2016	3/15/2017	6/12/2017	9/11/2017	11/14/2017	3/29/2018	6/27/2018	9/10/2015
2-Methylnaphthalene		µg/L																								
1-Methylnaphthalene	E625	µg/L	<0.040					<0.28							<0.040											<0.040
2-Methylphenol	E625	µg/L				<0.64	<0.64	<0.18	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64				<0.64	<0.64	<0.19	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	
3&4-Methylphenol		µg/L						<0.18												<0.19							
Naphthalene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040
2-Nitroaniline		µg/L						<1.2																			
3-Nitroaniline		µg/L						<1.1																			
4-Nitroaniline		µg/L						<1.1																			
Nitrobenzene	E625	µg/L	<0.74	<0.74	<0.74	<0.74	<0.74	<0.30	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.32	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74
2-Nitrophenol	E625	µg/L	<0.90	<0.90	<0.90	<0.90	<0.90	<1.3	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<1.4	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
4-Nitrophenol	E625	µg/L	<0.99	<0.99	<0.99	<0.99	<0.99	<1.6	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<1.7	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99
N-Nitrosodimethylamine	E625	µg/L	<1.1	<1.1	<1.1	<1.1	<1.1	<0.17	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1	<1.1	<1.1	<1.1	<0.74	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1
N-Nitroso-di-n-propylamine	E625	µg/L	<0.85	<0.85	<0.85	<0.85	<0.85	<0.33	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.18	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85
Pentachlorophenol	E625	µg/L	<1.4	<1.4	<1.4	<1.4	<1.4	<0.47	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4	<1.4	<1.4	<0.50	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4
Phenanthrene	E625	µg/L	<0.030	<0.030	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030
Phenol	E625	µg/L	<0.46	1.5	<0.46	<0.46	<0.46	<0.32	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.34	<0.46	<0.46	<0.46	<0.46	4.2	<0.46	<0.46
Pyrene	E625	µg/L	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030
1,2,4-Trichlorobenzene	E625	µg/L	<0.59	<0.59	<0.59	<0.59	<0.59	<0.21	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.22	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59
2,4,5-Trichlorophenol	E625	µg/L	<0.74	<0.74	<0.74	<0.74	<0.74	<0.20							<0.74	<0.74	<0.74	<0.74	<0.74	<0.21							<0.74
2,4,6-Trichlorophenol		µg/L						<0.22												<0.23							
Bis(2-chloro-1-methylethyl) Ether	E625	µg/L	<0.41	<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41
N-Nitrosodiphenylamine	E625	µg/L	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
TPH																											
TPH-Diesel	SW8015B	µg/L	<50	<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50
TPH-Heavy Oils	SW8015B	µg/L	<100	<100	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100
TPH as Gasoline	SW8260B	µg/L	<50	68	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	64
PCBs & Pesticides																											
4,4-DDD	E608	µg/L																									
4,4-DDE	E608	µg/L																									
4,4-DDT	E608	µg/L																									
Aldrin	E608	µg/L																									
alpha-BHC	E608	µg/L																									
alpha-Endosulfan	E608	µg/L																									
Aroclor 1016	E608	µg/L																									
Aroclor 1221	E608	µg/L																									
Aroclor 1232	E608	µg/L																									
Aroclor 1242	E608	µg/L																									
Aroclor 1248	E608	µg/L																									
Aroclor 1254	E608	µg/L																									
Aroclor 1260	E608	µg/L																									
beta-BHC	E608	µg/L																									
beta-Endosulfan	E608	µg/L																									
Chlordane	E608	µg/L																									
delta-BHC	E608	µg/L																									
Dieldrin	E608	µg/L																									
Endosulfan Sulfate	E608	µg/L																									
Endrin	E608	µg/L																									
Endrin Aldehyde	E608	µg/L																									
gamma-BHC	E608	µg/L																									
Heptachlor	E608	µg/L																									
Heptachlor Epoxide	E608	µg/L																									
Toxaphene	E608	µg/L																									

Location	Method	Unit	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-2	WMSA-DMW-2
Sample Date			12/7/2015	3/8/2016	6/14/2016	9/13/2016	12/6/2016	3/20/2017	6/22/2017	9/20/2017	12/11/2017	3/7/2018	6/26/2018	9/10/2015	12/7/2015	3/8/2016	6/14/2016	9/13/2016	12/6/2016	3/20/2017	6/22/2017	9/20/2017	12/11/2017	3/7/2018	6/26/2018	9/22/2015	12/10/2015
Field Parameters																										
Temp		°C	16.2	15.39	16.1	17.65	15.38	15.14	20.15	19.78	15.19	16.22	17.74	22.84	16.61	15.39	17.5	18.12	15.34	15.91	19.21	16.71	15.93	17.71	18.47	21.21	17.4
pH		s.u.	7.38	6.81	7.31	7.3	7.7	7.21	7.40	7.01	7.45	7.23	7.13	6.87	6.96	6.81	6.84	6.88	7.19	6.76	6.93	6.79	7.18	6.86	6.76	7.05	7
Electrical Conductivity		µS/cm	1039	1025	1039	1037	1011	1047	1073	1076	1058	1073	1096	1111	1112	1025	1042	1097	1051	1036	1076	1060	1063	1077	1078	2187	2117
Dissolved Oxygen		mg/L	0.47	0.35	0.61	0.47	0.69	0.19	0.53	0.62	0.56	0.56	0.52	0.85	0.47	0.35	1.04	0.66	1.25	0.49	0.56	0.91	2.01	0.94	0.71	1.61	0.41
Turbidity		NTU	13.3	1.91	1.64	1.57	2.04	2.12	0.91	1.31	0.74	1.01	1.03	26.8	2.15	1.91	0.67	0.85	0.82	1.92	0.75	1.31	0.80	0.90	0.75	2607	85.2
Oxidation Reduction Potential		mV	-92.7	48.1	-21.7	-9.5	-24.3	-40.8	-27.8	-45.2	25.7	5.3	-31.6	27.1	-1.5	48.1	65.4	75.2	51.5	73.0	43.5	87.3	95.3	101.8	78.7	3.7	-82.7
Metals, Dissolved																										
Mercury	E1631E	ng/L	0.244	0.661	0.368	0.376	<0.200	0.274	0.437	0.366	1.03	0.369	0.281		0.382	0.369	0.447	0.256	<0.200	0.501	0.471	0.362	0.342	0.357	0.228		1.68
Antimony	E200.8	µg/L	<0.080	<0.080	<0.020	0.04	0.02	0.028	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	0.43	<0.080	0.034	0.089	0.1	0.051	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	7.8
Arsenic	E200.8	µg/L	<0.80	1.2	0.54	0.87	0.96	0.97	1.4	<0.40	0.9	0.89	<0.80	1.3	0.84	<0.80	0.25	<0.20	0.52	<0.20	<0.80	<0.40	0.42	0.69	<0.80	2	0.85
Beryllium	E200.8	µg/L	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.080
Cadmium	E200.8	µg/L	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	0.37	<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080
Chromium	E200.8	µg/L	<0.32	0.5	0.11	<0.080	<0.080	<0.080	<0.32	1.3	0.33	<0.80	<02.0	<0.32	<0.32	0.63	0.086	0.2	0.094	<0.080	<0.32	1.1	0.57	<0.80	<02.0	0.55	2.3
Copper	E200.8	µg/L	0.17	0.45	0.26	0.28	0.29	0.28	0.65	<0.80	<0.80	<0.80	<0.80	<0.16	1.2	1.1	0.41	0.47	0.54	0.44	0.6	<0.80	<0.80	<0.80	<0.80	1.6	1.8
Lead	E200.8	µg/L	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	<0.080	<0.080
Nickel	E200.8	µg/L	4.8	4.5	2.1	1.6	1.8	2.2	3.2	2.4	1.4	1.2	1.8	14	27	21	13	11	21	19	22	20	18	20	9.2	8.7
Selenium	E200.8	µg/L	<0.80	<0.80	<0.20	0.27	<0.20	<0.20	<0.40	<0.40	<0.40	<0.40	<0.60	<0.80	<0.80	<0.80	<0.20	0.46	<0.20	<0.20	<0.40	<0.40	<0.40	<0.40	<0.60	<0.80	23
Silver	E200.8	µg/L	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20
Thallium	E200.8	µg/L	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080
Zinc	E200.8	µg/L	<2.0	<2.0	4.4	0.73	1.4	3.6	<02.0	<04.0	<04.0	<04.0	<04.0	<2.0	11	<2.0	<0.50	1.4	2.1	3.7	3.1	<04.0	<04.0	<04.0	<04.0	7.5	2600
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050
Metals, Total																										
Mercury	E1631E	ng/L	1.34	0.282	0.503	0.326	0.325	0.523	<0.200	0.728	0.456	0.321	0.315	3.71	0.51	0.61	0.418	0.334	0.398	0.464	<0.200	0.527	0.458	0.538	0.403	44.6	1.21
Antimony	E200.8	µg/L	<0.080	<0.080	0.022	<0.020	0.045	0.046	0.88	<0.40	<0.40	<0.40	<0.40	<0.080	0.085	<0.080	0.072	0.057	0.091	0.06	<0.080	<0.40	<0.40	<0.40	<0.40	0.18	41
Arsenic	E200.8	µg/L	<0.80	1.2	1.5	0.94	1.2	0.98	<0.80	<0.40	1.4	<0.40	1.1	2	<0.80	<0.80	0.48	0.36	0.54	0.21	<0.80	<0.40	<0.40	0.52	<0.80	4.2	1.9
Beryllium	E200.8	µg/L	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.040	<0.20	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.040	<0.20	0.24	<0.080
Cadmium	E200.8	µg/L	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.060	<0.12	0.43	0.33	<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.060	<0.12	0.45	0.17
Chromium	E200.8	µg/L	0.83	1.3	0.35	<0.080	<0.080	<0.080	0.81	1.7	<0.16	<0.16	<02.0	12	2	0.72	<0.080	<0.080	0.21	<0.080	0.74	1.3	<0.16	0.19	<02.0	170	41
Copper	E200.8	µg/L	<0.16	0.62	0.39	0.16	0.054	0.32	1.2	2.4	<0.80	8.2	<0.80	4.5	1	0.86	0.37	0.18	1.1	0.53	0.73	0.91	<0.80	<0.80	<0.80	130	18
Lead	E200.8	µg/L	<0.080	<0.080	<0.020	<0.020	0.026	<0.020	<0.080	0.17	<0.12	0.13	<0.12	0.22	<0.080	<0.080	<0.020	<0.020	0.14	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	1.6	0.88
Nickel	E200.8	µg/L	<0.24	4.7	3.6	1.6	2.4	4	2.8	3.7	1.7	2.8	5.6	26	12	23	22	13	15	22	20	23	19	20	21	120	36
Selenium	E200.8	µg/L	<0.80	<0.80	<0.20	<0.20	<0.20	<0.20	<0.40	<0.40	<0.40	<0.40	<0.60	<0.80	<0.80	<0.80	<0.20	<0.20	0.23	0.26	<0.40	<0.40	<0.40	<0.40	<0.60	<0.80	21
Silver	E200.8	µg/L	<0.20	<0.20	0.54	<0.050	0.22	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050	0.6	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	7.1	3.3
Thallium	E200.8	µg/L	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080
Zinc	E200.8	µg/L	2.5	<2.0	<0.50	<0.50	<0.50	3.7	<02.0	<04.0	<04.0	39	<04.0	14	10	<2.0	<0.50	<0.50	1.2	3.7	4.9	<04.0	<04.0	<04.0	<04.0	95	2800
Cyanide	QC10-204-00-1-X	mg/L		<0.0020	<0.0020	<0.0020	<0.0020	0.0027	<0.0020	<0.0020	0.003	<0.0020	0.0023			<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0021	0.0032	<0.0020	0.0035	
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.30	<0.30	<0.30	0.33	<0.30	<0.30	<0.050	<0.050
VOCs																										
1,1,1-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1,2,2-Tetrachloroethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,1,2-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1-Dichloroethane	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,2-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloropropane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,3-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,4-Dichlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
2-Chloroethyl Vinyl Ether	E624	µg/L	<0.70	<0.70	<0.70	<0.70	<0.70	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70
Acrolein	E624	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0
Acrylonitrile	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40
Benzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30
Bromodichloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40
Bromoform	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30
Bromomethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40
Carbon Tetrachloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30
Chloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40
Chloroform	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
cis-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Dibromochloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Methylene Chloride	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50
Tetrachloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40
Toluene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30
trans-1,2-Dichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40
trans-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trihalomethanes (total)	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Vinyl Chloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
SVOCs																										
Acenaphthene	E625	µg/L	<0.030	<0.030	<0.030	<0.20	<0.20							<0.030	<0.030	<0.030	<0.030	<0.20	<0.20						<0.030	<0.030
Acenaphthylene	E625	µg/L	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030
Acetochlor		µg/L						<0.20	<0.20	<0.20	<0.20	<0.20	<0.20							<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		
Anthracene	E625	µg/L	<0.030	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030
Benzidine	E625	µg/L	<3.4	<3.4	<3.4	<3.4	<0.29	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4	<3.4	<3.4	<0.29	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4
Benzo[a]anthracene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040
Benzo[a]pyrene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040
Benzo[b]fluoranthene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040
Benzo[g,h,i]perylene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040
Benzo[k]fluoranthene	E625	µg/L	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040
Benzyl Alcohol		µg/L																								
1,1-Biphenyl		µg/L																								
Bis(2-chloroethoxy)methane	E625	µg/L	<0.81	<0.81	<0.81	<0.81	<0.30	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.30	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81
Bis(2-chloroethyl) Ether	E625	µg/L	<0.14	<0.14	<0.14	<0.30	<0.24	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.14	<0.30	<0.24	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14
Bis(2-chloroisopropyl) Ether		µg/L					<0.28												<0.28								
Bis(2-ethylhexyl) Adipate		µg/L					<0.50	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83						<0.50	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83		
Bis(2-ethylhexyl) Phthalate	E625	µg/L	<0.83	<0.83	<0.83	<0.83	<0.34	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83	<0.83	<0.83	<0.83	<0.34	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	5	4.2
4-Bromophenyl Phenyl Ether	E625	µg/L	<0.43	<0.43	<0.43	<0.43	<0.17	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43	<0.43	<0.43	<0.17	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43
Butylbenzyl Phthalate	E625	µg/L	<0.64	<0.64	<0.64	<0.64	<0.29							<0.64	<0.64	<0.64	<0.64	<0.64	<0.29							<0.64	<0.64
4-Chloroaniline		µg/L						<0.58	<0.58	<0.58	<0.58	<0.58	<0.58							<0.58	<0.58	<0.58	<0.58	<0.58	<0.58		
4-Chloro-3-methylphenol	E625	µg/L	<0.58	<0.58	<0.58	<0.58	<0.27	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58	<0.58	<0.58	<0.27	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58
2-Chloronaphthalene	E625	µg/L	<0.57	<0.57	<0.57	<0.57	<0.25	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57	<0.57	<0.57	<0.25	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57
2-Chlorophenol	E625	µg/L	<0.66	<0.66	<0.66	<0.66	<0.26	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66	<0.66	<0.66	<0.26	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66
4-Chlorophenyl-phenylether	E625	µg/L	<0.93	<0.93	<0.93	<0.93	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93	<0.93	<0.93	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93
Chrysene	E625	µg/L	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.19	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040
Dibenz[a,h]anthracene	E625	µg/L	<0.080	<0.080	<0.080	<0.080	<0.10

Location	Method	Unit	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1D	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-1S	WMSA-DMW-2	WMSA-DMW-2
Sample Date			12/7/2015	3/8/2016	6/14/2016	9/13/2016	12/6/2016	3/20/2017	6/22/2017	9/20/2017	12/11/2017	3/7/2018	6/26/2018	9/10/2015	12/7/2015	3/8/2016	6/14/2016	9/13/2016	12/6/2016	3/20/2017	6/22/2017	9/20/2017	12/11/2017	3/7/2018	6/26/2018	9/22/2015	12/10/2015
2-Methylnaphthalene		µg/L																								
1-Methylnaphthalene	E625	µg/L												<0.040				<0.20							<0.040	
2-Methylphenol	E625	µg/L			<0.64	<0.64	<0.19	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64				<0.64	<0.64	<0.19	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64		
3&4-Methylphenol		µg/L					<0.19												<0.19								
Naphthalene	E625	µg/L	<0.040	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040
2-Nitroaniline		µg/L																								
3-Nitroaniline		µg/L																								
4-Nitroaniline		µg/L																								
Nitrobenzene	E625	µg/L	<0.74	<0.74	<0.74	<0.74	<0.32	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.32	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74
2-Nitrophenol	E625	µg/L	<0.90	<0.90	<0.90	<0.90	<1.4	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<1.4	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
4-Nitrophenol	E625	µg/L	<0.99	<0.99	<0.99	<0.99	<1.7	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<1.7	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99
N-Nitrosodimethylamine	E625	µg/L	<1.1	<1.1	<1.1	<1.1	<0.74	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1	<1.1	<1.1	<1.1	<0.74	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1
N-Nitroso-di-n-propylamine	E625	µg/L	<0.85	<0.85	<0.85	<0.85	<0.18	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.18	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85
Pentachlorophenol	E625	µg/L	<1.4	<1.4	<1.4	<1.4	<0.50	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4	<1.4	<1.4	<0.50	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4
Phenanthrene	E625	µg/L	<0.030	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030
Phenol	E625	µg/L	<0.46	<0.46	<0.46	<0.46	<0.34	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.34	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46
Pyrene	E625	µg/L	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030
1,2,4-Trichlorobenzene	E625	µg/L	<0.59	<0.59	<0.59	<0.59	<0.22	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.22	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59
2,4,5-Trichlorophenol	E625	µg/L	<0.74	<0.74	<0.74	<0.74	<0.21							<0.74	<0.74	<0.74	<0.74	<0.74	<0.21							<0.74	<0.74
2,4,6-Trichlorophenol		µg/L					<0.23												<0.23								
Bis(2-chloro-1-methylethyl) Ether	E625	µg/L	<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41
N-Nitrosodiphenylamine	E625	µg/L	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
TPH																											
TPH-Diesel	SW8015B	µg/L	<50	<50	<50	<50	<50	<050	<0150	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<0150	<050	<050	<050	<050	<90	<50
TPH-Heavy Oils	SW8015B	µg/L	<100	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<180	<100
TPH as Gasoline	SW8260B	µg/L	<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	150	<50
PCBs & Pesticides																											
4,4-DDD	E608	µg/L																									
4,4-DDE	E608	µg/L																									
4,4-DDT	E608	µg/L																									
Aldrin	E608	µg/L																									
alpha-BHC	E608	µg/L																									
alpha-Endosulfan	E608	µg/L																									
Aroclor 1016	E608	µg/L																									
Aroclor 1221	E608	µg/L																									
Aroclor 1232	E608	µg/L																									
Aroclor 1242	E608	µg/L																									
Aroclor 1248	E608	µg/L																									
Aroclor 1254	E608	µg/L																									
Aroclor 1260	E608	µg/L																									
beta-BHC	E608	µg/L																									
beta-Endosulfan	E608	µg/L																									
Chlordane	E608	µg/L																									
delta-BHC	E608	µg/L																									
Dieldrin	E608	µg/L																									
Endosulfan Sulfate	E608	µg/L																									
Endrin	E608	µg/L																									
Endrin Aldehyde	E608	µg/L																									
gamma-BHC	E608	µg/L																									
Heptachlor	E608	µg/L																									
Heptachlor Epoxide	E608	µg/L																									
Toxaphene	E608	µg/L																									

GOLDER

Location	Method	Unit	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S
Sample Date			3/8/2016	6/6/2016	9/26/2016	12/6/2016	3/27/2017	6/22/2017	9/14/2017	12/27/2017	3/26/2018	6/7/2018	9/17/2015	12/9/2015	3/3/2016	6/1/2016	9/6/2016	12/1/2016	3/16/2017	6/12/2017	9/13/2017	12/13/2017	3/12/2018	6/21/2018	9/17/2015	12/9/2015	3/3/2016
Field Parameters																										
Temp		°C	17.4	21	21.84	17.63	17.5	21.89	21.39	18.41	16.20	19.59	17.83	14.15	15.18	16.06	17.39	14.31	15.38	15.9	16.91	13.86	15.37	17.03	15.49	14.65	15.21
pH		s.u.	6.91	7.59	6.92	7.14	7.01	6.85	6.61	7.59	6.83	6.65	10.12	9.63	9.69	9.26	9.88	9.98	9.20	9.58	9.65	9.46	9.49	9.30	7.16	7.22	7.28
Electrical Conductivity		µS/cm	2116	1630	2101	2004	1925	1520	1514	1336	1380	1591	632	550	498	451	442	418	417	416	419	409	411	417	2243	2144	2306
Dissolved Oxygen		mg/L	0.64	4.18	0.98	2.07	0.41	0.6	1.89	0.96	2.07	0.81	0.16	0.08	0.15	0.32	0.79	0.16	0.19	0.08	0.73	0.35	0.40	0.27	2.72	3.88	3.38
Turbidity		NTU	58.7	2.84	8.72	6.26	584	581	1087	>4000	914	22.7	171	124	47	21.7	15.3	22.8	11.7	11.7	9.18	6.87	7.46	4.62	13.3	15.9	20.1
Oxidation Reduction Potential		mV	-52	-407.8	-54.8	-54.6	-24.3	17.1	57.1	45.4	101.7	23.9	-214	-222.6	-84.9	15.1	-63.8	-9.3	-62.4	-89.2	-127.1	-42.8	-132.7	-124.8	241.9	35.5	61.4
Metals, Dissolved																											
Mercury	E1631E	ng/L	0.828	0.479	0.568	0.58	0.897	<0.060	1.45	0.921	0.534	0		2.12	2.05	1.34	1.45	1.02	0.944	1.09	0.844	1.28	0.909	0.958		0.43	0.726
Antimony	E200.8	µg/L	3.1	0.23	0.97	3.1	0.68	0.33	<0.40	0.69	<0.40	<0.40	0.085	<0.080	<0.080	0.047	0.034	0.024	0.041	0.025	<0.40	<0.40	<0.40	<0.40	<0.080	<0.080	<0.080
Arsenic	E200.8	µg/L	<0.80	2.2	1.4	1.2	0.65	2	0.85	<0.40	0.7	2.2	<0.80	<0.80	<0.80	0.3	0.62	0.61	0.6	0.6	<0.40	1.6	0.64	<0.40	<0.80	<0.80	0.82
Beryllium	E200.8	µg/L	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	0.043	<0.040	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.040	<0.10	<0.10	<0.080	<0.080	<0.080
Cadmium	E200.8	µg/L	<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.050	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080
Chromium	E200.8	µg/L	0.6	<0.080	0.092	<0.080	<0.080	<0.32	1.2	<0.16	<0.80	<01.0	2.6	0.82	1.4	0.34	0.62	0.89	0.66	0.52	1.4	0.83	<0.80	<01.0	1	0.68	0.37
Copper	E200.8	µg/L	1	1.5	0.45	0.8	0.53	0.66	<0.80	<0.80	<0.80	1.4	1.1	0.27	1.5	1.1	1	0.32	0.96	1.3	0.99	<0.80	<0.80	1.5	0.71	0.18	1.5
Lead	E200.8	µg/L	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	0.022	<0.020	<0.12	<0.12	<0.12	<0.24	<0.080	<0.080	<0.080
Nickel	E200.8	µg/L	8.2	3.8	3	4.3	3.7	6.2	6	5.1	5	6.1	0.93	0.36	<0.24	0.33	0.43	0.13	0.35	0.34	<0.60	<0.60	<0.60	<0.60	3.1	6.4	8.2
Selenium	E200.8	µg/L	6.6	0.26	0.25	0.58	1.2	0.92	<0.40	1.2	<0.40	<0.60	<0.80	<0.80	<0.80	<0.20	0.27	<0.20	<0.20	<0.20	<0.40	<0.40	<0.40	<0.60	11	7.6	25
Silver	E200.8	µg/L	<0.20	<0.050	<0.050	0.21	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20
Thallium	E200.8	µg/L	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.20	<0.080	<0.080	<0.080
Zinc	E200.8	µg/L	270	17	20	52	77	37	21	4.9	5.7	7.3	3.9	<2.0	<2.0	<0.50	<0.50	3.4	0.87	0.72	<04.0	<04.0	<04.0	<04.0	5.6	4.2	6
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	0.33	<0.050	<0.050	<0.050	0.13	<0.050	0.37	<0.050	<0.050		<0.050	<0.050
Metals, Total																											
Mercury	E1631E	ng/L	15.2	6.94	2.06	2.1	1.72	<0.060	0.0804	0.0292	0.0659	0	0.258	0.463	4.9	6.32	3.77	3.42	2.42	2.9	2.36	2.53	2.46	2.29	3.39	2.94	9.17
Antimony	E200.8	µg/L	7.8	6.7	12	3.6	0.66	0.98	0.6	0.81	<0.40	<0.40	0.16	0.085	0.086	0.061	0.044	0.029	0.097	0.065	<0.40	<0.40	<0.40	<0.40	0.19	<0.080	0.088
Arsenic	E200.8	µg/L	2.2	2.8	2.5	1.7	0.72	2.1	3.9	3.3	4.3	2.2	<0.80	<0.80	<0.80	0.69	0.55	0.52	0.47	0.62	0.72	2.2	0.76	<0.40	<0.80	<0.80	<0.80
Beryllium	E200.8	µg/L	<0.080	0.036	0.092	<0.020	<0.020	0.17	0.25	0.24	0.23	<0.10	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.040	<0.10	<0.20	<0.080	<0.080	<0.080
Cadmium	E200.8	µg/L	<0.080	0.05	0.25	0.066	<0.050	0.34	0.49	0.33	0.62	<0.12	0.14	<0.080	<0.080	0.08	<0.050	<0.050	<0.050	<0.050	<0.060	<0.060	<0.12	<0.12	<0.080	0.11	0.084
Chromium	E200.8	µg/L	29	16	63	1.7	<0.080	52	130	83	140	9.1	75	27	15	16	11	10	5.5	4.5	5.6	6	3.8	3.7	4.7	4.7	3.2
Copper	E200.8	µg/L	12	8.8	34	12	1.4	21	72	43	88	5.5	21	7.7	5	5.5	3.6	2.2	2	3.2	4.5	2.3	2.5	2.3	24	3	2.7
Lead	E200.8	µg/L	0.4	0.36	1.1	0.083	<0.020	1.5	4.2	2.6	2.9	0.22	0.38	0.16	0.087	0.1	0.09	0.11	0.094	0.074	<0.12	<0.12	0.17	<0.12	0.17	<0.080	0.16
Nickel	E200.8	µg/L	29	19	50	7	3.5	62	120	82	120	14	49	18	11	11	6.6	5.3	3.1	2.7	2.9	3.4	2.3	2.4	15	14	13
Selenium	E200.8	µg/L	2.4	0.54	2.2	2.5	1.2	1.2	0.7	1.3	0.9	<0.60	<0.80	<0.80	<0.80	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40	<0.40	<0.40	<0.60	10	7.9	23
Silver	E200.8	µg/L	0.62	2.8	6.8	0.86	0.050	0.52	0.55	0.59	0.64	0.31	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050	<0.050	0.13	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20
Thallium	E200.8	µg/L	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080
Zinc	E200.8	µg/L	220	120	250	62	83	110	180	78	110	14	32	14	5.6	7.9	4.4	5.7	2.6	2.9	4.4	<04.0	<04.0	<04.0	7.4	8.7	3.4
Cyanide	QC10-204-00-1-X	mg/L	<0.0020	<0.0020	0.0028	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0023			<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			<0.0020
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	<0.050	<0.050	<0.050	<0.050	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.050	<0.050	<0.050
VOCs																											
1,1,1-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1,2,2-Tetrachloroethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,1,2-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1-Dichloroethane	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,2-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloropropane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,3-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,4-Dichlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
2-Chloroethyl Vinyl Ether	E624	µg/L	<0.70	<0.70	<0.70	<0.70	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.30	<0.30	<0.70	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70
Acrolein	E624	µg/L	<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0
Acrylonitrile	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40
Benzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30
Bromodichloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40
Bromoform	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30
Bromomethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40
Carbon Tetrachloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30
Chloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40
Chloroform	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
cis-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Dibromochloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Methylene Chloride	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50
Tetrachloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40
Toluene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.34	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30
trans-1,2-Dichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40
trans-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trihalomethanes (total)	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Vinyl Chloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
SVOCs																											
Acenaphthene	E625	µg/L	<0.030	<0.030	<0.20	<0.20							<0.030	<0.030	<0.030	<0.030	<0.20	<0.20							<0.030	<0.030	<0.030
Acenaphthylene	E625	µg/L	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030
Acetochlor		µg/L					<0.20	<0.20	<0.20	<0.20	<0.20	<0.20						<0.95	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20			
Anthracene	E625	µg/L	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030
Benzidine	E625	µg/L	<3.4	<3.4	<3.4	<3.4	<0.29	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4	<3.4	<3.4	<0.28	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4
Benzo[a]anthracene	E625	µg/L	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040
Benzo[a]pyrene	E625	µg/L	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040
Benzo[b]fluoranthene	E625	µg/L	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040
Benzo[g,h,i]perylene	E625	µg/L	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040
Benzo[k]fluoranthene	E625	µg/L	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040
Benzyl Alcohol		µg/L																<1.4									
1,1-Biphenyl		µg/L																<0.25									
Bis(2-chloroethoxy)methane	E625	µg/L	<0.81	<0.81	<0.81	<0.81	<0.30	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.29	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81
Bis(2-chloroethyl) Ether	E625	µg/L	<0.14	<0.14	<0.30	<0.24	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.14	<0.30	<0.23	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14
Bis(2-chloroisopropyl) Ether		µg/L				<0.28												<0.27									
Bis(2-ethylhexyl) Adipate		µg/L				<0.50	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83						<1.9	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83			
Bis(2-ethylhexyl) Phthalate	E625	µg/L	<0.83	<0.83	<0.83	0.8	<0.83	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83	<0.83	<0.83	<0.83	<0.32	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83	<0.83
4-Bromophenyl Phenyl Ether	E625	µg/L	<0.43	<0.43	<0.43	<0.17	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43	<0.43	<0.43	<0.16	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43
Butylbenzyl Phthalate	E625	µg/L	<0.64	<0.64	<0.64	<0.29							<0.64	<0.64	<0.64	<0.64	<0.64	<0.28							<0.64	<0.64	<0.64
4-Chloroaniline		µg/L					<0.58	<0.58	<0.58	<0.58	<0.58	<0.58						<0.31	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58			
4-Chloro-3-methylphenol	E625	µg/L	<0.58	<0.58	<0.58	<0.27	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58	<0.58	<0.58	<0.26	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58
2-Chloronaphthalene	E625	µg/L	<0.57	<0.57	<0.57	<0.25	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57	<0.57	<0.57	<0.24	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57
2-Chlorophenol	E625	µg/L	<0.66	<0.66	<0.66	<0.26	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66	<0.66	<0.66	<0.25	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66
4-Chlorophenyl-phenylether	E625	µg/L	<0.93	<0.93	<0.93	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93	<0.93	<0.93	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93
Chrysene	E625	µg/L	<0.040	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040
Dibenz[a,h]anthracene	E625	µg/L	<0.080	<0.080	<0.10	<0.10							<0.080	<0.080	<0.080	<0.080	<0.10	<0.10							<0.080	<0.080

Location	Method	Unit	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-2	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3D	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S
Sample Date			3/8/2016	6/6/2016	9/26/2016	12/6/2016	3/27/2017	6/22/2017	9/14/2017	12/27/2017	3/26/2018	6/7/2018	9/17/2015	12/9/2015	3/3/2016	6/1/2016	9/6/2016	12/1/2016	3/16/2017	6/12/2017	9/13/2017	12/13/2017	3/12/2018	6/21/2018	9/17/2015	12/9/2015	3/3/2016
2-Methylnaphthalene		µg/L																<1.2									
1-Methylnaphthalene	E625	µg/L											<0.040					<0.28							<0.040		
2-Methylphenol	E625	µg/L		<0.64	<0.64	<0.19	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64				<0.64	<0.64	<0.18	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64			
3&4-Methylphenol		µg/L				<0.19												<0.18									
Naphthalene	E625	µg/L	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.040
2-Nitroaniline		µg/L																<1.2									
3-Nitroaniline		µg/L																<1.1									
4-Nitroaniline		µg/L																<1.1									
Nitrobenzene	E625	µg/L	<0.74	<0.74	<0.74	<0.32	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.30	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74
2-Nitrophenol	E625	µg/L	<0.90	<0.90	<0.90	<1.4	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<1.3	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
4-Nitrophenol	E625	µg/L	<0.99	<0.99	<0.99	<1.7	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<1.6	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99
N-Nitrosodimethylamine	E625	µg/L	<1.1	<1.1	<1.1	<0.74	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1	<1.1	<1.1	<1.1	<0.17	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1	<1.1
N-Nitroso-di-n-propylamine	E625	µg/L	<0.85	<0.85	<0.85	<0.18	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.33	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85
Pentachlorophenol	E625	µg/L	<1.4	<1.4	<1.4	<0.50	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4	<1.4	<1.4	<0.48	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4
Phenanthrene	E625	µg/L	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030
Phenol	E625	µg/L	<0.46	<0.46	<0.46	<0.34	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	1.4	<0.46	<0.46	<0.46	<0.46	<0.32	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46
Pyrene	E625	µg/L	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030
1,2,4-Trichlorobenzene	E625	µg/L	<0.59	<0.59	<0.59	<0.22	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.21	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59
2,4,5-Trichlorophenol	E625	µg/L	<0.74	<0.74	<0.74	<0.21							<0.74	<0.74	<0.74	<0.74	<0.74	<0.20							<0.74	<0.74	<0.74
2,4,6-Trichlorophenol		µg/L				<0.23												<0.22									
Bis(2-chloro-1-methylethyl) Ether	E625	µg/L	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41
N-Nitrosodiphenylamine	E625	µg/L	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
TPH																											
TPH-Diesel	SW8015B	µg/L	<50	<50	<50	<50	<050	<0150	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50
TPH-Heavy Oils	SW8015B	µg/L	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100
TPH as Gasoline	SW8260B	µg/L	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50
PCBs & Pesticides																											
4,4-DDD	E608	µg/L																									
4,4-DDE	E608	µg/L																									
4,4-DDT	E608	µg/L																									
Aldrin	E608	µg/L																									
alpha-BHC	E608	µg/L																									
alpha-Endosulfan	E608	µg/L																									
Aroclor 1016	E608	µg/L																									
Aroclor 1221	E608	µg/L																									
Aroclor 1232	E608	µg/L																									
Aroclor 1242	E608	µg/L																									
Aroclor 1248	E608	µg/L																									
Aroclor 1254	E608	µg/L																									
Aroclor 1260	E608	µg/L																									
beta-BHC	E608	µg/L																									
beta-Endosulfan	E608	µg/L																									
Chlordane	E608	µg/L																									
delta-BHC	E608	µg/L																									
Dieldrin	E608	µg/L																									
Endosulfan Sulfate	E608	µg/L																									
Endrin	E608	µg/L																									
Endrin Aldehyde	E608	µg/L																									
gamma-BHC	E608	µg/L																									
Heptachlor	E608	µg/L																									
Heptachlor Epoxide	E608	µg/L																									
Toxaphene	E608	µg/L																									

Location	Method	Unit	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5
Sample Date			6/1/2016	9/6/2016	12/1/2016	3/16/2017	6/12/2017	9/13/2017	12/13/2017	3/12/2018	6/21/2018	9/14/2015	12/8/2015	12/9/2015	3/2/2016	6/13/2016	9/26/2016	12/5/2016	3/20/2017	6/13/2017	9/20/2017	12/11/2017	3/29/2018	6/26/2018	9/15/2015	12/28/2015	3/2/2016
Field Parameters																										
Temp		°C	16.08	15.72	14.63	15.49	15.89	16.09	14.39	15.01	15.73	20.55	15.42	15.42	17.79	19.36	20.48	16.07	15.22	18.13	18.88	15.77	18.25	19.42	19.77	16.42	18.95
pH		s.u.	7.18	7.04	7.30	7.27	7.28	6.90	6.82	6.83	6.76	7.58	7.5	7.50	7.44	7.32	7.36	7.52	7.09	7.26	7.38	7.75	7.20	7.22	7.36	7.16	7.18
Electrical Conductivity		µS/cm	2242	1899	1975	2030	2067	1753	1762	1894	1845	1533	1572	1572	1503	1658	1562	1529	2322	2155	2065	1865	1741	1751	1670	1156	1061
Dissolved Oxygen		mg/L	3.92	1.01	2.51	4.18	4.27	1.61	0.80	0.50	0.67	5.56	0.58	0.58	0.89	6.91	0.56	0.67	2.59	2.12	1.14	0.53	0.38	0.57	0.01	1.89	0.74
Turbidity		NTU	14.3	5.64	24.6	11.98	4.09	50.60	2.89	1.53	1.66	4.12	57	57	6.45	4	3.38	4.49	6.24	1.38	3.53	4.89	2.08	2.47	>4000	78.7	5.29
Oxidation Reduction Potential		mV	17	88.8	100.0	104.2	84.3	86.7	117.4	104.2	119.5	240	40.5	40.5	6.1	73.5	38.9	94.9	122.0	108.8	81.6	143.2	108.2	110.6	-10.4	68.6	-31
Metals, Dissolved																										
Mercury	E1631E	ng/L	0.663	0.466	0.447	0.613	0.706	0.418	0.518	0.429	0.377		0.518		0.222	0.379	0.534	0.443	1.09	0.883	0.51	0.891	0.629	0.636		0.495	0.521
Antimony	E200.8	µg/L	0.077	0.035	<0.020	0.15	0.077	<0.40	<0.40	<0.40	<0.40	<0.080	<0.080		<0.080	0.02	<0.020	0.081	0.044	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	0.23	<0.080
Arsenic	E200.8	µg/L	0.21	0.44	0.49	0.25	0.5	<0.40	1	<0.40	<0.40	<0.80	<0.80		<0.80	0.91	0.52	0.26	0.61	<0.80	0.95	1.1	0.45	<0.80	1.7	<0.80	<0.80
Beryllium	E200.8	µg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.040	<0.10	<0.10	<0.080	<0.080		<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.080	<0.080
Cadmium	E200.8	µg/L	<0.020	<0.050	<0.050	<0.050	<0.050	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080		<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080
Chromium	E200.8	µg/L	0.28	0.15	0.35	0.27	<0.080	0.94	0.22	<0.80	<01.0	0.65	<0.32		1.6	0.2	0.24	0.18	0.44	<0.32	1.8	0.42	<0.80	<02.0	1.3	<0.32	<0.32
Copper	E200.8	µg/L	1.4	0.71	0.2	0.52	0.74	<0.80	0.9	<0.80	<0.80	0.58	0.36		<0.16	0.37	0.28	0.47	0.59	0.81	<0.80	1.6	<0.80	<0.80	2.4	3.9	0.37
Lead	E200.8	µg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.12	<0.12	<0.12	<0.24	<0.080	<0.080		<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	<0.080	<0.080	<0.080
Nickel	E200.8	µg/L	4.7	1.4	6.4	1.8	1.4	2.7	2.3	2.1	3.9	1.9	6		7.1	2.1	0.62	3.1	4.2	3.9	1.5	1.2	0.76	0.9	6.3	8.3	6.1
Selenium	E200.8	µg/L	16	5.7	7.2	21	15	<0.40	3.7	6.7	5.5	<0.80	0.95		<0.80	8.8	1.8	0.92	29	54	23	23	13	15	<0.80	0.93	<0.80
Silver	E200.8	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20		<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20
Thallium	E200.8	µg/L	<0.020	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.20	<0.080	<0.080		<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080
Zinc	E200.8	µg/L	1.5	1.2	2	3.6	5.2	<04.0	<04.0	<04.0	<04.0	<2.0	7.8		<2.0	0.93	1.1	1.1	1.5	4	4.2	<04.0	<04.0	<04.0	<2.0	<2.0	<2.0
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	0.48	<0.050	<0.050	0.53	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050		<0.050	0.18	<0.050	<0.050	0.54	0.35	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050
Metals, Total																										
Mercury	E1631E	ng/L	2.65	8.74	2.42	2.24	1.71	0.948	2.17	0.511	0.907	0.295	2.43		9.06	0.833	5.44	1.32	1.83	1.8	1.2	1.49	0.933	1.01	42.2	1.47	1.6
Antimony	E200.8	µg/L	0.087	0.057	0.12	0.12	0.13	<0.40	<0.40	<0.40	<0.40	<0.080	<0.080		<0.080	0.047	<0.020	0.29	0.028	0.29	<0.40	<0.40	<0.40	<0.40	<0.080	0.17	0.16
Arsenic	E200.8	µg/L	<0.20	0.28	0.37	0.59	0.69	0.66	1.4	<0.40	<0.40	<0.80	<0.80		<0.80	1.3	0.84	1.2	0.51	1.4	1.5	1.3	<0.40	<0.80	0.88	<0.80	1.6
Beryllium	E200.8	µg/L	<0.020	<0.020	<0.020	0.028	0.022	<0.040	<0.040	<0.10	<0.20	<0.080	<0.080		<0.080	<0.020	<0.020	0.021	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	1.8	<0.080	<0.080
Cadmium	E200.8	µg/L	0.077	0.098	0.056	0.15	0.29	0.4	0.098	<0.12	<0.12	<0.080	0.14		<0.080	<0.020	0.06	0.12	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	1.8	<0.080	<0.080
Chromium	E200.8	µg/L	2.8	5	2.8	5.7	6.5	11	2.4	<0.80	<01.0	2.1	21		4.4	1.4	6.9	17	18	<0.32	3.7	3.7	1	2.5	990	14	2.5
Copper	E200.8	µg/L	2	3.3	1.2	3.2	4.4	7	2.4	13	1.3	<0.16	17		2.2	1.2	6.9	11	1.3	1.3	6.7	2.3	<0.80	2	670	7.6	0.94
Lead	E200.8	µg/L	0.11	0.14	0.071	0.51	0.3	0.31	<0.12	<0.12	<0.12	<0.080	0.31		<0.080	<0.020	0.41	0.7	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	6.7	0.15	<0.080
Nickel	E200.8	µg/L	13	6.9	8.4	9.4	10	22	8.7	4.2	6	3	20		16	2.8	6.4	13	10	3.8	6.1	1.7	1.3	7	660	14	7.5
Selenium	E200.8	µg/L	17	8	7.3	22	18	4.3	3.4	7.8	5.6	1.3	1		<0.80	10	3.2	1	31	53	30	22	12	15	1.4	<0.80	<0.80
Silver	E200.8	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20		<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	0.81	<0.20	<0.20
Thallium	E200.8	µg/L	<0.020	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080		<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	0.13	<0.080	<0.080
Zinc	E200.8	µg/L	3.4	4.9	6.2	4.8	8.7	9.3	4.4	<04.0	<04.0	<2.0	16		2	1.2	9	13	2.2	3.9	5.4	4.1	<04.0	<04.0	590	6.6	<2.0
Cyanide	QC10-204-00-1-X	mg/L	<0.0020	<0.0020	0.0023	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020				<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0029	<0.0020	0.0029	0.0022			<0.0020
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	<0.050	<0.050	<0.050	0.62	<0.30	<0.30	<0.30	<0.30	<0.30	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	0.55	0.37	<0.30	<0.30	<0.30	<0.30	0.44	<0.050	<0.050
VOCs																										
1,1,1-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1,2,2-Tetrachloroethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,1,2-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1-Dichloroethane	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,2-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloropropane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,3-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,4-Dichlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
2-Chloroethyl Vinyl Ether	E624	µg/L	<0.70	<0.70	<0.70	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70		<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70
Acrolein	E624	µg/L	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0		<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0
Acrylonitrile	E624	µg/L	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40
Benzene	E624	µg/L	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30		<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30
Bromodichloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40
Bromoform	E624	µg/L	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30		<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30
Bromomethane	E624	µg/L	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40
Carbon Tetrachloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30		<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30
Chloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40
Chloroform	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
cis-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Dibromochloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Methylene Chloride	E624	µg/L	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50		<0.50	<0.50	<0.50	<0.50	<0.40	<0.50	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50
Tetrachloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40
Toluene	E624	µg/L	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30		<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30
trans-1,2-Dichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40
trans-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trihalomethanes (total)	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Vinyl Chloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
SVOCs																											
Acenaphthene	E625	µg/L	<0.030	<0.20	<0.20							<0.030			<0.030	<0.030	<0.030	<0.20	<0.20						<0.030	<0.030	<0.030
Acenaphthylene	E625	µg/L	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030			<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030
Acetochlor		µg/L		<0.95	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20	<0.20	<0.20	<0.20	<0.20			
Anthracene	E625	µg/L	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030			<0.030	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030
Benzidine	E625	µg/L	<3.4	<3.4	<0.28	<03.0	<03.0	<03.0		<03.0	<03.0	<3.4			<3.4	<3.4	<3.4	<0.29	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4
Benzo[a]anthracene	E625	µg/L	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040			<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040
Benzo[a]pyrene	E625	µg/L	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040			<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040
Benzo[b]fluoranthene	E625	µg/L	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040			<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040
Benzo[g,h,i]perylene	E625	µg/L	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040			<0.040	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040
Benzo[k]fluoranthene	E625	µg/L	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040			<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040
Benzyl Alcohol		µg/L			<1.4																						
1,1-Biphenyl		µg/L			<0.25																						
Bis(2-chloroethoxy)methane	E625	µg/L	<0.81	<0.81	<0.29	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81			<0.81	<0.81	<0.81	<0.30	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81
Bis(2-chloroethyl) Ether	E625	µg/L	<0.14	<0.30	<0.23	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14			<0.14	<0.14	<0.14	<0.30	<0.24	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14
Bis(2-chloroisopropyl) Ether		µg/L			<0.27														<0.28								
Bis(2-ethylhexyl) Adipate		µg/L			<1.9	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83								<0.50	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83		
Bis(2-ethylhexyl) Phthalate	E625	µg/L	<0.83	<0.83	<0.32	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83			<0.83	<0.83	<0.83	<0.34	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	5.7	<0.83	<0.83
4-Bromophenyl Phenyl Ether	E625	µg/L	<0.43	<0.43	<0.16	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43			<0.43	<0.43	<0.43	<0.17	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43
Butylbenzyl Phthalate	E625	µg/L	<0.64	<0.64	<0.28						<0.64	<0.64			<0.64	<0.64	<0.64	<0.29							<0.64	<0.64	<0.64
4-Chloroaniline		µg/L			<0.31	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58								<0.58	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58		
4-Chloro-3-methylphenol	E625	µg/L	<0.58	<0.58	<0.26	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58			<0.58	<0.58	<0.58	<0.58	<0.27	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58
2-Chloronaphthalene	E625	µg/L	<0.57	<0.57	<0.24	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57			<0.57	<0.57	<0.57	<0.57	<0.25	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57
2-Chlorophenol	E625	µg/L	<0.66	<0.66	<0.25	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66			<0.66	<0.66	<0.66	<0.66	<0.26	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66
4-Chlorophenyl-phenylether	E625	µg/L	<0.93	<0.93	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93			<0.93	<0.93	<0.93	<0.93	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93
Chrysene	E625	µg/L	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040			<0.040	<0.040	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040
Dibenz[a,h]anthracene	E625	µg/L	<0.080	<0.10	<0.10						<0.080				<0.080	<0.080	<0.080	<0.10	<0.10						<0.080	<0.080	<0.080
Dibenzofuran		µg/L			<0.20	<0.91	<0.91	<0.91	<0.91	<0.91	<0.91								<0.91	<0.91	<0.91	<0.91	<0.91	<0.91			
Di-n-Butyl Phthalate	E625	µg/L	<0.91	<0.91	<0.29						<0.91				<0.91	<0.91	<0.91	<0.91	<0.30						<0.91	<0.91	<0.91
1,2-Dichlorobenzene	E625	µg/L	<0.61	<0.61	<0.22						<0.61				<0.61	<0.61	<0.61	<0.61	<0.23						<0.61	<0.61	<0.61
1,3-Dichlorobenzene	E625	µg/L	<0.62	<0.62	<0.21						<0.62				<0.62	<0.62	<0.62	<0.62	<0.22						<0.62	<0.62	<0.62

Location	Method	Unit	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-3S	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-4	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5
Sample Date			6/1/2016	9/6/2016	12/1/2016	3/16/2017	6/12/2017	9/13/2017	12/13/2017	3/12/2018	6/21/2018	9/14/2015	12/8/2015	12/9/2015	3/2/2016	6/13/2016	9/26/2016	12/5/2016	3/20/2017	6/13/2017	9/20/2017	12/11/2017	3/29/2018	6/26/2018	9/15/2015	12/28/2015	3/2/2016
2-Methylnaphthalene		µg/L																								
1-Methylnaphthalene	E625	µg/L			<0.28							<0.040													<0.040		
2-Methylphenol	E625	µg/L	<0.64	<0.64	<0.18	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64					<0.64	<0.64	<0.19	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64			
3&4-Methylphenol		µg/L			<0.18													<0.19									
Naphthalene	E625	µg/L	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040		<0.040	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.040
2-Nitroaniline		µg/L			<1.2																						
3-Nitroaniline		µg/L			<1.1																						
4-Nitroaniline		µg/L			<1.1																						
Nitrobenzene	E625	µg/L	<0.74	<0.74	<0.30	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74		<0.74	<0.74	<0.74	<0.74	<0.32	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74
2-Nitrophenol	E625	µg/L	<0.90	<0.90	<1.3	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<1.4	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
4-Nitrophenol	E625	µg/L	<0.99	<0.99	<1.6	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99		<0.99	<0.99	<0.99	<0.99	<1.7	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99
N-Nitrosodimethylamine	E625	µg/L	<1.1	<1.1	<0.17	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1		<1.1	<1.1	<1.1	<1.1	<0.74	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1	<1.1
N-Nitroso-di-n-propylamine	E625	µg/L	<0.85	<0.85	<0.33	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85		<0.85	<0.85	<0.85	<0.85	<0.18	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85
Pentachlorophenol	E625	µg/L	<1.4	<1.4	<0.48	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4		<1.4	<1.4	<1.4	<1.4	<0.50	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4
Phenanthrene	E625	µg/L	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030		<0.030	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030
Phenol	E625	µg/L	<0.46	<0.46	<0.32	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46		<0.46	<0.46	<0.46	<0.46	<0.34	<0.46	<0.46	<0.46	<0.46	3.7	<0.46	<0.46	<0.46	<0.46
Pyrene	E625	µg/L	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030		<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030
1,2,4-Trichlorobenzene	E625	µg/L	<0.59	<0.59	<0.21	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59		<0.59	<0.59	<0.59	<0.59	<0.22	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59
2,4,5-Trichlorophenol	E625	µg/L	<0.74	<0.74	<0.20							<0.74		<0.74	<0.74	<0.74	<0.74	<0.21							<0.74	<0.74	<0.74
2,4,6-Trichlorophenol		µg/L			<0.22													<0.23									
Bis(2-chloro-1-methylethyl) Ether	E625	µg/L	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41
N-Nitrosodiphenylamine	E625	µg/L	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
TPH																											
TPH-Diesel	SW8015B	µg/L	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50		<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50
TPH-Heavy Oils	SW8015B	µg/L	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100		<100	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100
TPH as Gasoline	SW8260B	µg/L	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50		<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50
PCBs & Pesticides																											
4,4-DDD	E608	µg/L																									
4,4-DDE	E608	µg/L																									
4,4-DDT	E608	µg/L																									
Aldrin	E608	µg/L																									
alpha-BHC	E608	µg/L																									
alpha-Endosulfan	E608	µg/L																									
Aroclor 1016	E608	µg/L																									
Aroclor 1221	E608	µg/L																									
Aroclor 1232	E608	µg/L																									
Aroclor 1242	E608	µg/L																									
Aroclor 1248	E608	µg/L																									
Aroclor 1254	E608	µg/L																									
Aroclor 1260	E608	µg/L																									
beta-BHC	E608	µg/L																									
beta-Endosulfan	E608	µg/L																									
Chlordane	E608	µg/L																									
delta-BHC	E608	µg/L																									
Dieldrin	E608	µg/L																									
Endosulfan Sulfate	E608	µg/L																									
Endrin	E608	µg/L																									
Endrin Aldehyde	E608	µg/L																									
gamma-BHC	E608	µg/L																									
Heptachlor	E608	µg/L																									
Heptachlor Epoxide	E608	µg/L																									
Toxaphene	E608	µg/L																									

Location	Method	Unit	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7
Sample Date			6/13/2016	9/26/2016	12/5/2016	3/20/2017	6/22/2017	9/18/2017	12/4/2017	3/15/2018	6/7/2018	9/15/2015	12/10/2015	3/8/2016	6/6/2016	9/13/2016	12/5/2016	3/27/2017	6/14/2017	9/14/2017	12/4/2017	3/15/2018	6/7/2018	9/16/2015	12/7/2015	3/2/2016	6/2/2016
Field Parameters																										
Temp		°C	18.62	23.53	17.79	17.08	21.45	21.94	17.99	15.85	19.88	19.71	17.27	17.51	21.81	18.8	17.31	17.77	19.53	21.68	17.19	14.74	19.14	16.34	16.04	17.03	18.11
pH		s.u.	7.05	7.23	7.25	7.24	7.30	7.05	7.62	7.27	7.07	6.96	6.75	6.65	7.54	6.70	6.82	6.53	6.69	6.71	7.01	6.74	6.60	7.99	7.9	7.93	7.69
Electrical Conductivity		µS/cm	1012	1003	945	974	913	909	975	887	899	1913	1903	1951	1770	1954	1904	1948	2005	1973	1981	1985	2002	525	529	529	520
Dissolved Oxygen		mg/L	4.84	1.17	1.41	1.22	0.94	2.78	1.46	1.62	1.07	6.1	1.33	0.54	5.49	3.74	2.76	1.25	2.29	5.30	1.79	2.35	2.75	0.22	0.12	0.15	0.16
Turbidity		NTU	9.65	4.11	2.67	0.81	2.92	2.04	1.36	1.10	1.31	26.1	13.6	3.31	1.16	6.16	2.78	2.71	3.15	5.47	17.90	33.3	5.02	23.2	2.29	2.14	5.43
Oxidation Reduction Potential		mV	-34	-51.2	-16.0	-57.7	-22.2	-29.4	84.7	-39.4	-38	50.2	-0.4	5.7	16.9	84.9	69.9	82.5	118.5	138.4	119	116.7	85.9	-50.5	-177.5	-136.5	-101.1
Metals, Dissolved																											
Mercury	E1631E	ng/L	0.322	0.411	0.209	0.345	0.432	2.52	0.22	0.237	0		0.427	0.767	0.538	0.92	0.827	2.2	1.46	0.907	1.94	2.34	0		<0.200	0.242	0.211
Antimony	E200.8	µg/L	1.6	0.26	0.18	0.098	0.65	<0.40	<0.40	<0.40	<0.40	<0.080	0.36	0.71	0.088	0.065	0.062	0.13	0.16	<0.40	<0.40	<0.40	<0.40	0.14	0.13	<0.080	0.15
Arsenic	E200.8	µg/L	0.86	0.98	0.64	0.9	1.1	0.72	<0.40	0.75	1.1	1.1	<0.80	<0.80	0.82	1	0.82	1	1.1	1.2	1	0.56	1.3	<0.80	0.98	<0.80	0.72
Beryllium	E200.8	µg/L	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020
Cadmium	E200.8	µg/L	0.036	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	0.038	<0.050	0.056	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020
Chromium	E200.8	µg/L	0.17	0.13	<0.080	<0.080	<0.32	1.1	<0.16	<0.80	<01.0	1.1	<0.32	0.82	0.32	0.7	0.65	0.2	2	1.6	0.47	<0.80	<01.0	1.8	<0.32	1.2	<0.080
Copper	E200.8	µg/L	0.81	0.35	1.8	0.4	0.62	0.95	<0.80	1.9	1	1	0.86	1.5	0.89	1.4	1.5	1.7	1.9	1.6	1.5	1.4	2	0.36	0.19	<0.16	0.3
Lead	E200.8	µg/L	0.06	<0.020	<0.020	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020
Nickel	E200.8	µg/L	3.4	1.9	2.8	2.8	3.1	3.3	3.5	3	2.8	12	5.9	7.1	5	4	3.1	2.6	2.7	2.7	2.7	2.2	2.4	1	0.8	0.75	0.38
Selenium	E200.8	µg/L	<0.20	<0.20	<0.20	<0.20	<0.40	<0.40	<0.40	<0.40	0.69	<0.80	<0.80	<0.80	<0.20	0.29	<0.20	<0.20	<0.40	<0.40	<0.40	1.4	<0.60	<0.80	<0.80	<0.80	<0.20
Silver	E200.8	µg/L	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	0.12	<0.20	<0.20	<0.20	<0.050	<0.050	0.059	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050
Thallium	E200.8	µg/L	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020
Zinc	E200.8	µg/L	1.5	1	1.5	1.5	<02.0	<04.0	<04.0	<04.0	<04.0	<2.0	12	8.9	1.8	3.5	3.8	3.4	7.2	<04.0	<04.0	<04.0	<04.0	<2.0	<2.0	<2.0	<0.50
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	<0.050	<0.050	0.22	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.3	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050
Metals, Total																											
Mercury	E1631E	ng/L	1.4	1.14	0.444	0.61	<0.000200	0.345	0.393	1.12		4.59	3.18	4.34	1.48	3.06	1.72	5.29	1.86	1.89	1.65	0.0301		2.02	0.283	0.409	0.238
Antimony	E200.8	µg/L	1.2	1.7	0.54	0.27	0.22	0.22	<0.40	0.6	<0.40	<0.080	1	4	0.12	0.11	0.044	0.19	0.1	<0.40	<0.40	<0.40	<0.40	0.16	0.29	0.14	0.21
Arsenic	E200.8	µg/L	0.9	1.1	1.2	1.1	<0.80	0.94	<0.40	<0.40	1.2	<0.80	<0.80	1.3	0.86	1.2	0.86	1.1	1.6	1.4	1	<0.40	0.82	1.3	<0.80	<0.80	0.87
Beryllium	E200.8	µg/L	<0.020	<0.020	<0.020	<0.020	<0.080	<0.020	<0.040	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020
Cadmium	E200.8	µg/L	0.025	0.061	<0.050	<0.050	<0.10	0.052	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	0.044	0.074	0.068	0.093	<0.10	0.064	0.077	0.17	<0.12	<0.080	<0.080	<0.080	<0.020
Chromium	E200.8	µg/L	2.5	3.9	1.8	0.68	1.2	1.1	0.37	3.6	<01.0	12	11	7	11	10	11	4.9	4.5	11	2	24	15	13	2.9	2.8	1.2
Copper	E200.8	µg/L	2.3	2.9	1.8	0.96	1.4	0.92	1.4	2.6	1.3	7	6.4	3.9	1.3	5	4.5	6	3.4	3.5	6.3	12	6.8	6.5	11	0.44	1.1
Lead	E200.8	µg/L	0.098	0.21	0.039	<0.020	<0.080	<0.060	<0.12	<0.12	<0.12	0.15	0.23	<0.080	<0.020	0.17	0.16	<0.080	<0.080	<0.12	0.33	0.35	0.52	0.12	0.37	<0.080	0.028
Nickel	E200.8	µg/L	4.9	5.8	4.2	4.8	3.6	3.5	3.4	7.1	4.3	19	13	11	5.7	9.9	10	10	3.8	5.7	11	19	13	11	5.6	1.4	1.1
Selenium	E200.8	µg/L	<0.20	0.59	<0.20	0.36	<0.40	<0.40	<0.40	<0.40	0.84	3.3	<0.80	<0.80	<0.20	<0.20	<0.20	<0.20	<0.40	<0.40	<0.40	1.6	<0.60	<0.80	<0.80	<0.80	<0.20
Silver	E200.8	µg/L	<0.050	0.94	<0.050	<0.050	<0.10	0.42	<0.10	0.23	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050
Thallium	E200.8	µg/L	<0.020	<0.050	<0.050	<0.050	<0.20	<0.050	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020
Zinc	E200.8	µg/L	3.8	6.9	1.5	1.7	6.6	3.5	<04.0	6.4	<04.0	7.3	29	21	<0.50	6.2	5.6	8	4.9	6.9	9	16	8.4	4.2	17	<2.0	<0.50
Cyanide	QC10-204-00-1-X	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0023	<0.0020	<0.0020	<0.0020			<0.0020	0.0024	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	<0.050	<0.050	<0.050	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.30	<0.30	<0.30	0.66	<0.30	<0.30	<0.050	<0.050	<0.050	<0.050
VOCs																											
1,1,1-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1,2,2-Tetrachloroethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,1,2-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1-Dichloroethane	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,2-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloropropane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,3-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,4-Dichlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
2-Chloroethyl Vinyl Ether	E624	µg/L	<0.70	<0.70	<0.70	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.70
Acrolein	E624	µg/L	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0
Acrylonitrile	E624	µg/L	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40
Benzene	E624	µg/L	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30
Bromodichloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40
Bromoform	E624	µg/L	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30
Bromomethane	E624	µg/L	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40
Carbon Tetrachloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30
Chloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40
Chloroform	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
cis-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Dibromochloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Methylene Chloride	E624	µg/L	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.50	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50
Tetrachloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40
Toluene	E624	µg/L	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30
trans-1,2-Dichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40
trans-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trihalomethanes (total)	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Vinyl Chloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
SVOCs																											
Acenaphthene	E625	µg/L	<0.030	<0.20	<0.20							<0.030	<0.030	<0.030	<0.030	<0.20	<0.20							<0.030	<0.030	<0.030	<0.030
Acenaphthylene	E625	µg/L	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030
Acetochlor		µg/L				<0.20	<0.20	<0.20	<0.20	<0.20	<0.20							<0.20	<0.20	<0.20	<0.20	<0.20	<0.20				
Anthracene	E625	µg/L	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030	<0.030
Benzidine	E625	µg/L	<3.4	<3.4	<0.29	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4	<3.4	<3.4	<0.29	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4	<3.4
Benzo[a]anthracene	E625	µg/L	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040
Benzo[a]pyrene	E625	µg/L	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040
Benzo[b]fluoranthene	E625	µg/L	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040
Benzo[g,h,i]perylene	E625	µg/L	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040
Benzo[k]fluoranthene	E625	µg/L	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040
Benzyl Alcohol		µg/L																									
1,1-Biphenyl		µg/L																									
Bis(2-chloroethoxy)methane	E625	µg/L	<0.81	<0.81	<0.81	<0.30	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.30	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81
Bis(2-chloroethyl) Ether	E625	µg/L	<0.14	<0.30	<0.24	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.14	<0.30	<0.24	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.14
Bis(2-chloroisopropyl) Ether		µg/L			<0.28												<0.28										
Bis(2-ethylhexyl) Adipate		µg/L			<0.50	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83						<0.50	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83				
Bis(2-ethylhexyl) Phthalate	E625	µg/L	<0.83	<0.83	0.77	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	3.7	<0.83	<0.83	<0.83	<0.83	0.73	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83	<0.83	<0.83
4-Bromophenyl Phenyl Ether	E625	µg/L	<0.43	<0.43	<0.17	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43	<0.43	<0.43	<0.17	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43	<0.43
Butylbenzyl Phthalate	E625	µg/L	<0.64	<0.64	<0.29							<0.64	<0.64	<0.64	<0.64	<0.64	<0.29							<0.64	<0.64	<0.64	<0.64
4-Chloroaniline		µg/L				<0.58	<0.58	<0.58	<0.58	<0.58	<0.58							<0.58	<0.58	<0.58	<0.58	<0.58	<0.58				
4-Chloro-3-methylphenol	E625	µg/L	<0.58	<0.58	<0.27	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58	<0.58	<0.58	<0.27	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58	<0.58
2-Chloronaphthalene	E625	µg/L	<0.57	<0.57	<0.25	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57	<0.57	<0.57	<0.25	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57	<0.57
2-Chlorophenol	E625	µg/L	<0.66	<0.66	<0.26	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66	<0.66	<0.66	<0.26	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66	<0.66
4-Chlorophenyl-phenylether	E625	µg/L	<0.93	<0.93	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93	<0.93	<0.93	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93	<0.93
Chrysene	E625	µg/L	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040
Dibenz[a,h]anthracene	E625	µg/L	<0.080	<0.10	<0.10							<0.080	<0.080	<0.080	<0.080	<0.10

Location	Method	Unit	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-5	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-6	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7
Sample Date			6/13/2016	9/26/2016	12/5/2016	3/20/2017	6/22/2017	9/18/2017	12/4/2017	3/15/2018	6/7/2018	9/15/2015	12/10/2015	3/8/2016	6/6/2016	9/13/2016	12/5/2016	3/27/2017	6/14/2017	9/14/2017	12/4/2017	3/15/2018	6/7/2018	9/16/2015	12/7/2015	3/2/2016	6/2/2016
2-Methylnaphthalene		µg/L																								
1-Methylnaphthalene	E625	µg/L										<0.040												<0.040		
2-Methylphenol	E625	µg/L	<0.64	<0.64	<0.19	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64				<0.64	<0.64	<0.19	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64				<0.64
3&4-Methylphenol		µg/L			<0.19												<0.19										
Naphthalene	E625	µg/L	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.040	<0.040
2-Nitroaniline		µg/L																									
3-Nitroaniline		µg/L																									
4-Nitroaniline		µg/L																									
Nitrobenzene	E625	µg/L	<0.74	<0.74	<0.32	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.32	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74
2-Nitrophenol	E625	µg/L	<0.90	<0.90	<1.4	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<1.4	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
4-Nitrophenol	E625	µg/L	<0.99	<0.99	<1.7	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<1.7	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99
N-Nitrosodimethylamine	E625	µg/L	<1.1	<1.1	<0.74	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1	<1.1	<1.1	<1.1	<0.74	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1	<1.1	<1.1
N-Nitroso-di-n-propylamine	E625	µg/L	<0.85	<0.85	<0.18	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.18	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85
Pentachlorophenol	E625	µg/L	<1.4	<1.4	<0.50	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4	<1.4	<1.4	2.7	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4	<1.4
Phenanthrene	E625	µg/L	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030	<0.030
Phenol	E625	µg/L	<0.46	<0.46	<0.34	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.34	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	1.3	<0.46
Pyrene	E625	µg/L	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030
1,2,4-Trichlorobenzene	E625	µg/L	<0.59	<0.59	<0.22	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.22	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59
2,4,5-Trichlorophenol	E625	µg/L	<0.74	<0.74	<0.21							<0.74	<0.74	<0.74	<0.74	<0.74	<0.21							<0.74	<0.74	<0.74	<0.74
2,4,6-Trichlorophenol		µg/L			<0.23												<0.23										
Bis(2-chloro-1-methylethyl) Ether	E625	µg/L	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41
N-Nitrosodiphenylamine	E625	µg/L	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
TPH																											
TPH-Diesel	SW8015B	µg/L	<50	<50	<50	<050	<0150	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<050	<050	<0100	<050	<050	<50	<50	<50	<50
TPH-Heavy Oils	SW8015B	µg/L	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100
TPH as Gasoline	SW8260B	µg/L	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	370	<50	<50
PCBs & Pesticides																											
4,4-DDD	E608	µg/L																									
4,4-DDE	E608	µg/L																									
4,4-DDT	E608	µg/L																									
Aldrin	E608	µg/L																									
alpha-BHC	E608	µg/L																									
alpha-Endosulfan	E608	µg/L																									
Aroclor 1016	E608	µg/L																									
Aroclor 1221	E608	µg/L																									
Aroclor 1232	E608	µg/L																									
Aroclor 1242	E608	µg/L																									
Aroclor 1248	E608	µg/L																									
Aroclor 1254	E608	µg/L																									
Aroclor 1260	E608	µg/L																									
beta-BHC	E608	µg/L																									
beta-Endosulfan	E608	µg/L																									
Chlordane	E608	µg/L																									
delta-BHC	E608	µg/L																									
Dieldrin	E608	µg/L																									
Endosulfan Sulfate	E608	µg/L																									
Endrin	E608	µg/L																									
Endrin Aldehyde	E608	µg/L																									
gamma-BHC	E608	µg/L																									
Heptachlor	E608	µg/L																									
Heptachlor Epoxide	E608	µg/L																									
Toxaphene	E608	µg/L																									

Location	Method	Unit	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S
Sample Date			9/8/2016	12/1/2016	3/15/2017	6/12/2017	9/11/2017	12/13/2017	3/13/2018	6/20/2018	9/17/2015	12/9/2015	3/3/2016	6/1/2016	9/6/2016	12/1/2016	3/14/2017	6/13/2017	9/13/2017	12/12/2017	3/12/2018	6/21/2018	9/17/2015	12/9/2015	3/3/2016	6/1/2016	9/6/2016
Field Parameters																										
Temp		°C	16.59	16.38	16.11	15.83	19.08	15.96	15.03	17.04	15.85	13.89	12.92	15.17	15.00	11.53	14.64	15.11	15.45	12.52	12.43	16.14	17.48	14.47	13.05	16.84	16.32
pH		s.u.	8.25	8.30	7.91	7.81	7.53	7.90	7.86	7.92	9.77	9.57	9.26	8.82	9.55	9.47	9.13	9.36	9.23	9.42	9.29	9.15	7.27	6.94	7.02	6.68	7.10
Electrical Conductivity		µS/cm	514	510	511	517	521	514	516	523	483	450	454	445	436	418	435	431	435	424	419	407	1456	1730	1008	920	1214
Dissolved Oxygen		mg/L	0.38	0.24	0.2	0.3	0.37	0.17	0.30	0.15	0.72	1	0.35	0.34	0.44	0.51	0.31	0.22	0.41	0.16	0.27	0.31	4.25	4.95	0.91	1.33	3.92
Turbidity		NTU	1.61	0.21	1.8	1.84	1.05	0.74	0.86	1.10	62.1	39.4	16.1	6.19	2.98	2.44	7.05	4.3	1.97	1.22	1.79	4.34	60.8	6.23	2.74	4.66	2.61
Oxidation Reduction Potential		mV	-122.1	-95.6	-138.8	-72.3	-86.2	-107	-109.2	-164.5	-31.7	-155.8	39.1	16.6	-41.5	78.7	-28.6	-7.6	-161.6	-85.4	-138.4	-110.5	156.7	82.6	82.7	16.4	106.1
Metals, Dissolved																										
Mercury	E1631E	ng/L	<0.200	<0.200	<0.200	0.262	<0.200	0.221	<0.200	<0.200		3.32	1.07	0.998	0.315	0.652	1.18	0.937	0.347	1.71	0.815	0.992		0.278	0.244	0.286	2.93
Antimony	E200.8	µg/L	0.21	0.14	0.13	0.095	<0.20	<0.40	<0.40	<0.40	0.19	0.1	<0.080	0.086	0.061	0.03	0.049	0.1	<0.40	<0.40	<0.40	<0.40	<0.080	<0.080	<0.080	0.022	<0.020
Arsenic	E200.8	µg/L	0.71	1.2	1	1.1	0.91	1.3	1.5	0.76	<0.80	<0.80	<0.80	1.3	1.2	1.3	1.7	<0.80	0.63	1.6	1	0.89	<0.80	<0.80	<0.80	<0.20	0.23
Beryllium	E200.8	µg/L	<0.020	<0.020	<0.020	<0.020	0.021	<0.040	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.020
Cadmium	E200.8	µg/L	<0.050	<0.050	<0.050	<0.050	<0.030	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020	<0.050
Chromium	E200.8	µg/L	0.099	0.38	<0.080	<0.080	<0.080	0.43	<0.80	<01.0	2.6	0.68	0.88	<0.080	0.19	0.39	<0.080	<0.32	1.4	0.31	<0.80	<01.0	2	1.1	0.95	0.43	0.56
Copper	E200.8	µg/L	<0.050	<0.050	0.22	0.27	<0.40	<0.80	<0.80	<0.80	0.91	<0.16	1.9	1.2	0.97	0.31	0.96	0.81	1.5	1.4	<0.80	2.8	1.1	2.9	0.79	0.6	1.7
Lead	E200.8	µg/L	<0.020	<0.020	<0.020	<0.020	<0.060	<0.12	<0.12	<0.24	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.12	<0.12	<0.12	<0.24	<0.080	<0.080	<0.080	<0.020	<0.020
Nickel	E200.8	µg/L	0.16	0.48	0.56	0.073	<0.30	<0.60	<0.60	1.1	0.5	<0.24	<0.24	0.1	0.48	<0.060	0.14	<0.24	<0.60	<0.60	<0.60	1.7	5.1	2.8	2	1.4	
Selenium	E200.8	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40	<0.40	<0.60	<0.80	<0.80	<0.80	<0.20	<0.20	<0.20	<0.20	<0.40	<0.40	<0.40	<0.40	<0.60	4	4.8	3.2	1.9	3.5
Silver	E200.8	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050
Thallium	E200.8	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.20	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.20	<0.080	<0.080	<0.080	<0.020	<0.050
Zinc	E200.8	µg/L	<0.50	3.5	<0.50	0.74	<02.0	<04.0	<04.0	<04.0	<2.0	<2.0	<2.0	<0.50	<0.50	3.3	0.61	<02.0	<04.0	<04.0	<04.0	<04.0	6.1	4.8	<2.0	<0.50	2.8
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	0.36	0.66	0.41
Metals, Total																										
Mercury	E1631E	ng/L	0.227	0.23	<0.200	0.244	<0.200	<0.200	<0.200	<0.200	161	43.8	19.7	9.21	6.26	4.02	5.85	5.28	5.54	4.58	3.4	7.32	8.6	1.74	0.851	0.235	0.849
Antimony	E200.8	µg/L	0.24	0.16	0.096	0.15	<0.20	<0.40	<0.40	<0.40	0.15	0.094	<0.080	0.097	0.08	0.042	0.11	<0.080	<0.40	<0.40	<0.40	<0.40	0.091	<0.080	<0.080	0.025	0.034
Arsenic	E200.8	µg/L	1.1	1	1.3	1.5	1.4	1.8	1.5	0.97	1.2	<0.80	1.8	1.5	1.2	1.4	1.7	1.5	1.6	1.6	1.3	0.53	<0.80	<0.80	<0.80	<0.20	<0.20
Beryllium	E200.8	µg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	0.097	<0.080	<0.080	<0.020	<0.020
Cadmium	E200.8	µg/L	<0.050	<0.050	<0.050	<0.050	<0.030	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	0.024	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	0.18	<0.080	<0.080	<0.020	<0.050
Chromium	E200.8	µg/L	<0.080	<0.080	<0.080	<0.080	<0.080	0.65	<0.80	<01.0	21	17	13	5.3	1.6	1.5	1.8	1.6	1.5	1.3	<0.80	2.2	31	1.9	<0.32	1.3	1.1
Copper	E200.8	µg/L	0.34	0.21	0.55	0.35	0.51	<0.80	0.82	<0.80	4	3.9	2.9	1.6	0.95	1.2	1.1	1.2	1.6	1.2	7	1.7	18	3.7	0.86	1.2	0.85
Lead	E200.8	µg/L	0.027	0.041	<0.020	<0.020	<0.060	<0.12	<0.12	<0.24	0.54	0.68	0.13	0.081	0.043	0.11	0.11	0.11	<0.12	<0.12	0.15	<0.12	0.65	<0.080	<0.080	0.02	<0.020
Nickel	E200.8	µg/L	0.61	0.6	0.64	0.13	0.83	<0.60	0.73	1.5	11	8.9	4.1	2.3	0.85	0.82	0.93	1.2	0.64	<0.60	8.1	1.5	24	5.9	3.9	4.1	1.5
Selenium	E200.8	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40	<0.40	<0.60	<0.80	<0.80	<0.80	<0.20	<0.20	<0.20	<0.20	<0.40	<0.40	<0.40	<0.40	<0.60	4.1	4.4	2.9	1.8	3.2
Silver	E200.8	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	0.32	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050
Thallium	E200.8	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.20	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.050
Zinc	E200.8	µg/L	0.71	<0.50	2.9	0.78	4.4	<04.0	<04.0	<04.0	5.9	4.9	<2.0	<0.50	<0.50	4.7	1.4	4.7	<04.0	<04.0	<04.0	<04.0	17	4.1	<2.0	<0.50	1.7
Cyanide	QC10-204-00-1-X	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			<0.0020	<0.0020	<0.0020	0.002	<0.0020	<0.0020	<0.0020	0.0028	0.0021	<0.0020			<0.0020	<0.0020	<0.0020
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	<0.050	<0.050	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.47	0.54	0.48	0.55	0.41
VOCs																										
1,1,1-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1,2,2-Tetrachloroethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,1,2-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1-Dichloroethane	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,2-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloropropane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,3-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,4-Dichlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
2-Chloroethyl Vinyl Ether	E624	µg/L	<0.70	<0.70	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.70	<0.70
Acrolein	E624	µg/L	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0	<2.0
Acrylonitrile	E624	µg/L	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40	<0.40
Benzene	E624	µg/L	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30
Bromodichloromethane	E624	µg/L	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40
Bromoform	E624	µg/L	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30
Bromomethane	E624	µg/L	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40
Carbon Tetrachloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chlorobenzene	E624	µg/L	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30
Chloroethane	E624	µg/L	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40
Chloroform	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
cis-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Dibromochloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Methylene Chloride	E624	µg/L	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethene	E624	µg/L	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40
Toluene	E624	µg/L	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30
trans-1,2-Dichloroethene	E624	µg/L	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40
trans-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trihalomethanes (total)	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Vinyl Chloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
SVOCs																										
Acenaphthene	E625	µg/L	<0.20	<0.20							<0.030	<0.030	<0.030	<0.030	<0.20	<0.20							<0.030	<0.030	<0.030	<0.030	<0.20
Acenaphthylene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20
Acetochlor		µg/L		<0.95	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20						<0.95	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20					
Anthracene	E625	µg/L	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030	<0.030	<0.090
Benzidine	E625	µg/L	<3.4	<0.28	<03.0	<030	<03.0		<03.0	<03.0	<3.4	<3.4	<3.4	<3.4	<3.4	<0.28	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4	<3.4	<3.4
Benzo[a]anthracene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20
Benzo[a]pyrene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20
Benzo[b]fluoranthene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20
Benzo[g,h,i]perylene	E625	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.10
Benzo[k]fluoranthene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20
Benzyl Alcohol		µg/L		<1.4												<1.4											
1,1-Biphenyl		µg/L		<0.25												<0.25											
Bis(2-chloroethoxy)methane	E625	µg/L	<0.81	<0.29	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.29	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81
Bis(2-chloroethyl) Ether	E625	µg/L	<0.30	<0.23	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.14	<0.30	<0.23	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.14	<0.30
Bis(2-chloroisopropyl) Ether		µg/L		<0.27												<0.27											
Bis(2-ethylhexyl) Adipate		µg/L		<1.9	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83						<1.9	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83					
Bis(2-ethylhexyl) Phthalate	E625	µg/L	<0.83	<0.32	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83	<0.83	<0.83	<0.83	<0.32	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83	<0.83	<0.83	<0.83
4-Bromophenyl Phenyl Ether	E625	µg/L	<0.43	<0.16	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43	<0.43	<0.43	<0.16	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43	<0.43	<0.43
Butylbenzyl Phthalate	E625	µg/L	<0.64	<0.28							<0.64	<0.64	<0.64	<0.64	<0.64	<0.28							<0.64	<0.64	<0.64	<0.64	<0.64
4-Chloroaniline		µg/L		<0.31	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58						<0.31	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58					
4-Chloro-3-methylphenol	E625	µg/L	<0.58	<0.26	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58	<0.58	<0.58	<0.26	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58	<0.58	<0.58
2-Chloronaphthalene	E625	µg/L	<0.57	<0.24	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57	<0.57	<0.57	<0.24	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57	<0.57	<0.57
2-Chlorophenol	E625	µg/L	<0.66	<0.25	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66	<0.66	<0.66	<0.25	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66	<0.66	<0.66
4-Chlorophenyl-phenylether	E625	µg/L	<0.93	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93	<0.93	<0.93	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93	<0.93	<0.93
Chrysene	E625	µg/L	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040

Location	Method	Unit	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-7	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8D	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S
Sample Date			9/8/2016	12/1/2016	3/15/2017	6/12/2017	9/11/2017	12/13/2017	3/13/2018	6/20/2018	9/17/2015	12/9/2015	3/3/2016	6/1/2016	9/6/2016	12/1/2016	3/14/2017	6/13/2017	9/13/2017	12/12/2017	3/12/2018	6/21/2018	9/17/2015	12/9/2015	3/3/2016	6/1/2016	9/6/2016
2-Methylnaphthalene		µg/L																									
1-Methylnaphthalene	E625	µg/L		<0.27							<0.040					<0.28							<0.040				
2-Methylphenol	E625	µg/L	<0.64	<0.18	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64				<0.64	<0.64	<0.18	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64				<0.64	<0.64
3&4-Methylphenol		µg/L		<0.18												<0.18											
Naphthalene	E625	µg/L	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.040	<0.040	<0.090
2-Nitroaniline		µg/L		<1.2												<1.2											
3-Nitroaniline		µg/L		<1.1												<1.1											
4-Nitroaniline		µg/L		<1.1												<1.1											
Nitrobenzene	E625	µg/L	<0.74	<0.30	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.30	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74
2-Nitrophenol	E625	µg/L	<0.90	<1.3	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<1.3	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
4-Nitrophenol	E625	µg/L	<0.99	<1.6	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<1.6	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99
N-Nitrosodimethylamine	E625	µg/L	<1.1	<0.17	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1	<1.1	<1.1	<1.1	<0.17	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1	<1.1	<1.1	<1.1
N-Nitroso-di-n-propylamine	E625	µg/L	<0.85	<0.33	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.33	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85
Pentachlorophenol	E625	µg/L	<1.4	<0.47	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4	<1.4	<1.4	<0.48	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4	<1.4	<1.4
Phenanthrene	E625	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030	<0.030	<0.10
Phenol	E625	µg/L	<0.46	<0.32	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.32	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46
Pyrene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20
1,2,4-Trichlorobenzene	E625	µg/L	<0.59	<0.21	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.21	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59
2,4,5-Trichlorophenol	E625	µg/L	<0.74	<0.20							<0.74	<0.74	<0.74	<0.74	<0.74	<0.20							<0.74	<0.74	<0.74	<0.74	<0.74
2,4,6-Trichlorophenol		µg/L		<0.22												<0.22											
Bis(2-chloro-1-methylethyl) Ether	E625	µg/L	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41
N-Nitrosodiphenylamine	E625	µg/L	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
TPH																											
TPH-Diesel	SW8015B	µg/L	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50
TPH-Heavy Oils	SW8015B	µg/L	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100	<100
TPH as Gasoline	SW8260B	µg/L	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50
PCBs & Pesticides																											
4,4-DDD	E608	µg/L																									
4,4-DDE	E608	µg/L																									
4,4-DDT	E608	µg/L																									
Aldrin	E608	µg/L																									
alpha-BHC	E608	µg/L																									
alpha-Endosulfan	E608	µg/L																									
Aroclor 1016	E608	µg/L																									
Aroclor 1221	E608	µg/L																									
Aroclor 1232	E608	µg/L																									
Aroclor 1242	E608	µg/L																									
Aroclor 1248	E608	µg/L																									
Aroclor 1254	E608	µg/L																									
Aroclor 1260	E608	µg/L																									
beta-BHC	E608	µg/L																									
beta-Endosulfan	E608	µg/L																									
Chlordane	E608	µg/L																									
delta-BHC	E608	µg/L																									
Dieldrin	E608	µg/L																									
Endosulfan Sulfate	E608	µg/L																									
Endrin	E608	µg/L																									
Endrin Aldehyde	E608	µg/L																									
gamma-BHC	E608	µg/L																									
Heptachlor	E608	µg/L																									
Heptachlor Epoxide	E608	µg/L																									
Toxaphene	E608	µg/L																									

Location	Method	Unit	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A
Sample Date			12/1/2016	3/14/2017	6/13/2017	9/13/2017	12/12/2017	3/12/2018	6/21/2018	9/16/2015	12/8/2015	3/8/2016	6/13/2016	9/27/2016	12/7/2016	3/27/2017	6/28/2017	9/20/2017	12/11/2017	3/13/2018	6/26/2018	9/17/2015	12/9/2015	3/3/2016	6/1/2016	9/8/2016	12/1/2016
Field Parameters																										
Temp		°C	12.04	17.46	16.43	17.27	12.79	12.58	15.72	19.01	16.21	16.07	18.42	22.14	15.48	16.64	17.76	16.94	17.17	15.79	19.41	17.52	14.9	13.2	19.54	13.50	19.59
pH		s.u.	7.14	7.07	7.24	6.75	7.00	7.00	6.85	7.42	7	7	6.97	6.89	7.13	6.81	6.98	6.93	7.26	6.92	6.86	8.63	7.8	7.6	7.2	8.41	7.94
Electrical Conductivity		µS/cm	1181	1168	1180	989	1039	963	1159	1612	1649	1647	1732	1837	1778	1588	1744	1845	1830	1680	1829	652	691	563	571	632	447
Dissolved Oxygen		mg/L	2.99	1.09	0.46	3.35	3.21	5.73	3.71	0.83	0.09	0.09	4.35	0.50	2.10	0.2	0.47	2.69	0.38	1.07	0.67	7.77	9.01	7.57	10.04	9.30	1.90
Turbidity		NTU	3.48	7.58	1.03	1.06	0.40	1.17	0.80	68.2	65.8	12.8	16.5	9.08	11.5	17.2	10.65	6.97	13.30	10.7	3.68	5.75	1	0.15	1.06	0.77	1.83
Oxidation Reduction Potential		mV	132.0	96.5	83.8	93	156.4	138.5	133.8	90.6	-8.7	61	55.8	76.1	148.2	98.7	35.9	93.2	103.5	108.4	121.2	93.8	63.8		168.3	102.7	28.4
Metals, Dissolved																										
Mercury	E1631E	ng/L	0.247	<0.200	0.304	<0.200	0.38	0.339	0.231		1.35	1.82	2.93	1.9	2.22	2.87	5.21	1.96	4.96	4.59	5.29		0.374	0.279	0.201	0.367	<0.200
Antimony	E200.8	µg/L	<0.020	0.024	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	0.21	0.096	0.034	0.025	0.035	0.055	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	0.16	<0.080	<0.020	<0.020	<0.020
Arsenic	E200.8	µg/L	<0.20	<0.20	<0.80	<0.40	<0.40	<0.40	<0.40	<0.80	<0.80	<0.80	0.57	0.44	0.38	0.33	<0.80	<0.40	0.56	0.65	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.20
Beryllium	E200.8	µg/L	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020
Cadmium	E200.8	µg/L	<0.050	<0.050	<0.10	<0.060	<0.060	<0.060	<0.12	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050
Chromium	E200.8	µg/L	0.86	0.32	<0.32	0.44	0.74	<0.80	<01.0	1.1	<0.32	0.51	<0.080	0.26	0.22	0.11	1.4	1.7	0.53	<0.80	<02.0	1.6	1.4	1.2	0.66	0.51	1.2
Copper	E200.8	µg/L	0.16	0.56	1.2	1	<0.80	<0.80	<0.80	0.69	0.37	0.31	0.47	0.34	1.5	0.72	0.67	0.81	0.87	<0.80	0.89	0.6	0.34	<0.16	0.6	0.054	0.17
Lead	E200.8	µg/L	<0.020	<0.020	<0.080	<0.12	<0.12	<0.12	<0.24	<0.080	<0.080	<0.080	<0.020	<0.020	0.026	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020
Nickel	E200.8	µg/L	3.3	2.2	0.63	2.3	1.4	<0.60	6.7	2.6	3.6	3.9	2.9	0.97	1.4	1.1	6.3	<0.60	1.4	3.2	1.3	0.64	1.7	1.1	1.3	<0.060	0.35
Selenium	E200.8	µg/L	2.7	0.81	1.3	1.9	1.9	3	3.9	0.96	<0.80	<0.80	<0.20	0.27	0.7	<0.20	3	<0.40	0.63	0.86	2.1	1.4	<0.80	<0.80	<0.80	0.42	0.36
Silver	E200.8	µg/L	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050
Thallium	E200.8	µg/L	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.20	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050
Zinc	E200.8	µg/L	4.3	1.1	<02.0	<04.0	<04.0	<04.0	<04.0	<2.0	7.5	2.2	<0.50	1.8	1.9	1.3	2.5	<04.0	<04.0	4.8	<04.0	2.7	2.9	<2.0	<0.50	1.3	<0.50
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	0.67	0.56	0.47	0.42	0.72	0.58	0.47		<0.050	<0.050	<0.050	0.18	<0.050	0.28	0.2	<0.050	0.49	0.19	0.18		<0.050	0.41	0.65	0.38	0.56
Metals, Total																										
Mercury	E1631E	ng/L	1.06	0.509	0.383	0.271	0.457	0.269	0.536	3.51	3.94	3.78	8.17	5.06	3.78	4.87	3.87	0.0106	0.00954	8.48	0.00908	1.21	0.959	0.393	0.301	<0.200	0.368
Antimony	E200.8	µg/L	<0.020	<0.020	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	0.31	1.6	0.05	<0.020	<0.020	0.068	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	0.16	<0.080	<0.020	<0.020	<0.020
Arsenic	E200.8	µg/L	<0.20	<0.20	<0.80	<0.40	<0.40	<0.40	<0.40	0.83	<0.80	0.81	0.59	0.31	<0.20	0.21	<0.80	<0.40	0.68	<0.40	<0.80	<0.80	<0.80	<0.80	<0.20	0.35	<0.20
Beryllium	E200.8	µg/L	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020
Cadmium	E200.8	µg/L	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	0.077	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050
Chromium	E200.8	µg/L	1.6	0.6	<0.32	0.91	1.2	<0.80	<01.0	30	13	7.3	39	6.7	5.2	7.4	3.5	7.1	5.4	4.2	3.7	1.7	1.4	<0.32	0.82	0.6	1.5
Copper	E200.8	µg/L	0.55	0.65	0.79	0.83	1.7	1.2	1.5	6.9	3.6	2.9	16	2.2	1.8	2.8	2.3	2.8	2.2	1.9	1.9	0.69	0.34	0.5	0.52	0.073	0.75
Lead	E200.8	µg/L	0.024	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	0.31	0.13	<0.080	0.23	0.16	<0.020	0.2	<0.080	<0.12	<0.12	<0.12	<0.12	<0.080	<0.080	<0.080	<0.020	<0.020	0.087
Nickel	E200.8	µg/L	4.3	2.8	2.3	4.3	1.9	1.2	8.9	29	15	10	36	6.1	6.4	5.9	7.1	3.1	5.2	6.6	12	2.5	1.7	1.9	1	0.47	1.9
Selenium	E200.8	µg/L	3.1	0.7	1.1	2	2.2	2.9	4.2	<0.80	<0.80	<0.80	<0.20	0.98	0.75	<0.20	<0.40	0.62	0.87	2.5	0.85	<0.80	<0.80	<0.80	0.38	<0.20	0.5
Silver	E200.8	µg/L	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	1.9	<0.050	<0.050	<0.050	<0.050	1.9	0.13	0.1	0.16	<0.10	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050
Thallium	E200.8	µg/L	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.020	<0.050	0.062
Zinc	E200.8	µg/L	4.8	1.2	2.9	<04.0	<04.0	<04.0	<04.0	7.9	12	12	11	3.3	3	2.9	3.7	<04.0	<04.0	9.3	<04.0	<2.0	2.9	<2.0	<0.50	<0.50	2.9
Cyanide	QC10-204-00-1-X	mg/L	0.0028	<0.0020	<0.0020	<0.0020	0.0026	0.0031	<0.0020		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	0.65	0.52	0.45	0.41	0.7	0.64	0.6	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.36	<0.30	<0.30	0.57	<0.30	<0.30	0.52	0.61	0.49	0.57	0.46	0.56
VOCs																										
1,1,1-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1,2,2-Tetrachloroethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,1,2-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1-Dichloroethane	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,2-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloropropane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,3-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,4-Dichlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
2-Chloroethyl Vinyl Ether	E624	µg/L	<0.70	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.70	<0.70	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70
Acrolein	E624	µg/L	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Acrylonitrile	E624	µg/L	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Benzene	E624	µg/L	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Bromodichloromethane	E624	µg/L	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Bromoform	E624	µg/L	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Bromomethane	E624	µg/L	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Carbon Tetrachloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chlorobenzene	E624	µg/L	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Chloroethane	E624	µg/L	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chloroform	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
cis-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Dibromochloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Methylene Chloride	E624	µg/L	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethene	E624	µg/L	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Toluene	E624	µg/L	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
trans-1,2-Dichloroethene	E624	µg/L	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
trans-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trihalomethanes (total)	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Vinyl Chloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
SVOCs																										
Acenaphthene	E625	µg/L	<0.20							<0.030	<0.030	<0.030	<0.030	<0.20	<0.20							<0.030	<0.030	<0.030	<0.030	<0.20	<0.20
Acenaphthylene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20
Acetochlor		µg/L	<0.95	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20						<0.95	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20						<0.94
Anthracene	E625	µg/L	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030	<0.030	<0.090	<0.090
Benzidine	E625	µg/L	<0.28	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<0.28	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4	<3.4	<3.4	<0.27
Benzo[a]anthracene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20
Benzo[a]pyrene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20
Benzo[b]fluoranthene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20
Benzo[g,h,i]perylene	E625	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10
Benzo[k]fluoranthene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20
Benzyl Alcohol		µg/L	<1.4												<1.4												<1.4
1,1-Biphenyl		µg/L	<0.25												<0.25												<0.24
Bis(2-chloroethoxy)methane	E625	µg/L	<0.29	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.28	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.28
Bis(2-chloroethyl) Ether	E625	µg/L	<0.23	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.14	<0.30	<0.23	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.14	<0.14	<0.30	<0.23
Bis(2-chloroisopropyl) Ether		µg/L	<0.27												<0.27												<0.26
Bis(2-ethylhexyl) Adipate		µg/L	<1.9	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83						<1.9	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83						<1.9
Bis(2-ethylhexyl) Phthalate	E625	µg/L	<0.32	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83	<0.83	<0.83	<0.83	<0.32	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83	<0.83	<0.83	<0.83	<0.32
4-Bromophenyl Phenyl Ether	E625	µg/L	<0.16	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43	<0.43	<0.43	<0.16	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43	<0.43	<0.43	<0.16
Butylbenzyl Phthalate	E625	µg/L	<0.28							<0.64	<0.64	<0.64	<0.64	<0.64	<0.28							<0.64	<0.64	<0.64	<0.64	<0.64	<0.27
4-Chloroaniline		µg/L	<0.31	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58						<0.31	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58						<0.31
4-Chloro-3-methylphenol	E625	µg/L	<0.26	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58	<0.58	<0.58	<0.26	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58	<0.58	<0.58	<0.25
2-Cloronaphthalene	E625	µg/L	<0.24	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57	<0.57	<0.57	<0.24	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57	<0.57	<0.57	<0.24
2-Chlorophenol	E625	µg/L	<0.25	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66	<0.66	<0.66	<0.25	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66	<0.66	<0.66	<0.24
4-Chlorophenyl-phenylether	E625	µg/L	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93	<0.93	<0.93	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93	<0.93	<0.93	<0.19
Chrysene	E625	µg/L	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.10	<0.10	<0.

Location	Method	Unit	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-8S	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-DMW-9	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A
Sample Date			12/1/2016	3/14/2017	6/13/2017	9/13/2017	12/12/2017	3/12/2018	6/21/2018	9/16/2015	12/8/2015	3/8/2016	6/13/2016	9/27/2016	12/7/2016	3/27/2017	6/28/2017	9/20/2017	12/11/2017	3/13/2018	6/26/2018	9/17/2015	12/9/2015	3/3/2016	6/1/2016	9/8/2016	12/1/2016
2-Methylnaphthalene		µg/L																									
1-Methylnaphthalene	E625	µg/L	<0.28							<0.040					<0.28							<0.040					<0.27
2-Methylphenol	E625	µg/L	<0.18	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64				<0.64	<0.64	<0.18	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64				<0.64	<0.64	<0.18
3&4-Methylphenol		µg/L	<0.18												<0.18												<0.18
Naphthalene	E625	µg/L	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.040	<0.040	<0.090	<0.090
2-Nitroaniline		µg/L	<1.2												<1.2												<1.2
3-Nitroaniline		µg/L	<1.1												<1.1												<1.1
4-Nitroaniline		µg/L	<1.1												<1.1												<1.1
Nitrobenzene	E625	µg/L	<0.30	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.30	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.30
2-Nitrophenol	E625	µg/L	<1.3	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<1.3	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<1.3
4-Nitrophenol	E625	µg/L	<1.6	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<1.6	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<1.6
N-Nitrosodimethylamine	E625	µg/L	<0.17	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<1.1	<1.1	<1.1	<1.1	<1.1	<0.17	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<1.1	<1.1	<1.1	<1.1	<1.1	<0.17
N-Nitroso-di-n-propylamine	E625	µg/L	<0.33	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.33	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.33
Pentachlorophenol	E625	µg/L	<0.47	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4	<1.4	<1.4	<0.47	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4	<1.4	<1.4	<0.47
Phenanthrene	E625	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.030	<0.030	<0.10	<0.10
Phenol	E625	µg/L	<0.32	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.32	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.32
Pyrene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.23	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20
1,2,4-Trichlorobenzene	E625	µg/L	<0.21	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.21	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.21
2,4,5-Trichlorophenol	E625	µg/L	<0.20							<0.74	<0.74	<0.74	<0.74	<0.74	<0.20							<0.74	<0.74	<0.74	<0.74	<0.74	<0.20
2,4,6-Trichlorophenol		µg/L	<0.22												<0.22												<0.22
Bis(2-chloro-1-methylethyl) Ether	E625	µg/L		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	
N-Nitrosodiphenylamine	E625	µg/L		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	
TPH																											
TPH-Diesel	SW8015B	µg/L	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<0130	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50
TPH-Heavy Oils	SW8015B	µg/L	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100	<100	<100
TPH as Gasoline	SW8260B	µg/L	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50
PCBs & Pesticides																											
4,4-DDD	E608	µg/L																			<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
4,4-DDE	E608	µg/L																			<0.0040	<0.0040	<0.040	<0.0040	<0.0040	<0.0040	<0.0040
4,4-DDT	E608	µg/L																			<0.0030	<0.0030	<0.030	<0.0030	<0.0030	<0.0030	<0.0030
Aldrin	E608	µg/L																			<0.0020	<0.0020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
alpha-BHC	E608	µg/L																			<0.0040	<0.0040	<0.040	<0.0040	<0.0040	<0.0040	<0.0040
alpha-Endosulfan	E608	µg/L																			<0.0040	<0.0040	<0.040	<0.0040	<0.0040	<0.0040	<0.0040
Aroclor 1016	E608	µg/L																			<0.080	<0.080	<0.80	<0.080	<0.080	<0.080	<0.080
Aroclor 1221	E608	µg/L																			<0.20	<0.20	<2.0	<0.20	<0.20	<0.20	<0.20
Aroclor 1232	E608	µg/L																			<0.10	<0.10	<1.0	<0.10	<0.10	<0.10	<0.10
Aroclor 1242	E608	µg/L																			<0.040	<0.040	<0.40	<0.040	<0.040	<0.040	<0.040
Aroclor 1248	E608	µg/L																			<0.060	<0.060	<0.60	<0.060	<0.060	<0.060	<0.060
Aroclor 1254	E608	µg/L																			<0.040	<0.040	<0.40	<0.040	<0.040	<0.040	<0.040
Aroclor 1260	E608	µg/L																			<0.040	<0.040	<0.40	<0.040	<0.040	<0.040	<0.040
beta-BHC	E608	µg/L																			<0.0020	<0.0020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
beta-Endosulfan	E608	µg/L																			<0.0020	<0.0020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
Chlordane	E608	µg/L																			<0.040	<0.040	<0.40	<0.040	<0.040	<0.040	<0.040
delta-BHC	E608	µg/L																			<0.0020	<0.0020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
Dieldrin	E608	µg/L																			<0.0050	<0.0050	<0.050	<0.0050	<0.0050	<0.0050	<0.0050
Endosulfan Sulfate	E608	µg/L																			<0.020	<0.020	<0.20	<0.020	<0.020	<0.020	<0.020
Endrin	E608	µg/L																			<0.0020	<0.0020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
Endrin Aldehyde	E608	µg/L																			<0.0020	<0.0020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
gamma-BHC	E608	µg/L																			<0.0040	<0.0040	<0.040	<0.0040	<0.0040	<0.0040	<0.0040
Heptachlor	E608	µg/L																			<0.0030	<0.0030	<0.030	<0.0030	<0.0030	<0.0030	<0.0030
Heptachlor Epoxide	E608	µg/L																			<0.0090	<0.0090	<0.090	<0.0090	<0.0090	<0.0090	<0.0090
Toxaphene	E608	µg/L																			<0.20	<0.20	<2.0	<0.20	<0.20	<0.20	<0.20

Location	Method	Unit	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C
Sample Date			3/16/2017	6/13/2017	9/12/2017	12/12/2017	3/12/2018	6/21/2018	3/3/2016	6/1/2016	9/8/2016	12/1/2016	3/16/2017	6/13/2017	9/12/2017	12/12/2017	3/12/2018	6/21/2018	9/17/2015	9/17/2015	12/9/2015	12/9/2015	3/3/2016	6/1/2016	9/7/2016	12/1/2016	3/16/2017
Field Parameters																										
Temp		°C	12.51	12.37	15.53	11.45	11.43	12.31	13.31	18.43	13.69	17.69	12.75	12.18	16.22	10.70	11.39	12.22	17.52	17.52	14.4	14.4	13.91	20.11	15.33	11.58	13.93
pH		s.u.	8.19	7.97	8.18	8.02	8.04	7.90	7.98	7.82	8.53	7.91	8.21	7.76	8.43	8.36	8.25	7.98	8.03	8.03	7.6	7.6	7.87	7.95	8.11	7.63	8.15
Electrical Conductivity		µS/cm	465	506	583	581	542	571	556	538	597	509	462	505	571	573	550	553	2099	2099	1961	1961	1334	1023	1691	1212	763
Dissolved Oxygen		mg/L	9.89	10.7	8.10	9.85	9.65	9.71	7.36	7.85	9.55	1.19	10.17	8.4	8.43	10.59	10.03	10.64	13.59	13.59	6.58	6.58	8.5	9.19	8.25	10.36	10.41
Turbidity		NTU	2.27	1.85	0.76	0.51	0.90	0.83	0.17	1.38	1.08	2.24	2.17	2.74	0.76	0.79	0.36	0.88	2.52	2.52	0.61	0.61	0.2	1.45	1.49	2.24	3.39
Oxidation Reduction Potential		mV	120.2	167.0	219.6	154.4				161.5	116.4	168.4	132.3	162.5		167.2	147.4		149.4	149.4	74.8	74.8	-	154.6	150.6	42.7	99.5
Metals, Dissolved																											
Mercury	E1631E	ng/L	<0.200	0.275	0.302	<0.200	0.212	<0.200	0.29	0.26	0.227	<0.200	<0.200	0.262	<0.200	0.236	0.231	<0.200			0.472	0.498	0.51	0.451	0.338	0.414	0.269
Antimony	E200.8	µg/L	<0.020	<0.080	<0.40	<0.40	<0.40	<0.40	0.18	0.023	<0.020	<0.020	<0.020	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	<0.080	<0.080	<0.080	<0.080	0.032	0.04	<0.020	0.023
Arsenic	E200.8	µg/L	<0.20	<0.80	<0.40	0.59	<0.40	<0.40	<0.80	<0.20	<0.20	<0.20	<0.20	<0.80	<0.40	0.41	<0.40	<0.40	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	0.47	<0.20	<0.20
Beryllium	E200.8	µg/L	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.080	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020
Cadmium	E200.8	µg/L	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050
Chromium	E200.8	µg/L	0.27	<0.32	<0.16	0.62	<0.80	<01.0	1.1	0.57	0.5	1	0.3	<0.32	<0.16	0.92	<0.80	<01.0	0.97	1.5	1.1	1.1	0.95	0.44	0.47	0.45	0.31
Copper	E200.8	µg/L	0.85	1.5	1.3	<0.80	<0.80	<0.80	<0.16	0.53	0.48	0.17	0.32	<0.20	<0.80	0.98	<0.80	<0.80	1.5	1.4	1.3	<0.16	0.95	0.6	0.75	0.33	0.48
Lead	E200.8	µg/L	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	<0.080	<0.020	0.028	<0.020	<0.020	<0.080	<0.12	<0.12	<0.12	<0.12	0.14	0.16	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020
Nickel	E200.8	µg/L	0.71	0.63	0.86	<0.60	1.3	3.5	0.73	1	<0.060	0.72	0.41	0.98	1	<0.60	1.4	3.5	6.5	7.3	6	5.6	3.8	2.1	1.3	0.79	0.86
Selenium	E200.8	µg/L	0.27	<0.40	<0.40	<0.40	<0.40	<0.60	<0.80	0.4	0.31	0.36	0.26	<0.40	<0.40	<0.40	<0.40	0.67	7	7.3	7.3	6.9	9.8	3.9	7.1	4.8	2.9
Silver	E200.8	µg/L	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050
Thallium	E200.8	µg/L	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050
Zinc	E200.8	µg/L	1.5	2.4	<04.0	<04.0	<04.0	<04.0	<2.0	0.63	0.88	<0.50	0.57	<02.0	<04.0	<04.0	<04.0	<04.0	9.9	8.7	15	3.1	<2.0	1.1	3.7	0.6	2.2
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	0.52	0.41	0.44	0.73	0.45	0.42	0.44	0.67	0.43	0.56	0.53	0.44	0.4	0.71	0.39	0.44			<0.050	<0.050	0.34	0.64	0.12	0.4	0.54
Metals, Total																											
Mercury	E1631E	ng/L	0.283	0.253	<0.200	0.321	<0.200	<0.200	0.539	0.314	0.778	0.258	0.325	0.228	<0.000200	0.217	<0.000200	0.202	2.01	1.5	0.901	0.648	0.968	0.856	0.48	0.684	0.576
Antimony	E200.8	µg/L	<0.020	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	<0.080	<0.080	<0.080	<0.080	0.025	0.029	0.031	0.027
Arsenic	E200.8	µg/L	<0.20	<0.80	<0.40	<0.40	<0.40	<0.40	<0.80	<0.20	0.23	<0.20	<0.20	<0.80	<0.40	<0.40	<0.40	<0.40	<0.80	<0.80	<0.80	<0.80	<0.80	0.29	<0.20	<0.20	<0.20
Beryllium	E200.8	µg/L	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.080	<0.080	<0.080	<0.080	<0.020	<0.020	<0.020	<0.020
Cadmium	E200.8	µg/L	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.080	<0.080	<0.080	<0.080	<0.020	<0.050	<0.050	<0.050
Chromium	E200.8	µg/L	0.49	<0.32	0.51	0.88	0.80	<01.0	<0.32	0.65	0.77	0.93	0.5	<0.32	0.56	1	<0.80	<01.0	1.4	1.7	1.1	1.5	0.54	0.82	0.74	0.53	0.8
Copper	E200.8	µg/L	0.45	0.48	<0.80	1.4	1	<0.80	1.1	0.38	0.5	0.45	0.48	0.52	<0.80	<0.80	<0.80	<0.80	0.78	1.1	1.1	0.85	0.71	0.65	0.86	0.57	0.55
Lead	E200.8	µg/L	0.028	0.099	<0.12	<0.12	<0.12	<0.12	<0.080	<0.020	0.092	0.066	0.032	0.11	<0.12	<0.12	<0.12	<0.12	<0.080	<0.080	<0.080	<0.080	<0.080	<0.020	<0.020	0.053	0.028
Nickel	E200.8	µg/L	0.61	1	1.9	<0.60	2.1	3.9	2	0.98	0.31	1.5	0.75	1.3	2.1	<0.60	2.1	3.8	11	11	6.3	6.8	5.5	2.3	1.1	3	1.1
Selenium	E200.8	µg/L	0.36	<0.40	<0.40	<0.40	<0.40	<0.60	<0.80	0.32	0.47	0.55	0.37	<0.40	<0.40	<0.40	<0.40	0.83	7.9	8.1	6.5	7.2	9	4	7.1	5.3	3.4
Silver	E200.8	µg/L	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.050	<0.050	<0.050	<0.050
Thallium	E200.8	µg/L	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.020	<0.050	0.057	<0.050	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.080	<0.080	<0.080	<0.080	<0.020	<0.050	0.053	<0.050
Zinc	E200.8	µg/L	1.1	2.7	<04.0	<04.0	<04.0	<04.0	4.2	<0.50	0.94	<0.50	0.71	<02.0	<04.0	<04.0	<04.0	<04.0	7	6.9	13	4.3	<2.0	<0.50	3.5	<0.50	1.1
Cyanide	QC10-204-00-1-X	mg/L	0.0038	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0021	0.0027	<0.0020	<0.0020	<0.0020	<0.0020	0.0044					<0.0020	<0.0020	<0.0020	0.0022	0.0023
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	0.6	0.48	0.44	0.69	0.48	0.56	0.46	0.57	0.38	0.56	0.55	0.46	0.45	0.69	0.38	0.54	0.41	0.38	0.4	0.43	0.42	0.51	<0.050	0.5	0.55
VOCs																											
1,1,1-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1,2,2-Tetrachloroethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,1,2-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1-Dichloroethane	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,2-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloropropane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,3-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,4-Dichlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
2-Chloroethyl Vinyl Ether	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.30	<0.30	<0.30	<0.70	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.30
Acrolein	E624	µg/L	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<0.70
Acrylonitrile	E624	µg/L	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<02.0
Benzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40
Bromodichloromethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30
Bromoform	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40
Bromomethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30
Carbon Tetrachloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40
Chloroethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30
Chloroform	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
cis-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Dibromochloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Methylene Chloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40
Tetrachloroethene	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50
Toluene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40
trans-1,2-Dichloroethene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30
trans-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trihalomethanes (total)	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Vinyl Chloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
SVOCs																											
Acenaphthene	E625	µg/L							<0.030	<0.030	<0.20	<0.20							<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	
Acenaphthylene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20
Acetochlor		µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20			<0.94	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20							<0.94	<0.20	
Anthracene	E625	µg/L	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.090	<0.090	<0.090
Benzidine	E625	µg/L	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4	<0.27	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<0.27	<03.0
Benzo[a]anthracene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20
Benzo[a]pyrene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20
Benzo[b]fluoranthene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20
Benzo[g,h,i]perylene	E625	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10	<0.10
Benzo[k]fluoranthene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.20
Benzyl Alcohol		µg/L									<1.4															<1.4	
1,1-Biphenyl		µg/L									<0.24															<0.24	
Bis(2-chloroethoxy)methane	E625	µg/L	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.28	<0.81	<0.81	<0.81	<0.81				<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.28	<0.81
Bis(2-chloroethyl) Ether	E625	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.30	<0.23	<0.30	<0.30	<0.30				<0.30	<0.30	<0.14	<0.14	<0.14	<0.14	<0.14	<0.23	<0.30
Bis(2-chloroisopropyl) Ether		µg/L										<0.26														<0.26	
Bis(2-ethylhexyl) Adipate		µg/L	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83				<1.9	<0.83	<0.83	<0.83				<0.83	<0.83						<1.9	<0.83
Bis(2-ethylhexyl) Phthalate	E625	µg/L	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83	<0.83	<0.32	<0.43	<0.43	<0.43				<0.43	<0.43	<0.83	<0.83	<0.83	<0.83	<0.83	<0.32	<0.43
4-Bromophenyl Phenyl Ether	E625	µg/L	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43	<0.16	<0.64	<0.64	<0.64				<0.64	<0.64	<0.43	<0.43	<0.43	<0.43	<0.43	<0.16	<0.64
Butylbenzyl Phthalate	E625	µg/L							<0.64	<0.64	<0.64	<0.27							<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.27	
4-Chloroaniline		µg/L	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58			<0.31	<0.58	<0.58	<0.58	<0.58				<0.58	<0.58						<0.31	<0.58
4-Chloro-3-methylphenol	E625	µg/L	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58	<0.25	<0.57	<0.57	<0.57				<0.57	<0.57	<0.58	<0.58	<0.58	<0.58	<0.58	<0.25	<0.57
2-Cloronaphthalene	E625	µg/L	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57	<0.24	<0.66	<0.66	<0.66				<0.66	<0.66	<0.57	<0.57	<0.57	<0.57	<0.57	<0.24	<0.66
2-Chlorophenol	E625	µg/L	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66	<0.24	<0.93	<0.93	<0.93				<0.93	<0.93	<0.66	<0.66	<0.66	<0.66	<0.66	<0.24	<0.93
4-Chlorophenyl-phenylether	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93	<0.19	<0.20	<0.20	<0.20				<0.20	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.19	<0.20
Chrysene	E625	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10				<0.10	<0.10	<0.040	<0.040	<0.040	<0.040	<0.20	<0.20	<0.10
Dibenz[a,h]anthracene	E625	µg/L							<0.080	<0.080	<0.10	<0.10									<0.080	<0.080	<0.080	<0.080	<0.080	<0.10	<0.10
Dibenzofuran		µg/L	<0.91	<0.91	<0.91	<0.91	<0.91	<0.91			<0.20	<0.91	<0.91

Location	Method	Unit	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-A	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-B	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C
Sample Date			3/16/2017	6/13/2017	9/12/2017	12/12/2017	3/12/2018	6/21/2018	3/3/2016	6/1/2016	9/8/2016	12/1/2016	3/16/2017	6/13/2017	9/12/2017	12/12/2017	3/12/2018	6/21/2018	9/17/2015	9/17/2015	12/9/2015	12/9/2015	3/3/2016	6/1/2016	9/7/2016	12/1/2016	3/16/2017
2-Methylnaphthalene		µg/L																									
1-Methylnaphthalene	E625	µg/L										<0.27							<0.040	<0.040						<0.27	
2-Methylphenol	E625	µg/L	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64		<0.64	<0.64	<0.18	<0.64	<0.64	<0.64		<0.64	<0.64					<0.64	<0.64	<0.64	<0.18	<0.64
3&4-Methylphenol		µg/L										<0.18														<0.18	
Naphthalene	E625	µg/L	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090		<0.090	<0.090	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.090	<0.090	<0.090
2-Nitroaniline		µg/L										<1.2														<1.2	
3-Nitroaniline		µg/L										<1.1														<1.1	
4-Nitroaniline		µg/L										<1.1														<1.1	
Nitrobenzene	E625	µg/L	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.30	<0.74	<0.74	<0.74		<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.30	<0.74
2-Nitrophenol	E625	µg/L	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<1.3	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<1.3	<0.90
4-Nitrophenol	E625	µg/L	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<1.6	<0.99	<0.99	<0.99		<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<1.6	<0.99
N-Nitrosodimethylamine	E625	µg/L	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1	<1.1	<0.17	<01.1	<01.1	<01.1		<01.1	<01.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<0.17	<01.1
N-Nitroso-di-n-propylamine	E625	µg/L	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.33	<0.85	<0.85	<0.85		<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.33	<0.85
Pentachlorophenol	E625	µg/L	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4	<0.47	<01.4	<01.4	<01.4		<01.4	<01.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<0.47	<01.4
Phenanthrene	E625	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.10	<0.10	<0.10
Phenol	E625	µg/L	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.32	<0.46	<0.46	<0.46		<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.32	<0.46
Pyrene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20		<0.20	<0.20	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.20	<0.20	<0.20
1,2,4-Trichlorobenzene	E625	µg/L	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.21	<0.59	<0.59	<0.59		<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.21	<0.59
2,4,5-Trichlorophenol	E625	µg/L							<0.74	<0.74	<0.74	<0.20							<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.20	
2,4,6-Trichlorophenol		µg/L										<0.22														<0.22	
Bis(2-chloro-1-methylethyl) Ether	E625	µg/L	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41		<0.41
N-Nitrosodiphenylamine	E625	µg/L	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90
TPH																											
TPH-Diesel	SW8015B	µg/L	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<50	<50	<050
TPH-Heavy Oils	SW8015B	µg/L	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100	<100	<100	<100	<100	<0100
TPH as Gasoline	SW8260B	µg/L	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<50	<50	<50	<50	<50	<50	<50	<50	<050
PCBs & Pesticides																											
4,4-DDD	E608	µg/L	<0.020	<0.020	<0.020	<0.020		<0.0025	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020		<0.0025	<0.020	<0.020	<0.020	<0.20	<0.20	<0.020	<0.020	<0.020	<0.020
4,4-DDE	E608	µg/L	<0.0040	<0.0040	<0.0040	<0.0040		<0.0020	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040		<0.0020	<0.0040	<0.0040	<0.040	<0.040	<0.040	<0.0040	<0.0040	<0.0040	<0.0040
4,4-DDT	E608	µg/L	<0.0030	<0.0030	<0.0030	<0.0030	0.00075	<0.0015	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.00074	<0.0055	<0.0030	<0.0030	<0.030	<0.030	<0.030	<0.0030	<0.0030	<0.0030	<0.0030
Aldrin	E608	µg/L	<0.0020	<0.0020	<0.0020	<0.0020	0.0005	<0.0024	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.00028	<0.0010	<0.0020	<0.0020	<0.020	<0.020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
alpha-BHC	E608	µg/L	<0.0040	<0.0040	<0.0040	<0.0040		<0.0030	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040		<0.0020	<0.0040	<0.0040	<0.040	<0.040	<0.040	<0.0040	<0.0040	<0.0040	<0.0040
alpha-Endosulfan	E608	µg/L	<0.0040	<0.0040	<0.0040	<0.0040		<0.0020	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040		<0.0020	<0.0040	<0.0040	<0.040	<0.040	<0.040	<0.0040	<0.0040	<0.0040	<0.0040
Aroclor 1016	E608	µg/L	<0.080	<0.080	<0.080	<0.080		<0.040	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080		<0.040	<0.080	<0.080	<0.80	<0.80	<0.80	<0.080	<0.080	<0.080	<0.080
Aroclor 1221	E608	µg/L	<0.20	<0.20	<0.20	<0.20		<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		<0.10	<0.20	<0.20	<2.0	<2.0	<2.0	<0.20	<0.20	<0.20	<0.20
Aroclor 1232	E608	µg/L	<0.10	<0.10	<0.10	<0.10		<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		<0.050	<0.10	<0.10	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10
Aroclor 1242	E608	µg/L	<0.040	<0.040	<0.040	<0.040		<0.020	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040		<0.020	<0.040	<0.040	<0.40	<0.40	<0.40	<0.040	<0.040	<0.040	<0.040
Aroclor 1248	E608	µg/L	<0.060	<0.060	<0.060	<0.060		<0.030	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060		<0.030	<0.060	<0.060	<0.60	<0.60	<0.60	<0.060	<0.060	<0.060	<0.060
Aroclor 1254	E608	µg/L	<0.040	<0.040	<0.040	<0.040		<0.020	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040		<0.020	<0.040	<0.040	<0.40	<0.40	<0.40	<0.040	<0.040	<0.040	<0.040
Aroclor 1260	E608	µg/L	<0.040	<0.040	<0.040	<0.040		<0.020	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040		<0.020	<0.040	<0.040	<0.40	<0.40	<0.40	<0.040	<0.040	<0.040	<0.040
beta-BHC	E608	µg/L	<0.0020	<0.0020	<0.0020	<0.0020		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020		<0.0020	<0.0020	<0.0020	<0.020	<0.020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
beta-Endosulfan	E608	µg/L	<0.0020	<0.0020	<0.0020	<0.0020		<0.0025	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020		<0.0025	<0.0020	<0.0020	<0.020	<0.020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
Chlordane	E608	µg/L	<0.040	<0.040	<0.040	<0.040		<0.0050	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040		<0.0050	<0.040	<0.040	<0.40	<0.40	<0.40	<0.040	<0.040	<0.040	<0.040
delta-BHC	E608	µg/L	<0.0020	<0.0020	<0.0020	<0.0020	0.00026	<0.0030	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.00061	<0.0055	<0.0020	<0.0020	<0.020	<0.020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
Dieldrin	E608	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.00046	<0.0025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.00019	<0.0025	<0.0050	<0.0050	<0.050	<0.050	<0.050	<0.0050	<0.0050	<0.0050	<0.0050
Endosulfan Sulfate	E608	µg/L	<0.020	<0.020	<0.020	<0.020		<0.0015	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020		<0.0015	<0.020	<0.020	<0.20	<0.20	<0.20	<0.020	<0.020	<0.020	<0.020
Endrin	E608	µg/L	<0.0020	<0.0020	<0.0020	<0.0020	0.00022	<0.0040	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.00018	<0.0040	<0.0020	<0.0020	<0.020	<0.020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
Endrin Aldehyde	E608	µg/L	<0.0020	<0.0020	<0.0020	<0.0020		<0.0048	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020		<0.0050	<0.0020	<0.0020	<0.020	<0.020	<0.020	<0.0020	<0.0020	<0.0020	<0.0020
gamma-BHC	E608	µg/L	<0.0040	<0.0040	<0.0040	<0.0040		<0.0020	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040		<0.0020	<0.0040	<0.0040	<0.040	<0.040	<0.040	<0.0040	<0.0040	<0.0040	<0.0040
Heptachlor	E608	µg/L	<0.0030	<0.0030	<0.0030	<0.0030		<0.0025	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030		<0.0025	<0.0030	<0.0030	<0.030	<0.030	<0.030	<0.0030	<0.0030	<0.0030	<0.0030
Heptachlor Epoxide	E608	µg/L	<0.0090	<0.0090	<0.0090	<0.0090		<0.0045	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090		<0.0045	<0.0090	<0.0090	<0.090	<0.090	<0.090	<0.0090	<0.0090	<0.0090	<0.0090
Toxaphene	E608	µg/L	<0.20	<0.20	<0.20	<0.20		<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		<0.10	<0.20	<0.20	<2.0	<2.0	<2.0	<0.20	<0.20	<0.20	<0.20

GOLDER

Location	Method	Unit	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-E	WMSA-SW-E	WMSA-SW-E
Sample Date			6/13/2017	9/12/2017	12/12/2017	3/12/2018	6/21/2018	3/3/2016	6/1/2016	9/7/2016	12/1/2016	3/14/2017	6/13/2017	6/13/2017	9/12/2017	9/12/2017	12/12/2017	12/12/2017	3/12/2018	3/12/2018	6/21/2018	6/21/2018	3/14/2016	3/16/2017	6/13/2017
Field Parameters																								
Temp		°C	15.14	16.68	10.82	12.03	16.87	14.52	21.35	15.6	9.55		13.66	13.66	17.74	17.74	8.82	8.82	11.08	11.08	18.47	18.47	13.08	13.5	15.01
pH		s.u.	8.10	7.88	7.87	7.89	7.87	8.16	8.21	8.53	7.29		8.25	8.25	7.67	7.67	7.98	7.98	7.37	7.37	8.11	8.11	8.04	8.02	8.43
Electrical Conductivity		µS/cm	843	1326	1109	1355	1514	1250	1005	1617	1167		793	793	1229	1229	1060	1060	1390	1390	1434	1434	622	699	827
Dissolved Oxygen		mg/L	9.22	8.43	9.84	9.00	8.41	10.5	7.38	8.9	11.53		9.73	9.73	9.13	9.13	11.02	11.02	9.88	9.88	6.85	6.85	8.67	10.36	7.95
Turbidity		NTU	1.41	2.14	0.53	0.75	7.37	1.04	2.34	4.21	1.03		1.19	1.19	7.70	7.70	0.92	0.92	0.27	0.27	0.62	0.62	15.2	5.27	1.48
Oxidation Reduction Potential		mV	110.7	112.9	213.3	153.2			179.1	140.1	89.8		154.9	154.9	134.5	134.5	262.5	262.5	137	137				69.4	98.1
Metals, Dissolved																									
Mercury	E1631E	ng/L	0.603	0.387	0.365	0.533	0.44	0.493	0.381	0.455	0.376	0.216	0.642	0.744	0.542	0.371	0.564	0.318	0.413	0.351	0.409	0.404	1.24	0.296	0.584
Antimony	E200.8	µg/L	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	0.053	0.032	0.028	0.028	<0.080	<0.080	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.080	0.024	<0.080
Arsenic	E200.8	µg/L	<0.80	<0.40	0.66	<0.40	<0.40	<0.80	<0.20	0.22	<0.20	<0.20	<0.80	<0.80	<0.40	<0.40	<0.40	<0.40	0.6	<0.40	<0.40	<0.40	<0.80	<0.20	<0.80
Beryllium	E200.8	µg/L	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.080	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10	<0.20	<0.20	<0.080	<0.020	<0.080
Cadmium	E200.8	µg/L	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.10	<0.060	<0.060	<0.060	<0.060	<0.12	<0.12	<0.12	<0.12	<0.080	<0.050	<0.10
Chromium	E200.8	µg/L	<0.32	<0.16	0.61	<0.80	<01.0	0.8	0.46	0.53	0.5	0.43	<0.32	<0.32	0.21	0.27	0.67	0.65	<0.80	<0.80	<01.0	<01.0	2.1	0.37	<0.32
Copper	E200.8	µg/L	0.31	<0.80	1.1	1.2	<0.80	0.53	0.98	0.64	0.31	0.56	1.2	0.76	1.1	1.2	0.86	<0.80	<0.80	<0.80	<0.80	<0.80	0.51	0.42	0.27
Lead	E200.8	µg/L	<0.080	<0.12	<0.12	<0.12	<0.12	<0.080	<0.020	<0.020	0.034	<0.020	<0.080	<0.080	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.080	<0.020	<0.080
Nickel	E200.8	µg/L	0.71	1.7	<0.60	<0.60	11	3.9	2	0.84	0.42	0.59	<0.24	0.28	1.7	1.7	<0.60	<0.60	0.86	<0.60	11	12	0.64	0.71	<0.24
Selenium	E200.8	µg/L	2.8	4.5	3.4	7	6.6	9	3.7	6.7	4.5	2.6	2.4	2.5	4	4	3.1	3.1	7.2	7.2	6	6.7	3	2.9	2.5
Silver	E200.8	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.050	<0.10
Thallium	E200.8	µg/L	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.020	<0.050	<0.050	<0.050	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.080	<0.050	<0.20
Zinc	E200.8	µg/L	3.4	<04.0	<04.0	<04.0	<04.0	<2.0	3	1.5	0.58	1.5	3.3	3.4	<04.0	<04.0	<04.0	<04.0	<04.0	<04.0	<04.0	<08.0	<2.0	2.6	2.5
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	0.39	0.32	0.6	0.51	0.44	0.41	0.6	0.37	0.44	<0.050	0.36	0.46	0.32	0.45	0.73	0.7	0.49	0.48	0.37	0.44	0.59	0.56	0.39
Metals, Total																									
Mercury	E1631E	ng/L	0.394	0.759	0.445	0.583	0.405	0.952	0.59	14.4	0.244	0.591	0.374	0.36	0.436	0.571	0.307	0.467	1.08	0.946	0.334	0.322	0.994	0.728	0.546
Antimony	E200.8	µg/L	<0.080	<0.40	<0.40	<0.40	<0.40	<0.080	0.024	0.028	0.033	<0.020	<0.080	<0.080	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.080	0.033	<0.080
Arsenic	E200.8	µg/L	<0.80	<0.40	0.55	0.5	<0.40	<0.80	0.28	0.26	<0.20	0.26	<0.80	<0.80	<0.40	<0.40	<0.40	<0.40	0.52	<0.40	<0.40	<0.40	<0.80	<0.20	<0.80
Beryllium	E200.8	µg/L	<0.080	<0.040	<0.040	<0.10	<0.20	<0.080	<0.020	<0.020	<0.020	<0.020	<0.080	<0.080	<0.040	<0.040	<0.040	<0.040	<0.10	<0.10	<0.20	<0.20	<0.080	<0.020	<0.080
Cadmium	E200.8	µg/L	<0.10	<0.060	<0.060	<0.12	<0.12	<0.080	<0.020	<0.050	<0.050	<0.050	<0.10	<0.10	<0.060	<0.060	<0.060	<0.060	<0.12	<0.12	<0.12	<0.12	<0.080	<0.050	<0.10
Chromium	E200.8	µg/L	<0.32	0.72	1.6	<0.80	<01.0	<0.32	0.64	0.73	0.55	0.98	<0.32	<0.32	0.75	0.55	0.61	0.86	<0.80	<0.80	4.3	1.6	10	1.4	<0.32
Copper	E200.8	µg/L	0.78	<0.80	1.3	1	0.93	0.68	0.83	0.59	0.5	0.57	4.4	0.39	<0.80	<0.80	<0.80	1.1	5.2	2.3	4.7	1.3	4.4	1.1	0.84
Lead	E200.8	µg/L	<0.080	<0.12	<0.12	<0.12	<0.12	<0.080	<0.020	0.023	0.063	0.03	<0.080	<0.080	<0.12	<0.12	<0.12	<0.12	<0.12	0.15	0.16	<0.12	0.34	0.27	<0.080
Nickel	E200.8	µg/L	1.8	5.7	1.8	1.6	11	5	2	6.8	3	1.3	1.5	1.1	5	5	0.99	1.3	0.94	1.5	14	12	10	1.8	1.6
Selenium	E200.8	µg/L	2.7	4.4	3.7	8.3	6.7	8.3	3.6	7.1	5	2.8	2.2	1.8	4.1	4.3	3.1	3.3	7.8	7.7	6.5	6.2	3.3	2.9	2.3
Silver	E200.8	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.050	<0.10
Thallium	E200.8	µg/L	<0.20	<0.10	<0.10	<0.10	<0.10	<0.080	<0.020	<0.050	0.056	<0.050	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.080	<0.050	<0.20
Zinc	E200.8	µg/L	6.9	<04.0	<04.0	<04.0	<04.0	<2.0	<0.50	1.8	<0.50	1.3	4.5	3.4	<04.0	<04.0	<04.0	5.3	<04.0	<04.0	5.1	<04.0	4.6	1.5	<02.0
Cyanide	QC10-204-00-1-X	mg/L	<0.0020	<0.0020	0.0024	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Hexavalent Chromium	E218.6/SM3500-CR-B	µg/L	0.44	0.33	0.63	0.45	0.55	0.36	0.54	<0.050	0.43	0.62	0.45	0.5	0.54	0.45	<0.30	<0.30	0.56	0.51	0.52	0.54	0.45	0.57	0.47
VOCs																									
1,1,1-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1,2,2-Tetrachloroethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,1,2-Trichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,1-Dichloroethane	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
1,2-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloroethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,2-Dichloropropane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,3-Dichlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
1,4-Dichlorobenzene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
2-Chloroethyl Vinyl Ether	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.30	<0.30	<0.70	<0.70	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.70	<0.70	<0.70	<0.30	<0.30
Acrolein	E624	µg/L	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<2.0	<2.0	<2.0	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<2.0	<0.70	<0.70
Acrylonitrile	E624	µg/L	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<0.40	<0.40	<0.40	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<02.0	<0.40	<02.0	<02.0
Benzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.40	<0.40
Bromodichloromethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.30	<0.30
Bromoform	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.40	<0.40
Bromomethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Carbon Tetrachloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chlorobenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.40	<0.40
Chloroethane	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.30	<0.30
Chloroform	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Chloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
cis-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Dibromochloromethane	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Methylene Chloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.50	<0.40	<0.40
Tetrachloroethene	E624	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.40	<0.40	<0.40	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.40	<0.50	<0.50
Toluene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.40	<0.40
trans-1,2-Dichloroethene	E624	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.40	<0.40	<0.40	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.40	<0.30	<0.30
trans-1,3-Dichloropropene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trichloroethene	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trihalomethanes (total)	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Vinyl Chloride	E624	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
SVOCs																									
Acenaphthene	E625	µg/L						<0.030	<0.030	<0.20	<0.20											<0.030			
Acenaphthylene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.20	<0.20
Acetochlor		µg/L	<0.20	<0.20	<0.20	<0.20	<0.20				<0.94	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		<0.20	<0.20
Anthracene	E625	µg/L	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.030	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.030	<0.090	<0.090
Benzidine	E625	µg/L	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<3.4	<3.4	<0.27	<03.3	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<3.4	<03.0	
Benzo[a]anthracene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.20	<0.20
Benzo[a]pyrene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.20	<0.20
Benzo[b]fluoranthene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.20	<0.20
Benzo[g,h,i]perylene	E625	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.10	<0.10
Benzo[k]fluoranthene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.040	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.040	<0.20	<0.20
Benzyl Alcohol		µg/L									<1.4														
1,1-Biphenyl		µg/L									<0.24														
Bis(2-chloroethoxy)methane	E625	µg/L	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.28	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81
Bis(2-chloroethyl) Ether	E625	µg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.14	<0.30	<0.23	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.14	<0.30	<0.30
Bis(2-chloroisopropyl) Ether		µg/L									<0.26														
Bis(2-ethylhexyl) Adipate		µg/L	<0.83	<0.83	<0.83	<0.83	<0.83				<1.9	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83	<0.83		<0.83	<0.83
Bis(2-ethylhexyl) Phthalate	E625	µg/L	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.83	<0.83	<0.32	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.83	<0.43	<0.43
4-Bromophenyl Phenyl Ether	E625	µg/L	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.43	<0.43	<0.16	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.43	<0.64	<0.64
Butylbenzyl Phthalate	E625	µg/L						<0.64	<0.64	<0.64	<0.27												<0.64		
4-Chloroaniline		µg/L	<0.58	<0.58	<0.58	<0.58	<0.58				<0.31	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58	<0.58		<0.58	<0.58
4-Chloro-3-methylphenol	E625	µg/L	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.58	<0.58	<0.25	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.58	<0.57	<0.57
2-Chloronaphthalene	E625	µg/L	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.57	<0.57	<0.24	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.57	<0.66	<0.66
2-Chlorophenol	E625	µg/L	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.66	<0.66	<0.24	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.93	<0.66	<0.93	<0.93
4-Chlorophenyl-phenylether	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.93	<0.19	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.93	<0.93	<0.20	<0.20	<0.20
Chrysene	E625	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.040	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.040	<0.10	<0.10
Dibenz[a,h]anthracene	E625	µg/L						<0.080	<0.080	<0.10	<0.10												<0.080		
Dibenzofuran		µg/L	<0.91	<0.91	<0.91	<0.91	<0.91				<0.20	<0.91	<0.91	<0.91	<0.91	<0.91	<0.91	<0.91	<0.91	<0.91	<0.91	<0.91		<0.91	<0.91
Di-n-Butyl Phthalate	E625	µg/L						<0.91	<0.91	<0.91	<0.28												<0.91		
1,2-Dichlorobenzene	E625	µg/L						<0.61	<0.61	<0.61	<0.22												<0.61		
1,3-Dichlorobenzene	E625	µg/L						<0.62	<0.62	<0.62	<0.21												<0.62		
1,4-Dichlorobenzene	E625	µg/L						<0.61	<0.61	<0.61	<0.21												<0.61		
3,3-Dichlorobenzidine	E625	µg/L	<03.0	<03.0	<03.0	<03.0	<03.0	<2.0	<2.0	<2.0	<0.13	<02.2	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<03.0	<2.0	<02.0	
2,4-Dichlorophenol	E625	µg/L	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.26	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66
Diethyl Phthalate	E625	µg/L	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86	<0.14	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86
2,4-Dimethylphenol	E625	µg/L	<01.2	<01.2	<01.2	<01.2	<01.2	<1.2	<1.2	<1.2	<0.092	<01.2	<01.2	<01.2	<01.2	<01.2	<01.2	<01.2	<01.2	<01.2	<01.2	<01.2	<1.2	<01.2	<01.2

Location	Method	Unit	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-C	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-D	WMSA-SW-E	WMSA-SW-E	WMSA-SW-E
Sample Date			6/13/2017	9/12/2017	12/12/2017	3/12/2018	6/21/2018	3/3/2016	6/1/2016	9/7/2016	12/1/2016	3/14/2017	6/13/2017	6/13/2017	9/12/2017	9/12/2017	12/12/2017	12/12/2017	3/12/2018	3/12/2018	6/21/2018	6/21/2018	3/14/2016	3/16/2017	6/13/2017
2-Methylnaphthalene		µg/L																						
1-Methylnaphthalene	E625	µg/L									<0.27													
2-Methylphenol	E625	µg/L	<0.64	<0.64	<0.64	<0.64	<0.64		<0.64	<0.64	<0.18	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64		<0.64	<0.64
3&4-Methylphenol		µg/L									<0.18													
Naphthalene	E625	µg/L	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.040	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.090	<0.040	<0.090	<0.090
2-Nitroaniline		µg/L									<1.2													
3-Nitroaniline		µg/L									<1.1													
4-Nitroaniline		µg/L									<1.1													
Nitrobenzene	E625	µg/L	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.30	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74	<0.74
2-Nitrophenol	E625	µg/L	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<1.3	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
4-Nitrophenol	E625	µg/L	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<1.6	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99	<0.99
N-Nitrosodimethylamine	E625	µg/L	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<1.1	<1.1	<0.17	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<01.1	<1.1	<01.1	<01.1
N-Nitroso-di-n-propylamine	E625	µg/L	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.33	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85
Pentachlorophenol	E625	µg/L	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<1.4	<1.4	<0.47	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<01.4	<1.4	<01.4	<01.4
Phenanthrene	E625	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.030	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.030	<0.10	<0.10
Phenol	E625	µg/L	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.32	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46	<0.46
Pyrene	E625	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.030	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.030	<0.20	<0.20
1,2,4-Trichlorobenzene	E625	µg/L	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.21	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59
2,4,5-Trichlorophenol	E625	µg/L						<0.74	<0.74	<0.74	<0.20												<0.74		
2,4,6-Trichlorophenol		µg/L									<0.22														
Bis(2-chloro-1-methylethyl) Ether	E625	µg/L	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41		<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41
N-Nitrosodiphenylamine	E625	µg/L	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90		<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90
TPH																									
TPH-Diesel	SW8015B	µg/L	<050	<050	<050	<050	<050	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<050	<050	<050	<050	<050	<50	<050	<050
TPH-Heavy Oils	SW8015B	µg/L	<0100	<0100	<0100	<0100	<0100	<100	<100	<100	<100	<0100	<0100	<0100	<0100	<0100	<0100	<0100	<0100	<0100	<0100	<0100	<100	<0100	<0100
TPH as Gasoline	SW8260B	µg/L	<050	<050	<050	<050	<050	<50	<50	<50	<50	<050	<050	<050	<050	<050	<050	<050	<050	<050	<050	<050	<50	<050	<050
PCBs & Pesticides																									
4,4-DDD	E608	µg/L	<0.020	<0.020	<0.020		<0.0025	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020			<0.0050	<0.0050	<0.020	<0.020	<0.020
4,4-DDE	E608	µg/L	<0.0040	<0.0040	<0.0040		<0.0020	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040			<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
4,4-DDT	E608	µg/L	<0.0030	<0.0030	<0.0030	0.00061	<0.0015	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.00047		<0.010	<0.0030	<0.0030	<0.0030	<0.0030
Aldrin	E608	µg/L	<0.0020	<0.0020	<0.0020	<0.00028	<0.0010	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.00028		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
alpha-BHC	E608	µg/L	<0.0040	<0.0040	<0.0040		<0.0020	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040			<0.0040	<0.0070	<0.0040	<0.0040	<0.0040
alpha-Endosulfan	E608	µg/L	<0.0040	<0.0040	<0.0040		<0.0020	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040			<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Aroclor 1016	E608	µg/L	<0.080	<0.080	<0.080		<0.040	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080			<0.080	<0.160	<0.080	<0.080	<0.080
Aroclor 1221	E608	µg/L	<0.20	<0.20	<0.20		<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20			<0.20	<0.20	<0.20	<0.20	<0.20
Aroclor 1232	E608	µg/L	<0.10	<0.10	<0.10		<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10			<0.10	<0.10	<0.10	<0.10	<0.10
Aroclor 1242	E608	µg/L	<0.040	<0.040	<0.040		<0.020	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040			<0.040	<0.040	<0.040	<0.040	<0.040
Aroclor 1248	E608	µg/L	<0.060	<0.060	<0.060		<0.030	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060			<0.060	<0.060	<0.060	<0.060	<0.060
Aroclor 1254	E608	µg/L	<0.040	<0.040	<0.040		<0.020	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040			<0.040	<0.040	<0.040	<0.040	<0.040
Aroclor 1260	E608	µg/L	<0.040	<0.040	<0.040		<0.020	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040			<0.040	<0.040	<0.040	<0.040	<0.040
beta-BHC	E608	µg/L	<0.0020	<0.0020	<0.0020		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			<0.0040	<0.0040	<0.0020	<0.0020	<0.0020
beta-Endosulfan	E608	µg/L	<0.0020	<0.0020	<0.0020		<0.0025	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			<0.0050	<0.0050	<0.0020	<0.0020	<0.0020
Chlordane	E608	µg/L	<0.040	<0.040	<0.040		<0.0050	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040			<0.010	<0.010	<0.040	<0.040	<0.040
delta-BHC	E608	µg/L	<0.0020	<0.0020	<0.0020	<0.0014	<0.0010	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0014		<0.011	<0.0020	<0.0020	<0.0020	<0.0020
Dieldrin	E608	µg/L	<0.0050	<0.0050	<0.0050	0.00018	<0.0025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.00029		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Endosulfan Sulfate	E608	µg/L	<0.020	<0.020	<0.020		<0.0015	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020			<0.0030	<0.0030	<0.020	<0.020	<0.020
Endrin	E608	µg/L	<0.0020	<0.0020	<0.0020	<0.00018	<0.0040	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.00018		<0.0080	<0.0080	<0.0020	<0.0020	<0.0020
Endrin Aldehyde	E608	µg/L	<0.0020	<0.0020	<0.0020		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			<0.0098	<0.011	<0.0020	<0.0020	<0.0020
gamma-BHC	E608	µg/L	<0.0040	<0.0040	<0.0040		<0.0020	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040			<0.0040	<0.0057	<0.0040	<0.0040	<0.0040
Heptachlor	E608	µg/L	<0.0030	<0.0030	<0.0030		<0.0025	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030			<0.0050	<0.0050	<0.0030	<0.0030	<0.0030
Heptachlor Epoxide	E608	µg/L	<0.0090	<0.0090	<0.0090		<0.0045	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090	<0.0090			<0.0090	<0.0090	<0.0090	<0.0090	<0.0090
Toxaphene	E608	µg/L	<0.20	<0.20	<0.20		<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20			<0.20	<0.20	<0.20	<0.20	<0.20

Sample	Date	Sample Type	Selenium	pH	Turbidity	Notes
EC-11	3/22/2017	Cover	1.4	7.73	6.78	
EC-11	3/24/2017	Cover	0.98	7.33	2.42	
EC-12	3/6/2016	Cover	4.4			
EC-12	3/7/2016	Cover	3.8			
EC-12	3/11/2016	Cover	1.8			
EC-12	3/13/2016	Cover	1.1			
EC-14	3/6/2016	Cover	3.7			
EC-14	3/7/2016	Cover	2.5			
EC-14	3/11/2016	Cover	2.4			
EC-14	3/13/2016	Cover	1.4			
EC-14	3/24/2017	Cover	1.1	8.41	15.9	
EC-17	3/6/2016	Cover	1.3			
EC-17	3/7/2016	Cover	0.37			
EC-17	3/11/2016	Cover	1.3			
EC-17	3/13/2016	Cover	0.82			
EC-17	3/21/2017	Cover	3.1	9.26	2.56	
EC-17	3/24/2017	Cover	1.2	8.38	6.79	
EC-17	3/1/2018	Cover	3.4	9.20	1.61	
EC-18	3/11/2016	Cover	0.75			
EC-18	3/13/2016	Cover	0.63			
EC-18	3/22/2017	Cover	1.1	7.94	2.55	
EC-19	3/21/2017	Cover	8.3			runoff from above
EC-19	3/24/2017	Cover	2.8			runoff from above
EC-19	3/22/2017	Cover	2.2	7.97	3.27	runoff from above
EC-19	3/24/2017	Cover	4.1	8.56	12.2	
EC-20	3/11/2016	Cover	2.6			less than 1 gpm
EC-20	3/13/2016	Cover	1.2			less than 1 gpm
EC-20	3/21/2017	Cover	2.2	8.04	5.95	
EC-20	3/24/2017	Cover	1.1	8.37	1.93	
EC-20	3/1/2018	Cover	6.0	8.44	5.20	
EC-20	3/16/2018	Cover	4.4	8.86	1.84	
EC-20	4/7/2018	Cover	3.1	8.33	6.72	
EC-21	3/11/2016	Cover	2.9			
EC-21	3/13/2016	Cover	1.5			
EC-21	3/21/2017	Cover	5.3	8.92	2.1	
EC-21	3/24/2017	Cover	1.4	8.02	1.06	
EC-21	4/7/2017	Cover	2.6	8.20	3.19	
EC-21	3/1/2018	Cover	4.6	8.70	1.71	
EC-21	3/16/2018	Cover	6.4	8.75	5.30	
EC-21	4/7/2018	Cover	2.6	8.40	0.52	
EC-22	3/21/2017	Cover	2.5	8.29	15.4	
EC-22	3/24/2017	Cover	0.61	7.82	1.54	
EC-22	3/1/2018	Cover	17	8.33	1.74	result appears anomalous
EC-22	4/7/2018	Cover	1.9	8.33	1.82	
EC-22	3/11/2016	Cover	1.8			
EC-22	3/13/2016	Cover	1.8			
EC-23	3/11/2016	Cover	4.7			
EC-23	3/13/2016	Cover	1.8			
EC-24	3/11/2016	Cover	1.3			
EC-24	3/13/2016	Cover	0.96			
EC-25	3/21/2017	Cover	13	8.56	204	
EC-25	3/24/2017	Cover	3.8	8.13	33.0	
EC-26	3/22/2017	Cover	0.91	8.14	53.4	
EC-26	3/24/2017	Cover	0.89	7.73	93.3	
EC-26	4/7/2017	Cover	2.1	8.24	8.09	
EC-26	3/16/2018	Cover	4.0	8.56	26.8	
EC-26	4/7/2018	Cover	2.7	7.81	14.7	
EC-27	3/22/2017	Cover	2.9	8.00	16.7	
EC-27	3/24/2017	Cover	0.88	7.76	6.40	
EC-27	4/7/2017	Cover	2.0	7.94	4.06	
EC-27	3/1/2018	Cover	3.2	8.51	3.51	
EC-27	3/16/2018	Cover	2.8	8.37	61.7	
EC-27	4/7/2018	Cover	2.7	8.18	1.89	
EC-28	3/24/2017	Cover	2.2	8.13	5.81	
EC-28	4/7/2017	Cover	1.6	8.22	11.6	
EC-29	3/1/2018	Cover	1.1 J	8.28	30.4	
EC-29	3/16/2018	Cover	0.99 J	8.95	14.2	
EC-29	4/7/2018	Cover	0.40 J	8.85	21.3	
EC-30	3/1/2018	Cover	2.7	9.06	3.36	
EC-30	4/7/2018	Cover	1.8	8.65	8.04	
		average	2.5			

Notes:
J = estimated value below laboratory reporting limit

Appendix C

Hydrological Data, Analytical Model Results

HYDROLOGICAL DATA SUMMARY

Precipitation

Precipitation data from 2008 to present were compiled from three sources:

- **Los Altos Hills** – this station was located approximately 3.3 miles northwest of the North Quarry at an elevation of about 2,000 feet amsl. The site collected climate data from 1999 until 2012 when it was discontinued.
- **Lehigh's Onsite Meteorological Station** – this station is located between the North Quarry and the Cement Plant approximately 0.5 miles southeast of the North Quarry at an elevation of 900 feet amsl. This site was established in 2013 and the data were used to supplement the precipitation data from the Los Altos Hills precipitation station (Santa Clara Valley Water District, 2018).
- **Rancho San Antonio Park** – this station is located approximately 0.8 miles to the northwest of the North Quarry at an elevation of about 1,090 feet amsl (Santa Clara Valley Water District, 2018). The station has been collecting climate data since December 2011 and is used to supplement the data from Lehigh's meteorological station.

A water year (WY) is defined from October 1 through September 30 (e.g., WY 2018 is from October 1, 2017 through September 30, 2018). The annual average rainfall over this period of record was 22.5 inches, with an overall range of 11.6 to 42.3 inches.

Monthly Precipitation Table

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
1999	0.61	3.98	1.04	4.56	5.65	3.11	0.7	0.02	0.16	0	0	0.19	20.02
2000	0.23	2.26	0.32	6.84	10.54	1.99	1.26	0.54	0.18	0	0.01	0.06	24.23
2001	3.71	0.76	0.28	5.17	7	2.01	0.73	0	0	0	0	0.12	19.78
2002	0.21	9.15	6.7	1.24	1.59	1.84	0.43	0.85	0	0	0	0	22.01
2003	0	3.83	9.84	0.55	2.75	1.28	5.49	0.58	0	0	0	0	24.32
2004	0.05	2.28	6.33	2.29	5.83	0.53	0.03	0.08	0	0	0	0	17.42
2005	2.55	1.14	6.96	4.88	4	3.24	2	1.26	0.32	0	0	0.05	26.4
2006	0.09	0.41	4.48	3.65	2.51	7.77	4.18	0.59	0	0.03	0	0	23.71
2007	--	--	--	--	--	--	--	--	--	--	--	--	--
2008	--	--	--	--	--	--	--	--	--	--	--	--	--
2009	0.55	2.43	2.27	1.12	10.4	4.32	0.28	0.25	0.04	0	0.1	0.12	21.88
2010	--	--	--	--	--	--	--	--	--	--	--	--	--
2011	--	--	--	--	--	--	--	--	--	--	--	--	--
2012	--	--	--	3.06	1.71	5.16	2.27	0	0.08	0	0	0	--
2013	0.48	6.59	9.77	0.56	0.56	1.24	0.6	0	0.04	0	0.08	0.28	20.2
2014	0	0.48	0.75	0	5.95	2.67	1.16	0	0	0	0	0.6	11.61
2015	0.44	2.24	14.12	0	5.59	0.12	1.67	0.16	0.08	0	0.04	0	24.46
2016	0	2.55	3.99	6.87	1.27	8.29	1.64	0.12	0	0	0	0	24.73
2017	3.61	1.84	3.7	14.17	12.56	3.54	2.84	0	0.08	0	0	0	42.3
2018	0.16	2.52	0.16	4.61	0	5.08	1.65	0	0	0	0	0	14.2
Avg.	**0.8**	**2.8**	**4.7**	**3.7**	**4.9**	**3.3**	**1.7**	**0.3**	**0.1**	**0.0**	**0.0**	**0.1**	**22.5**

Notes:

Precipitation data for WY 1999 to 2009 from Los Altos Hills Station (LSA) – Elevation 2,000 ft amsl
Precipitation data for WY 2012 to 2016 from Lehigh Cement Plant Station – Elevation 900 ft amsl
Precipitation data for WY 2017 and 2018 from Rancho San Antonio County Park (Station 6140) – Elevation 1,090 ft amsl.
--- = no data

Wells and Piezometers

Several wells and piezometers were installed as part of various site assessments since 2008. (Golder 2011, Golder 2015, Stantec 2018). A borehole completion summary is provided below.

Borehole Completion Summary

Well ID	Total Depth (feet bgs)	Ground Elevation (feet msl)	Completion Type	Monitored Elevation or Screen Interval (feet msl)	Lithology at Monitored/Screen Location
Rock Plant Reserve Area/South of Permanente Creek					
GT1-4	268	1,119	VWP	951	Greenstone
GT2-7	477	1,281	VWP	1,010	Limestone/Graywacke
GT3-4	513	1,739	VWP	1,469	Limestone
GT4-25a	392	1,671	VWP	1,394	Limestone
GT2-14	265	1,281	2-inch MW	1,019.5 - 1,039.5	Greenstone
HG-1	590	1,585	2-inch MW	--	Weathered Greenstone
HG-2	560	1,613	VWP	1,256	Limestone/Graywacke
HG-3	460	1,548	VWP	1,178	Limestone/Greenstone
HG-4	300	1,857	2-inch MW	1,562-1,582	Greenstone
HG-5	400	1,615	VWP	1,377	Greenstone
HG-6	400	1,822	2-inch MW	1,549-1,569	Greenstone
HG-7	300	1,254	2-inch MW	1,118-1,138	Greenstone/Graywacke
HG-8	200	1,148	VWP	1,002	Greenstone
HG-9	200	1,245	2-inch MW	1,136-1,156	Weathered Graywacke
HG-10S	580	1,585	2-inch MW	1,431-1,451	Limestone
HG-10int	580	1,585	VWP	1,290	Limestone
HG-10D	580	1,585	VWP	1,090	Limestone
HG-11	600	1,585	6-inch MW	985-1,085	Limestone
WMSA and North Quarry Area					
WMSA-DMW-1S	137	1850	2-inch MW	1713-1723	Greenstone
WMSA-DMW-1D	167	1850	2-inch MW	1683-1693	Greenstone
WMSA-DMW-2	312	1763	2-inch MW	1451-1471	Greenstone
WMSA-DMW-3S	30	1372	2-inch MW	1342-1362	Colluvium
WMSA-DMW-3D	65	1372	2-inch MW	1307-1327	Greenstone
WMSA-DMW-4	117	1857	2-inch MW	1740-1760	Greenstone
WMSA-DMW-5	327	1821	2-inch MW	1494-1514	Greenstone
WMSA-DMW-6	347	1978	2-inch MW	1631-1651	Greenstone
WMSA-DMW-7	95	1615	2-inch MW	1523-1543	Greenstone
WMSA-DMW-8S	30	1288	2-inch MW	1258-1278	Colluvium
WMSA-DMW-8D	65	1288	2-inch MW	1223-1243	Greenstone
WMSA-DMW-9	117	1888	2-inch MW	1771-1791	Greenstone

Well ID	Total Depth (feet bgs)	Ground Elevation (feet msl)	Completion Type	Monitored Elevation or Screen Interval (feet msl)	Lithology at Monitored/Screen Location
WMSA-DMW-10	145	1645	2-inch MW	1525-1545	Greenstone
WMSA-DMW-11A	63	1450	2-inch MW	1395-1410	Greenstone
MS-INC-1S	85	1,790	VWP	1,705	Greenstone
MS-INC-1M	280	1,790	VWP	1,510	Greenstone
MS-INC-1D	480	1,790	VWP	1,310	Greenstone
MS-INC-2	111	1,790	VWP	1,679	Greenstone
WMSA-P6	97	1921	2-inch Piezo	1,824-1,844	Greenstone
EW-07 (destroyed)	350	850	8-inch EW	510-760	Limestone
OW-01S,D (destroyed)	350	850	VWP	725, 570	Limestone

Note: VWPs are vibrating-wire piezometers that are grouted-in place.

Hydraulic Properties

The hydraulic properties of the above geological units were estimated from packer tests conducted in several boreholes and from constant-rate pumping tests conducted in HG-10S in 2009 (Golder, 2011), EW-07 in 2012 (Golder, 2012), and a falling-head test conducted in GT2-14 in 2018. The following table summarizes the hydraulic properties of the geological units based on the analytical results.

Summary of Hydraulic Properties of Geological Units

Geological Unit	Hydraulic Conductivity (ft/day)				Storativity (dimensionless)			
	Number of Tests	Minimum	Maximum	Geometric Mean	Number of Tests	Minimum	Maximum	Geometric Mean
Limestone	14	0.06	6.46	2.3	5	$2.6x10^{-3}$	$9.3x10^{-3}$	$4.9x10^{-3}$
Greenstone	9	5.6×10^{-5}	3.26	0.14	-	-	-	-
Graywacke	2	2.51	29.8	8.64*	-	-	-	-

Note: * Results based on two measurements and are likely biased high due to packer testing discrete fractures in the graywacke; bulk hydraulic conductivity is expected to be lower than limestone (Golder, 2011).

Groundwater Elevations

Since 2008, groundwater elevation data have been collected from wells and piezometers from the North Quarry, WMSA, and the south of Permanente Creek. Water levels were measured with pressure transducer dataloggers and electric water level tapes in the monitoring wells and with Geo-Slope® Miniloggers or VWP data loggers.

Groundwater Elevation Monitoring Summary

Well/Piezometer	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
GT1-4	X	X	X	X	X	X					
GT2-7	X	X	X					X		X	X
GT2-14											X
GT3-4	X	X	X	X	X					X	
GT4-25	X	X	X	X	X					X	X
HG-3	X	X	X							X	X

Well/Piezometer	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
HG-4		X	X							X	X
HG-5	X	X	X							X	X
HG-6		X	X							X	
HG-7		X	X								
HG-8	X	X	X								
HG-9		X	X								
HG-10S		X	X	X	X						
HG-10int		X	X							X	
HG-10d		X	X	X	X					X	
HG-11		X									
WMSA-DMW-1D								X	X	X	X
WMSA-DMW-1S								X	X	X	X
WMSA-DMW-2								X	X	X	X
WMSA-DMW-3D								X	X	X	X
WMSA-DMW-3S								X	X	X	X
WMSA-DMW-4								X	X	X	X
WMSA-DMW-5								X	X	X	X
WMSA-DMW-6								X	X	X	X
WMSA-DMW-7								X	X	X	X
WMSA-DMW-8D								X	X	X	X
WMSA-DMW-8S								X	X	X	X
WMSA-DMW-9								X	X	X	X
WMSA-DMW-10								X	X	X	X
MS-INC-1S		X	X			X	X				X
MS-INC-1M		X	X			X	X				X
MS-INC-ID		X	X			X	X				X
MS-INC-2		X	X			X	X				X

Water Balance Approach

A water balance is an accounting of inflows, outflows and the change in storage volumes within a defined hydrologic system during a specific period, often a Water Year. In this case, the defined hydrologic system is the North Quarry, and the period of the assessment is from October 1, 2017 to September 30, 2018 (WY 2018). The water balance formula is:

$$V_{PRECIP} + V_{RUNOFF} + V_{GW} + V_{POND\ 11} = V_{PIT} + V_{PUMPED} + V_{EVAP}$$

Where:

V_{GW} is the total volume of groundwater entering the quarry

V_{PIT} is the change in volume of the water in the quarry

V_{PUMPED} is the volume of water pumped out of the quarry

V_{PRECIP} is the volume of water from direct precipitation into the quarry

V_{EVAP} is the volume of water lost to evaporation based on the surface area of the quarry water

V_{RUNOFF} is the volume of water from runoff using the catchment area of the quarry

$V_{POND\ 11}$ is the volume of water entering the quarry from Pond 11 starting December 2017

Inflows to the North Quarry during WY 2018 included precipitation, surface water runoff, Pond 11, and groundwater inflow (including seepage); no other water entered into the North Quarry. Outflows from the North Quarry included evaporation from the water surface within the quarry sump and pumping from dewatering activities; there was no overflow of water from the quarry to surface water. Change in storage involved the change in water volume in the quarry lake between October 1, 2017 and September 30, 2018.

Groundwater inflow into the North Quarry was estimated by re-arranging the formula as follows:

$$V_{GW} = V_{PIT} + V_{PUMPED} + V_{EVAP} - V_{PRECIP} - V_{RUNOFF} - V_{POND\ 11}$$

Hydrologic Components Data

The hydrologic components of the water balance are described in detail below.

Precipitation

The volume of water entering the North Quarry during WY 2018 was calculated based on the amount of precipitation that fell directly on the quarry sump. The total amount of precipitation for WY 2018 was 14.2 inches, which is about 7.4 inches below the average annual rainfall over the period of record. WY 2018 was second driest year since 2009 (WY 2014 annual rainfall was 11.6 inches). During WY 2018, the surface area receiving direct precipitation ranged from 136,343 square feet (for a quarry water elevation of 525 feet amsl) to a maximum of 342,344 square feet when the elevation of the quarry water level was about 604 feet amsl.

Surface Runoff

Surface water runoff was estimated based on the precipitation within the catchment area of the North Quarry and using a runoff coefficient based on the NRCS[1] curve number (CN) procedure (NRCS, 2004):

$$Q = \frac{(P - I_a)^2}{(P - I_a - S)}$$

$$S = \frac{1000}{CN} - 10$$

$$I_a = 0.2S$$

Where:

Q is the accumulated runoff in inches.

P is precipitation in inches

[1] Natural Resource Conservation Services

S is the maximum retention factor (inches)

CN is the curve number, a parameter of S

I_a is the initial abstraction (e.g., interception, infiltration, and surface depression storage during initial rainfall event).

I_a is difficult to determine and is typically considered to be equal to 0.2S (NRCS, 2004). A CN of 86 was used for the catchment area of the North Quarry and WMSA (Golder, 2014). The surface water runoff volume was determined by multiplying Q by the catchment area for the North Quarry (390 acres or 16,988,400 ft^2) minus the surface area of the quarry lake.

Pond 11 Discharge

Water from the Cement Plant Reclaim Water System (Pond 11) was discharged to the North Quarry. Daily volumes of water entering the quarry were recorded by Lehigh and provided to Golder in a spreadsheet (communication between Lehigh and Golder, 2018).

Evaporation

Evaporation in the North Quarry was estimated based on the monthly average pan (Class "A") evaporation values for the California Central Coast, Coastal Valleys, and Plains (Golder, 2011). A factor of 0.75 was used to correct for pan effects, which tend to overestimate evaporation rates for water bodies (i.e. lakes) (Ward, 2004).

Monthly Open Water Evaporation (WY 2018)

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Evaporation (inches)	4.3	3.0	2.1	2.5	2.9	4.1	5.1	6.0	6.3	6.8	6.1	5.0

Evaporation was calculated by multiplying the surface area of the pit lake by the corresponding monthly evaporation rate listed in above table.

North Quarry Pumping and Change in North Quarry Water Storage

A plot of daily precipitation and the water level in the North Quarry versus pumping rate for WY 2018 is included in the report. No pumping occurred in October and November 2018. The quarry lake increased from 525 feet amsl to about 565 feet amsl by early December 2018. From December 6, 2018 to January 5, 2018, the quarry lake was pumped intermittently up to about 460 gpm, with an overall average pumping rate of about 200 gpm; the pit lake continued to increase during this period to about 577 feet amsl.

The pumping rate gradually increased to about 950 gpm from mid- to late-January 2018. For most of February 2018, the pumping rate was between about 800 and 950 gpm; during this time, the pit lake decreased from a high of about 590 feet amsl to 570 feet amsl by the end of February. Between early March and early May 2018, the average pumping rate was about 570 gpm, but was more variable with pumping rates ranging from less than 200 gpm to about 1,000 gpm. Seepage of about 200 gpm was observed in the main landslide area of the pit in early March 2018 by Lehigh personnel.

No pumping occurred between May 3 and 13, 2018; during this time, the pit lake level increased to about 604 feet amsl. From May 14 through June 30, 2018, pumping resumed at an overall average rate

of 1,030 gpm. From July 16, 2018 to the October 1, 2018, the pit lake level increased from about 564 to 583 feet amsl while no pumping occurred.

The WY 2018 water balance evaluation predicts about 23% more inflow than outflow based on the available data. The difference in inflow versus outflow plus change in storage is likely attributable to the following:

- The actual precipitation at the North Quarry compared to measured values.
- Variability of surface water runoff within the total catchment area, including the footprint of the North Quarry. Surface water runoff estimates could be affected by depression storage (i.e. ponding) and spatial differences in runoff resulting from variable vegetation density and changes in slope.
- Actual vs predicted evaporation rates. Evaporation is calculated based on assumed monthly averages for the region and could be different based on changes in temperature, solar intensity, and wind speeds.
- The accuracy and completeness of Pond 11 data sent to the North Quarry.
- Quarry water used for dust suppression.
- Actual versus modeled lake volume with depth.

Steady-State Water Balance

The estimated total average annual inflow to the North Quarry at equilibrium is 174 gpm. Total monthly inflows include surface water runoff, groundwater inflows, and evapotranspiration.

Steady State Monthly Summary North Quarry

Month	Surface Water (gpm)	Groundwater (gpm)	Evapotranspiration (gpm)	Total (gpm)
October	127	80	115	92
November	356	80	83	353
December	577	80	56	600
January	352	80	67	365
February	564	80	86	558
March	375	80	110	345
April	193	80	141	132
May	35	80	160	-46
June	7	80	174	-87

July	0	80	182	-102
August	2	80	163	-81
September	11	80	138	-47
		Annual Average		**174**

The following assumptions were made from the estimate:

- **Surface Water Runoff** – Water entering the North Quarry as surface water runoff is based on the surface capture area, monthly precipitation and a surface water runoff coefficient of 0.85. The runoff coefficient and North Quarry catchment area were provided by Chang Consultants (Chang, 2019). A The western portion of the North Quarry catchment area (~35 acres) and the WMSA runoff were not included in the surface water runoff calculation of the North Quarry based on the drainage configuration. Direct precipitation was not included as a water body will not be present.
- **Groundwater Inflow** – Groundwater entering the North Quarry is based on the results of the numerical model. The water balance assumed that groundwater inflow declined over time as groundwater elevations rise within the quarry backfill from 371 gpm to 80 gpm by the time the water table elevation reaches 990 feet amsl.
- **Evapotranspiration** – Evapotranspiration rate based on a percentage of the pan evaporation rate for quarry floor at elevation 990 feet.

Inflow to the Open Pit Case 1 (Pg. 1)
Based on Equations by Marinelli and Niccoli (2000)

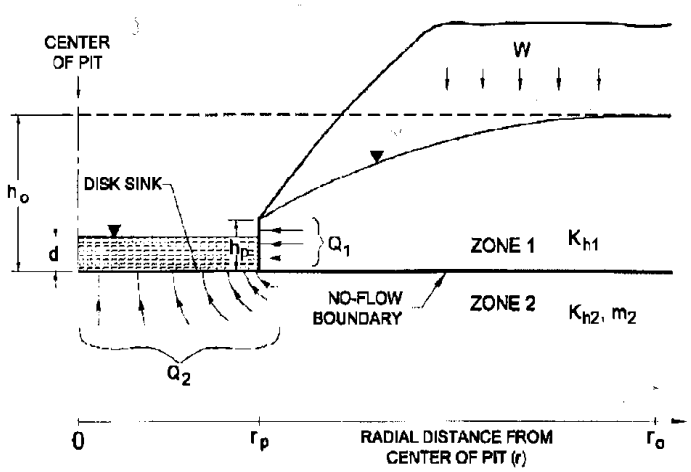


Figure 2. Pit inflow analytical model.

Marinelli, F., and W. L. Niccoli. 2000. Simple analytical equations for estimating ground water inflow to a mine pit. Ground Water 38, no. 2: 311-314.

(A) $$h_0 = \sqrt{h_p^2 + \frac{W}{K_{h1}}\left(r_0^2 ln\left(\frac{r_0}{r_p}\right) - \frac{\left(r_0^2 - r_p^2\right)}{2}\right)}$$

(B) $$Q_1 = W\pi\left(r_0^2 - r_p^2\right)$$

(C) $$Q_2 = 4r_p\left(\frac{K_{h2}}{m_2}\right)(h_0 - d)$$

(D) $$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

Input Parameters

W (ft/s)	5.3E-09	*recharge flux (2 inches/year)*
Kh1 (ft/s)	1.7E-07	*horizontal hydraulic conductivity in Zone 1 (greenstone)*
Kh2 (ft/s)	1.7E-07	*horizontal hydraulic conductivity in Zone 2 (greenstone)*
Kv2 (ft/s)	8.3E-09	*vertical hydraulic conductivity in Zone 2 (1:100)*
ho (ft)	635	*initial saturated thickness above the base of Zone 1*
hp (ft)	160	*saturated thickness at the pit wall*
rp (ft)	250	*effective pit radius*
d (ft)	0.0	*depth of the pit lake*

Inflow to the Open Pit Case 1 (Pg. 2)
Based on Equations by Marinelli and Niccoli (2000)

Inflow from Zone 1

r_o (ft)	**2,547**	radius of influence calculated by iterating equation A

(known h_o)		(ho calculated using eq. A)
635	=	635

Q_1 (ft^3/s)	**0.11**	pit inflow from Zone 1 calculated using equation B
Q_1 (ft^3/day)	**9,215**	
Q_1 (USgpm)	**48**	

Inflow from Zone 2

m_2	**4.5**	anisotropy parameter calculated using equation D

Q_2 (ft^3/s)	**0.02**	pit inflow from Zone 2 calculated using equation C
Q_2 (ft^3/day)	**2,040**	
Q_2 (USgpm)	**11**	

Total Pit Inflow

	Full Pit	Half Pit
Q_T (ft^3/s)	**0.13**	**0.07**
Q_T (ft^3/day)	**11,256**	**5,628**
Q_T (USgpm)	**58**	**29**

Assumptions

Equivalent radius at mid-depth=	**250**	ft
At pit mid-depth of 1200 ft amsl, area is:	**196,350**	ft^2

Inflow to the Open Pit Case 1 (Pg. 1)
Based on Equations by Marinelli and Niccoli (2000)

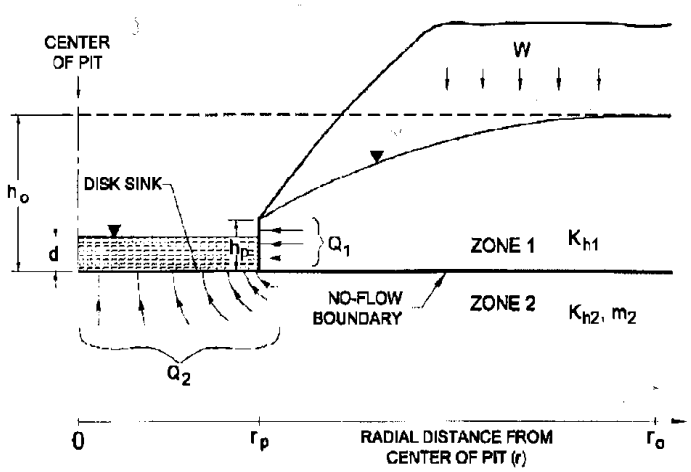


Figure 2. Pit inflow analytical model.

Marinelli, F., and W. L. Niccoli. 2000. Simple analytical equations for estimating ground water inflow to a mine pit. Ground Water 38, no. 2: 311-314.

(A) $$h_0 = \sqrt{h_p^2 + \frac{W}{K_{h1}}\left(r_0^2 ln\left(\frac{r_0}{r_p}\right) - \frac{\left(r_0^2 - r_p^2\right)}{2}\right)}$$

(B) $$Q_1 = W\pi\left(r_0^2 - r_p^2\right)$$

(C) $$Q_2 = 4r_p\left(\frac{K_{h2}}{m_2}\right)(h_0 - d)$$

(D) $$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

Input Parameters

W (ft/s)	2.1E-08	*recharge flux (8 inches/year)*
Kh1 (ft/s)	1.7E-07	*horizontal hydraulic conductivity in Zone 1 (greenstone)*
Kh2 (ft/s)	1.7E-07	*horizontal hydraulic conductivity in Zone 2 (greenstone)*
Kv2 (ft/s)	8.3E-09	*vertical hydraulic conductivity in Zone 2 (1:100)*
ho (ft)	635	*initial saturated thickness above the base of Zone 1*
hp (ft)	160	*saturated thickness at the pit wall*
rp (ft)	250	*effective pit radius*
d (ft)	0.0	*depth of the pit lake*

Inflow to the Open Pit Case 1 (Pg. 2)
Based on Equations by Marinelli and Niccoli (2000)

Inflow from Zone 1

r_o (ft)	**1,504**	radius of influence calculated by iterating equation A

(known h_o)		(ho calculated using eq. A)
635	=	635

Q_1 (ft^3/s)	**0.15**	pit inflow from Zone 1 calculated using equation B
Q_1 (ft^3/day)	**12,627**	
Q_1 (USgpm)	**66**	

Inflow from Zone 2

m_2	**4.5**	anisotropy parameter calculated using equation D

Q_2 (ft^3/s)	**0.02**	pit inflow from Zone 2 calculated using equation C
Q_2 (ft^3/day)	**2,040**	
Q_2 (USgpm)	**11**	

Total Pit Inflow

	Full Pit	Half Pit
Q_T (ft^3/s)	**0.17**	**0.08**
Q_T (ft^3/day)	**14,667**	**7,334**
Q_T (USgpm)	**76**	**38**

Assumptions

Equivalent radius at mid-depth=	**250**	ft
At pit mid-depth of 1200 ft amsl, area is:	**196,350**	ft^2

Appendix D

Mined Material Characterization

Mined Materials Characterization

Mined materials characterization was completed to provide information on acid rock drainage (ARD) potential, chemical and mineralogical composition, and leaching potential via the California modified waste extraction test (WET) with deionized water so that appropriate materials for backfilling purposes could be identified. The work was completed to supplement and confirm the existing geochemical characterization dataset for quarry materials.

A total of 23 samples of clastic sedimentary rock (Santa Clara Formation), graywacke, greenstone, limestone, and top soil from the Site were collected between May and September 2018. Rock and soil samples were collected from archived drill core and grab surface samples were collected from the following areas: North Quarry, haul roads, the EMSA and the WMSA. The surficial sampling locations are shown in Figure D1. The elemental composition, static metal leaching potential, and ARD potential of these materials was determined by Total Threshold Limit Concentration (TTLC), WET, and acid base accounting (ABA) testing methods. Mineralogical composition was analyzed by quantitative X-Ray Diffraction (XRD).

ABA analysis was performed to assess the ARD potential of a material by conducting laboratory testing to simulate the potential for the material to generate acidic conditions overtime. A common approach for assigning an ARD potential to a material, using ABA results, is to apply the neutralization potential ratio (NPR = NP/AP). California has adopted a threshold NPR guideline value of three (3) for a determination of low ARD potential (RWQCB, 2008). All samples reported NPR values of four or greater and are therefore classified as having no ARD potential, which is similar to previous results from 2009 and 2013 (Table D1).

TTLC results are shown on Table D2. For the greenstone and graywacke samples, TTLC selenium was not detected above the laboratory method detection limit; arsenic values ranged from 3.4 milligrams per kilogram (mg/kg) to 18.8 mg/kg; nickel ranged from 24.8 mg/kg to 280 mg/kg; total chromium ranged from 9.23 mg/kg to 304 mg/kg; and vanadium ranged from 11.2 mg/kg to 193 mg/kg. While the arsenic results are above the Commercial/Industrial Direct Exposure Environmental Screening Level (ESL) for soil, they are within the expected background ranges of 11 mg/kg for local flatland geologic environments[1] and 24 mg/kg for local upland areas[2] in the San Francisco Bay Area. The TTLC results for the remaining metals from the greenstone and graywacke samples were at least an order of magnitude less than the Commercial/Industrial Direct Exposure ESL.

WET leach test results are also shown in Table D2. The results of leach tests tend to be sensitive to the methodology used (e.g., solid to solution ratio, nature of the lixiviant, grain size reduction). Therefore, although leach tests provide an estimation of which metals are most likely to leach from a particular material, leachate metal concentrations will exhibit variability related to the specific test methodology used and may not be representative of field scale conditions. The WET test leachate pHs ranged from 7.6 to 9.5. Leach test results are therefore representative of metal leaching under circum-neutral to alkaline conditions. Constituents that are typically mobile under neutral to alkaline pH conditions were detected in the leachates (e.g., antimony, arsenic, molybdenum, and nickel).

[1] Duvergé, Dylan 2011 San Francisco State University. Establishing Background Arsenic in Soil of the Urbanized San Francisco Bay Region.
[2] Lawrence Berkeley National Laboratory and Parsons Engineering Science, Inc (2002), Analysis of Background Distributions of Metals in the Soil at Lawrence Berkeley National Laboratory.

For the greenstone and graywacke samples, selenium results ranged from non-detect to 1.8 micrograms per Liter (µg/L); total chromium ranged from non-detect to 9.9 µg/L; arsenic ranged from estimated value of 0.57 to 7.36 µg/L; molybdenum ranged from non-detect to 3 µg/L; and vanadium ranged from 7.6 to 29.6 µg/L. The WET results were primarily below the Drinking Water ESL; however, vanadium was detected in one sample at 50.2 µg/L, which is slightly above the vanadium Drinking Water ESL of 50 µg/L. Antimony was detected at 8.08 µg/L from the one graywacke sample, which is above the Drinking Water ESL of 6 µg/L. No other leachate results of the greenstone and graywacke were above the Drinking Water ESLs. Two results for vanadium (29.6 and 50.2 µg/L); one result for cobalt (4.86 µg/L); and one result for copper (19.8 µg/L) were above the Freshwater Aquatic Habitat ESLs of 19 µg/L for vanadium, 3 µg/L for cobalt, and 9 µg/L for copper. No other leachate results of the greenstone and graywacke samples were detected above the Freshwater Aquatic Habitat ESLs. The leachate results indicate that greenstone and graywacke are not a significant source of metals to groundwater.

Greenstone samples reported the highest leachate nickel concentrations compared to limestone; however, the concentrations are below ESLs. Molybdenum and selenium leachate concentrations were generally greater in limestone samples compared to the other samples from greenstone and graywacke. Selenium leachate from the limestone was detected up to 8.3 µg/L, which is above the Freshwater Aquatic ESL of 5 µg/L. The results are similar with previous STLC results from 2009 and 2014 and the 2009 wall washing results (Golder, 2011). The selenium data supports the premise that the oxidation of sulfides in the limestone is the primary mechanism of generating leachable selenium.

In addition to the mined material characterization, seeps have been sampled within the North Quarry as part of the Current Reclamation Plan conditions of approval. Seep sample locations are shown on Figure 2.4. Water quality monitoring data for the North Quarry 750-Seep (5 samples between April 2014 and 2018), 850-Seep (11 samples between April 2013 to April 2018), and the 1000-Seep (3 samples between April 2016 and 2018) are summarized in Table D3. The data includes total and dissolved metals as noted on Table D3. The average selenium concentrations were 4.4 µg/L for the 750-Seep, 29 µg/L for 850-Seep, and 8.7 µg/L for the 1000-Seep. The 850-Seep and 1000-Seep emanate from limestone and were typically in range of the North Quarry water while the 750-Seep water quality data is distinct. The 750-Seep emanates from the northwestern portion of the quarry from a non-limestone area that is encompassed with greenstone. The 750-Seep pH was slightly basic (pH 7.7 to 8.6), had TDS in the range of 410 to 870 mg/L, and an ORP value indicative of oxidizing conditions (e.g., 191 millivolts in April 2017). The 2016 through 2018 results from the 750-Seep are below ESLs where the 850 and 1000-Seeps had detections above ESLs (e.g., selenium was detected up to 41 µg/L). The lower concentrations in the 750-seep samples are attributed to its location within greenstone.

From this analysis, the use of greenstone (and minor amounts of graywacke) as a backfill source in any location of the North Quarry, similar to S3 material, is sound and is not expected to negatively affect groundwater or hydrogeologically-connected surface waters.

Appendix D Tables

Acid Base Accounting Results

Sample Identification	Rock Type	Collection Date	Paste pH	Sulfur - Total	Sulfur - Sulfate	Sulfur - Sulfide	Sulfur - Non-Extractable	Total Inorganic Carbon	Neutralization Potential (NP)	Acid Potential (AP)	NNP (NP - AP)	NPR (NP/AP)
			s.u.	wt. %	wt. %	wt. %	wt. %	wt. %	kg $CaCO_3$/t	kg $CaCO_3$/t	kg $CaCO_3$/t	-
CS-01	Top Soil	2009	7.34	0.01	-	-	-	<0.1	23	<0.3	23	>77
Composite # 1	Graywacke	2009	8.00	0.32	0.08	0.12	0.12	-	62	3.8	58	17
Composite # 2	Limestone and Dolomitic Limestone	2009	8.39	0.18	<0.01	0.10	0.13	-	644	3.1	641	206
GT1-2-08-213	Chert	2009	8.17	0.51	0.35	0.07	0.07	-	94	2.2	92	43
Composite # 3	Fault Breccia	2009	8.14	1.41	0.07	0.92	0.42	-	112	29	83	4
Composite # 4	Greenstone	2009	8.63	0.02	0.01	<0.01	0.01	-	205	<0.3	205	>656
Composite # 5	Metabasalt	2009	8.55	0.12	0.01	<0.01	0.17	-	867	<0.3	867	>2,774
SC-1-HAUL ROAD	Clastic Sedimentary Rock	2018	8.00	<0.01	<0.01	<0.01	<0.01	-	23.9	<0.3	24	>76
SC-2-UPPER PAD		2018	7.50	0.01	0.01	<0.01	<0.01	-	48	<0.3	48	>154
SC-3-EMSA		2018	8.00	0.02	0.02	<0.01	<0.01	-	35.3	<0.3	35	>113
GR-1-1025 PIT	Graywacke	2018	8.30	0.12	0.06	0.05	<0.01	-	46.2	1.7	45	27
GEO 2-12 240-250'	Greenstone	2018	8.20	0.16	0.15	0.02	<0.01	-	140	0.6	139	233
GEO 2-12 40-50'		2018	8.20	<0.01	<0.01	<0.01	<0.01	-	854	<0.3	854	>2,733
GEO 2-13 30-40'		2018	8.10	<0.01	<0.01	<0.01	<0.01	-	17.1	<0.3	17	>55
GREEN-1-QUARRY		2018	8.40	<0.01	<0.01	<0.01	<0.01	-	48.5	<0.3	48	155
GREEN-2-WMSA		2018	8.40	0.02	0.02	<0.01	<0.01	-	38.9	<0.3	39	>124
GREEN-3-EMSA		2018	8.10	0.02	0.02	<0.01	<0.01	-	103	<0.3	103	>330
2018-Q800-1 10-20'	Limestone and Dolomitic Limestone	2018	8.60	0.04	0.04	<0.01	<0.01	-	242	<0.3	242	>774
2018-Q800-1 240-250'		2018	8.60	0.14	0.14	<0.01	<0.01	-	531	<0.3	531	>1,699
2018-Q800-1 400-410'		2018	7.90	0.12	0.12	<0.01	0.06	-	919	<0.3	919	>2,941
FINES-1-WMSA		2018	7.40	0.49	0.49	<0.01	<0.01	-	580	<0.3	580	>1,856
GEO 2-12 20-30'		2018	8.60	<0.01	<0.01	<0.01	<0.01	-	756	<0.3	756	>2,419
HGLS-1-UNWEATHERED		2018	8.60	0.03	0.03	<0.01	<0.01	-	927	<0.3	927	>2,966
HGLS-1-WEATHERED		2018	8.30	0.15	0.15	<0.01	0.06	-	922	<0.3	922	>2,950
LGLS-1-UNWEATHERED		2018	8.80	0.12	0.12	<0.01	<0.01	-	661	<0.3	661	>2,115
LGLS-1-WEATHERED		2018	8.30	0.14	0.14	<0.01	0.07	-	941	<0.3	941	>3,011
LS-2-WEATHERED		2018	8.60	0.1	0.1	<0.01	0.04	-	686	<0.3	686	>2,195
SOIL-1-EMSA	Top Soil	2018	7.90	0.03	0.03	<0.01	<0.01	-	33	<0.3	33	>106
SOIL-2-BKGD-1		2018	7.60	0.01	0.01	<0.01	<0.01	-	23.1	<0.3	23	>74
SOIL-3-RIDGE		2018	7.90	<0.01	<0.01	<0.01	<0.01	-	42.3	<0.3	42	>135

TABLE D2
Overburden and Ore - TTLC and STLC Results

Parameter		Unit	2009 Sampling		2018 Sampling		CS-01		Composite 1		Composite 2		GT1-2-08-213		Composite 3		Composite 4		Composite 5		GR-1-1025 Pit		GEO 2-12 20-30'		2018-Q800-1 10-20'		2018-Q800-1 240-250'		2018-Q800-1 400-410'		Fines-1-WMSA		LS-2-Weathered	
							Top Soil		Graywacke		Limestone and Dolomitic Limestone		Chert		Fault Breccia		Greenstone		Metabasalt		Graywacke		Limestone and Dolomitic Limestone		Limestone and Dolomitic Limestone		Limestone and Dolomitic Limestone		Limestone and Dolomitic Limestone		Limestone and Dolomitic Limestone		Limestone and Dolomitic Limestone	
							2009		2009		2009		2009		2009		2009		2009		2018		2018		2018		2018		2018		2018		2018	
			Detection Limit	PQL	Detection Limit	PQL	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]	Result	Q [(b)]
SOLUBLE THRESHOLD LIMIT CONCENTRATION (STLC) ANALYSIS																																		
pH		s.u.	0.05	0.05			7.63	B,H	8.11		8.16		8.27		8.24		8.29		8.36		8.85		9.44		9.25		9.33		8.76		7.95		9.37	
Electrical Conductivity (@ 25°C)		µmhos/cm	1	1			140		160		130		190		160		160		130		-		-		-		-		-		-		-		-	
Total Alkalinity		mg/L as $CaCO_3$	4.1	4.1			70		37		42		49		56		76		46		-		-		-		-		-		-		-	
Aluminum	Al	mg/L	0.038	1			0.1	J	-		-		-		-		-		-		-		-		-		-		-		-		-	
Antimony	Sb	mg/L	0.00017	0.002	0.00023	0.003	0.00029	J	0.0072		0.0015	J	0.0032		0.0058		0.00098	J	0.0085		0.00808		0.00045	J	<0.00023		0.00145	J	0.00278	J	0.00104	J	0.00124	J
Arsenic	As	mg/L	0.00052	0.002	0.00021	0.003	<0.00052		0.003		0.0013	J	0.0012	J	0.0062		0.0027		0.0073		0.00326		<0.00021		0.00229	J	0.00023	J	0.00031	J	0.00024	J	0.00037	J
Barium	Ba	mg/L	0.00012	0.001	0.00031	0.001	0.012		0.059		0.22		0.17		0.12		0.037		0.12		0.0866		0.397		0.304		0.201		0.191		0.0163		0.194	
Beryllium	Be	mg/L	0.00018	0.001	0.000065	0.0002	<0.00018		<0.00018		<0.00018		<0.00018		<0.00018		<0.00018		<0.00018		<0.000065		<0.000065		<0.000065		<0.000065		<0.000065		<0.000065		<0.000065	
Boron	B	mg/L	0.0097	0.1			0.049	J	-		-		-		-		-		-		-		-		-		-		-		-		-	
Cadmium	Cd	mg/L	0.00013	0.001	0.000063	0.0002	<0.00013		<0.00013		<0.00013		<0.00013		<0.00013		<0.00013		<0.00013		<0.000063		<0.000063		<0.000063		<0.000063		<0.000063		<0.000063		<0.000063	
Calcium	Ca	mg/L	0.016	0.1			17		18		16		14		13		17		11		-		-		-		-		-		-		-		-	
Chloride	Cl	mg/L	0.059	0.5			2.3	B	1.6		1.1		1.4		1.3		2		1.3		-		-		-		-		-		-		-		-	
Chromium	Cr	mg/L	0.00055	0.003	0.0002	0.0015	0.00098	J	<0.00055	B	<0.00055	B	<0.00055	B	<0.00055	B	0.0019	B,J	<0.00055	B	0.0002	J	0.0003	J	<0.0002		<0.0002		0.0012	J	<0.0002		<0.0002	
Cobalt	Co	mg/L	0.000033	0.001	0.000027	0.001	0.00012	J	0.00029	J	0.00015	J	0.00025	J	0.00013	J	0.00034	J	0.0001	J	0.000099	J	<0.000027		<0.000027		0.000041	J	<0.000027		0.000096	J	<0.000027	
Copper	Cu	mg/L	0.00068	0.002	0.00036	0.001	0.0025		0.0013	J	<0.00068		0.0012	J	<0.00068		<0.00068		<0.00068		<0.00036		<0.00036		<0.00036		<0.00036		<0.00036		0.00062	J	<0.00036	
Iron	Fe	mg/L	0.0093	0.5			0.16	J	-		-		-		-		-		-		-		-		-		-		-		-		-		-	
Lead	Pb	mg/L	0.000054	0.001	0.00014	0.003	0.000071	J	0.0012		0.00011	J	0.00012	J	<0.000054		<0.000054		0.000092	J	<0.00014		<0.00014		<0.00014		<0.00014		<0.00014		<0.00014		<0.00014	
Magnesium	Mg	mg/L	0.029	0.05			5.5		4.3		4.2		14		6.8		8.3		5.4		-		-		-		-		-		-		-		-	
Manganese	Mn	mg/L	0.00011/0.0025 [(c)]	0.001/0.1 (c)			0.0034	J	0.0052		0.0025		0.0012		0.0075		0.003		0.0031		-		-		-		-		-		-		-		-	
Mercury	Hg	mg/L	0.000016	0.01	0.000076	0.1	0.00019	J	<0.000016		0.00021	J	<0.000016		<0.000016		<0.000016		<0.000016		<0.000076		<0.000076		<0.000076		<0.000076		<0.000076		<0.000076		<0.000076	
Molybdenum	Mo	mg/L	0.00013	0.001	0.000098	0.001	0.00085	J	0.011		0.027		0.012		0.0073		0.0023		0.028		0.00643		0.00191		0.00086	J	0.0146		0.632		0.0305		0.0169	
Nickel	Ni	mg/L	0.00015	0.002	0.0005	0.001	0.002		0.0017	J	0.0017	J	0.0032		0.002		0.0081		0.00089	J	<0.0005		<0.0005		<0.0005		<0.0005		<0.0005		<0.0005		<0.0005	
Potassium	K	mg/L	0.074	1			5.5		3.7		2.8		2		3.9		0.96	J	4.1		-		-		-		-		-		-		-		-	
Selenium	Se	mg/L	0.00038	0.002	0.0002	0.003	<0.00038		<0.00038		0.006		<0.00038		<0.00038		<0.00038		0.00058	J	0.0006	J	<0.0002		0.0007	J	0.0013	J	0.0068		0.0062		0.0017	J
Silver	Ag	mg/L	0.000065	0.001	0.000061	0.0001	<0.000065		<0.000065		<0.000065		<0.000065		<0.000065		<0.000065		<0.000065		<0.000061		<0.000061		<0.000061		<0.000061		<0.000061		<0.000061		<0.000061	
Sodium	Na	mg/L	0.12	0.5			2.6	B	8.8		4		2.7		7.9		5.9		6.6		-		-		-		-		-		-		-		-	
Sulfate	SO4	mg/L	0.21	1			1.3		22		12		29		16		3		8.8		-		-		-		-		-		-		-		-	
Thallium	Tl	mg/L	0.00011	0.001	0.00008	0.001	<0.00011		<0.00011		<0.00011		<0.00011		<0.00011		<0.00011		<0.00011		<0.00008		<0.00008		<0.00008		<0.00008		<0.00008		0.000105	J	<0.00008	
Vanadium	V	mg/L	0.0012	0.003	0.0003	0.003	0.0019	J	0.0015	J	<0.0012		<0.0012		0.012		0.018		0.0049		0.0032		0.0095		0.0353		0.0014	J	0.183		0.0007	J	0.0051	
Zinc	Zn	mg/L	0.0019	0.005	0.0027	0.005	0.0093		0.022		0.0081		0.037		0.011		0.011		0.01		<0.0027		<0.0027		<0.0027		<0.0027		<0.0027		<0.0027		<0.0027	
Dissolved Non-Volatile Organic Carbon		mg/L	0.31	5			8	B	-		-		-		-		-		-		-		-		-		-		-		-		-		-	
TOTAL THRESHOLD LIMIT CONCENTRATION (TTLC) ANALYSIS																																		
Antimony	Sb	mg/kg	1.7 [(a)]	5 [(a)]	0.8	2	3.700	J	<1.7		6.500		5.300		4.200	J	<17		<1.7		1.6	J	<0.8		<0.8		<0.8		<0.8		1	J	<0.8	
Arsenic	As	mg/kg	0.71 [(a)]	1 [(a)]	0.6	2.5	<0.71		5.100		8.400		5.700		2.400		<7.1		4.800		9		17.2		7.1		11.7		19.4		16.3		16	
Barium	Ba	mg/kg	0.13 [(a)]	0.5 [(a)]	0.18	0.2	77.000		60.000		800.000		560.000		180.000		46.000		110.000		218		369		360		246		366		1610		933	
Beryllium	Be	mg/kg	0.026 [(a)]	0.5 [(a)]	0.08	0.2	0.068	J	0.170	J	0.300	J	0.110	J	<0.026		<0.26		0.032	J	0.47		0.23		0.66		0.12	J	0.29		0.44		0.25	
Cadmium	Cd	mg/kg	0.033 [(a)]	0.5 [(a)]	0.06	0.2	0.120	J	0.071	B,J	0.068	B,J	0.150	B,J	<0.033	B	<0.33	B	<0.033	B	0.12	J	2.22		0.3		0.91		4.06		1.61		1.79	
Chromium	Cr	mg/kg	0.045 [(a)]	0.5 [(a)]	0.2	0.6	120.000		95.000		29.000		6.600		260.000		400.000		110.000		95		1.92		157		1.19		8.64		100		20.4	
Cobalt	Co	mg/kg	0.18 [(a)]	2.5 [(a)]	0.07	0.6	29.000		20.000		21.000		8.400		34.000		93.000		26.000		18		1		34.3		1.68		0.34	J	24		4.59	
Copper	Cu	mg/kg	0.13 [(a)]	1 [(a)]	0.16	1	63.000		50.000		56.000		27.000		56.000		45.000		62.000		32.9		7.91		60.9		12.9		19.1		56.8		20.1	
Lead	Pb	mg/kg	0.59 [(a)]	2.5 [(a)]	0.3	0.8	3.400		9.700		6.800		2.000	J	8.300		<5.9		11.000		10		1.3		3		1.1		0.7	J	4.7		3.1	
Molybdenum	Mo	mg/kg	0.18 [(a)]	2.5 [(a)]	0.13	0.8	<0.18		0.220	J	2.300	J	0.740	J	<0.18		<1.8		1.000	J	0.76	J	2.52		0.96		2.47		11.9		5.16		3.41	
Nickel	Ni	mg/kg	0.12 [(a)]	0.5 [(a)]	0.24	1	73.000	B	120.000		120.000		220.000		250.000		1,200.000		100.000		107		6.45		146		5.24		19.3		111		29.3	
Selenium	Se	mg/kg	0.76 [(a)]	1 [(a)]	1.1	4	3.300		10.000		8.500		2.400		15.000		15.000		13.000		<1.1		<1.1		<1.1		<1.1		<1.1		1.8	J	<1.1	
Silver	Ag	mg/kg	0.086 [(a)]	0.5 [(a)]	0.2	0.5	<0.086		<0.086		0.630		<0.086		0.130	J	<0.86		0.160	J	<0.2		1.4		0.73		0.93		1.78		1.08		1.41	
Thallium	Tl	mg/kg	0.94 [(a)]	5 [(a)]	0.4	1.5	<0.94		<0.94		<0.94		<0.94		0.970	J	<9.4		<0.94		<0.4		<0.4		0.5	J	<0.4		0.9	J	<0.4		<0.4	
Vanadium	V	mg/kg	0.062 [(a)]	0.5 [(a)]	0.16	0.5	120.000		64.000		15.000		5.900		75.000		53.000		70.000		54		14		132		0.86		134		68.7		46.2	
Zinc	Zn	mg/kg	0.25 [(a)]	2.5 [(a)]	0.3	1	51.000	B	250.000	B	67.000	B	150.000	B	75.000	B	64.000	B	71.000	B	63.4		20.8		64.5		10.5		110		95.4		40	
Mercury	Hg	mg/kg	0.014	0.16	0.011	0.033	0.078	J	0.033	J	0.150	J	<0.014		0.053	J	<0.014		<0.014		0.093		0.047		0.084		0.078		0.123		0.44		0.123	

Notes:
PQL - practical quantitation limit
[(a)] 'Composite 4 Greenstone' sample detection limit or PQL is 10x higher (raised due to matrix interference).
[(b)] Laboratory qualifiers:
B - detected in method blank
J - estimated value
H - holding time exceeded
[(c)] Higher MDL and PQL for CS-01 sample.

TABLE D2
Overburden and Ore - TTLC and STLC Results

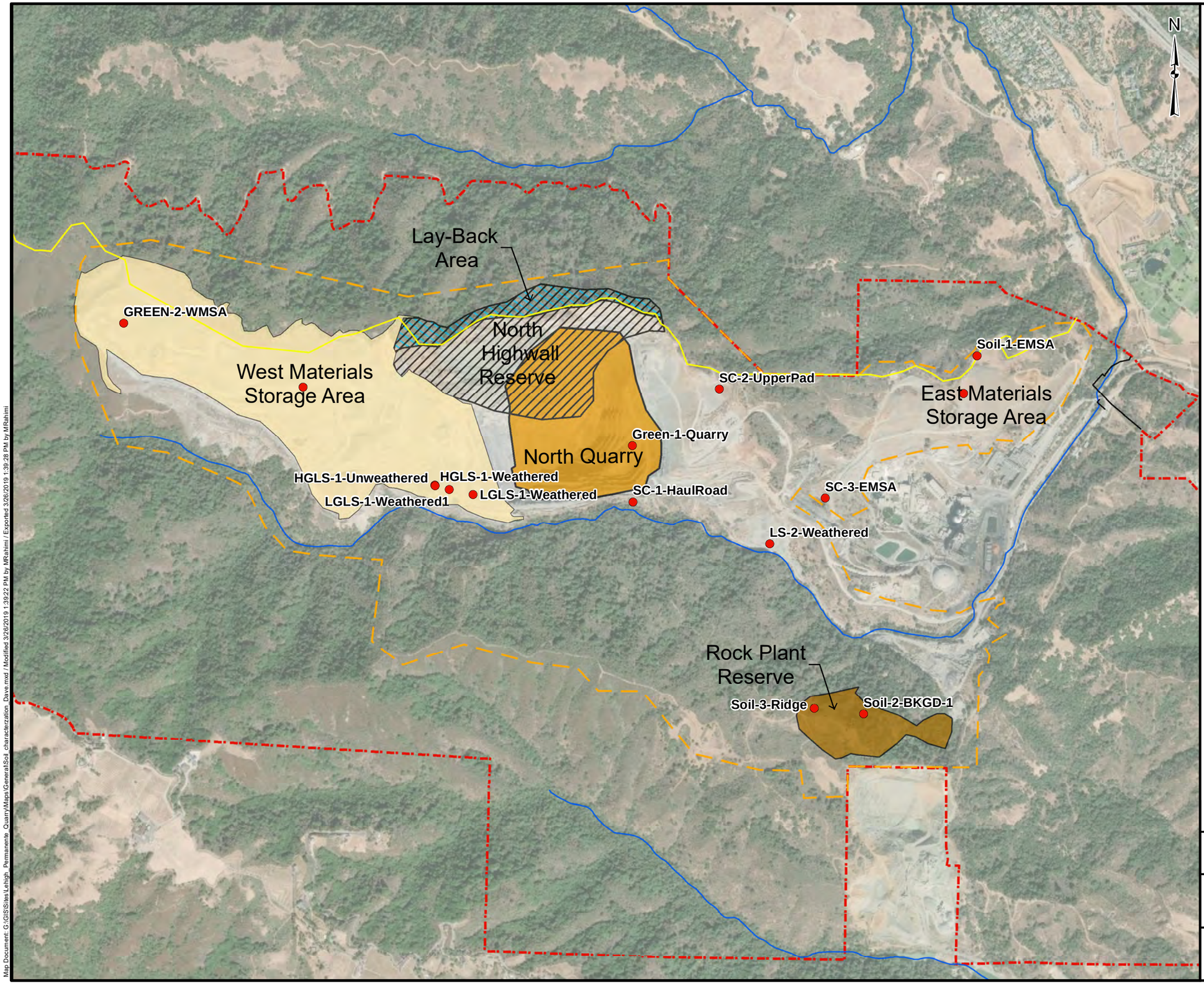
Parameter		Unit	HGLS-1-WEATHERED		HGLS-1-UNWEATHERED		LGLS-1-WEATHERED		LGLS-1-UNWEATHERED		GEO 2-12 40-50'		GEO 2-12 240-250'		GEO 2-13 30-40'		Green-1-Quarry		Green-2-WMSA		Gree-3-EMSA		SOIL-1-EMSA		SOIL-2-BKGD-1		SOIL-3-RIDGE		SC-1-HAUL ROAD		SC-2-UPPER PAD		SC-3-EMSA	
			Limestone and Dolomitic Limestone		Limestone and Dolomitic Limestone		Limestone and Dolomitic Limestone		Limestone and Dolomitic Limestone		Limestone and Dolomitic Limestone		Greenstone		Greenstone		Greenstone		Greenstone		Greenstone		Topsoil		Topsoil		Topsoil		Clastic Sedimentary Rock		Clastic Sedimentary Rock		Clastic Sedimentary Rock	
			2018		2018		2018		2018		2018		2018		2018		2018		2018		2018		2018		2018		2018		2018		2018		2018	
			Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]	Result	Q [b]
SOLUBLE THRESHOLD LIMIT CONCENTRATIO																																		
pH		s.u.	8.92		9.34		8.8		9.5		8.95		8.98		9.18		8.94		-		-		-		-		8.57		-		-		9.44	
Electrical Conductivity (@ 25°C)		µmhos/cm	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Total Alkalinity		mg/L as $CaCO_3$	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Aluminum	Al	mg/L	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Antimony	Sb	mg/L	0.00358		0.00093	J	0.00415		0.00115	J	0.00023	J	0.00513		<0.00023		0.00032	J	-		-		-		-		<0.00023		-		-		0.0003	J
Arsenic	As	mg/L	0.00037	J	0.00062	J	0.00029	J	0.00021	J	0.0016	J	0.00736		0.00057	J	0.00079	J	-		-		-		-		0.00099	J	-		-		0.00421	
Barium	Ba	mg/L	0.123		0.48		0.0698		0.353		0.0177		0.187		0.0141		0.36		-		-		-		-		0.00245		-		-		0.00915	
Beryllium	Be	mg/L	<0.000065		<0.000065		<0.000065		<0.000065		<0.000065		<0.000065		<0.000065		<0.000065		-		-		-		-		<0.000065		-		-		<0.000065	
Boron	B	mg/L	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Cadmium	Cd	mg/L	<0.000063		<0.000063		<0.000063		<0.000063		<0.000063		<0.000063		<0.000063		<0.000063		-		-		-		-		<0.000063		-		-		<0.000063	
Calcium	Ca	mg/L	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Chloride	Cl	mg/L	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Chromium	Cr	mg/L	<0.0002		<0.0002		0.0002	J	<0.0002		0.0003	J	<0.0002		0.0099		0.001	J	-		-		-		-		0.0015		-		-		0.0028	
Cobalt	Co	mg/L	<0.000027		<0.000027		<0.000027		<0.000027		<0.000027		<0.000027		0.00486		0.00013	J	-		-		-		-		0.00011	J	-		-		0.000033	J
Copper	Cu	mg/L	0.00207		<0.00036		<0.00036		<0.00036		<0.00036		<0.00036		0.0198		<0.00036		-		-		-		-		0.00265		-		-		0.00206	
Iron	Fe	mg/L	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Lead	Pb	mg/L	<0.00014		<0.00014		<0.00014		<0.00014		<0.00014		<0.00014		0.00015	J	<0.00014		-		-		-		-		<0.00014		-		-		<0.00014	
Magnesium	Mg	mg/L	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Manganese	Mn	mg/L	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Mercury	Hg	mg/L	<0.000076		<0.000076		<0.000076		<0.000076		<0.000076		<0.000076		<0.000076		<0.000076		-		-		-		-		<0.000076		-		-		<0.000076	
Molybdenum	Mo	mg/L	0.197		0.0161		0.271		0.00316		0.00095	J	0.0138		0.00263		0.00028	J	-		-		-		-		0.00655		-		-		0.0679	
Nickel	Ni	mg/L	0.0013		<0.0005		0.0005	J	<0.0005		<0.0005		<0.0005		0.0065		0.0007	J	-		-		-		-		0.0013		-		-		<0.0005	
Potassium	K	mg/L	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Selenium	Se	mg/L	0.0051		0.0003	J	0.0083		0.0003	J	<0.0002		0.0018	J	0.0004	J	<0.0002		-		-		-		-		0.0003	J	-		-		0.0019	J
Silver	Ag	mg/L	<0.000061		<0.000061		<0.000061		<0.000061		<0.000061		<0.000061		<0.000061		<0.000061		-		-		-		-		<0.000061		-		-		<0.000061	
Sodium	Na	mg/L	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Sulfate	SO4	mg/L	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
Thallium	Tl	mg/L	<0.00008		<0.00008		<0.00008		<0.00008		<0.00008		<0.00008		<0.00008		<0.00008		-		-		-		-		<0.00008		-		-		<0.00008	
Vanadium	V	mg/L	0.0136		0.0057		0.0303		<0.0003		0.0076		0.0173		0.0296		0.0502		-		-		-		-		0.004		-		-		0.0216	
Zinc	Zn	mg/L	0.0029	J	<0.0027		<0.0027		<0.0027		<0.0027		<0.0027		0.0116		<0.0027		-		-		-		-		<0.0027		-		-		<0.0027	
Dissolved Non-Volatile Organic Carbon		mg/L	-		-		-		-		-		-		-		-		-		-		-		-				-		-		-	
TOTAL THRESHOLD LIMIT CONCENTRATION (T																																		
Antimony	Sb	mg/kg	<0.8		<0.8		<0.8		<0.8		<0.8		<0.8		1.2	J	3.5		2.7		1.8	J	<0.8		1.6	J	1.4	J	<0.8		1.3	J	1.7	J
Arsenic	As	mg/kg	19.7		18.9		19.3		15.5		18.8		9.9		4.2		3.4		3.5		5.2		5		4.6		2.8		4.4		5.6		8.5	
Barium	Ba	mg/kg	825		1560		218		1170		151		163		41.4		233		311		157		392		111		59.1		73.6		986		1450	
Beryllium	Be	mg/kg	0.24		0.25		0.28		0.21		0.35		0.42		0.45		0.53		0.35		0.26		0.55		0.75		0.53		0.28		0.46		0.61	
Cadmium	Cd	mg/kg	3.5		1.65		3.31		1.27		1.9		0.57		<0.06		<0.06		0.11	J	0.1	J	3.11		1.49		0.47		<0.06		0.23		0.29	
Chromium	Cr	mg/kg	6.17		4.67		10.1		3.5		9.23		84.1		39.8		214		304		126		19.7		31.8		297		59.4		14.1		25.1	
Cobalt	Co	mg/kg	0.63		1.95		0.68		2.81		5.77		18		38.2		47.2		39.3		44.9		6.25		43		42.3		37.8		18.6		33.9	
Copper	Cu	mg/kg	18.9		8.95		18.2		12.7		16.6		39.5		109		70.2		104		117		19.4		117		128		153		107		137	
Lead	Pb	mg/kg	1.8		1.4		1.4		1.9		2.5		8.3		2.6		2.4		2.9		2.5		23.2		8.7		4.5		2.6		10.5		16.1	
Molybdenum	Mo	mg/kg	8.21		3.57		10.1		2.25		2.42		1.01		0.46	J	0.18	J	0.37	J	0.7	J	0.47	J	0.28	J	0.19	J	0.46	J	3.99		6.79	
Nickel	Ni	mg/kg	17.6		8.23		22.3		11.2		24.8		131		40.4		280		198		147		19		48.2		118		56.6		62.8		81.5	
Selenium	Se	mg/kg	1.4	J	<1.1		2.2	J	<1.1		<1.1		<1.1		<1.1		<1.1		<1.1		<1.1		<1.1		<1.1		<1.1		<1.1		<1.1		<1.1	
Silver	Ag	mg/kg	1.74		1.55		1.82		1.17		1.33		0.29	J	0.38	J	<0.2		0.41	J	0.41	J	0.36	J	0.36	J	0.35	J	0.23	J	<0.2		<0.2	
Thallium	Tl	mg/kg	0.6	J	<0.4		0.7	J	<0.4		0.4	J	0.5	J	0.5	J	0.7	J	0.7	J	1	J	0.5	J	1.5		1.7		1.3	J	<0.4		<0.4	
Vanadium	V	mg/kg	76.7		10.9		117		1.74		11.2		51.4		176		72.1		193		125		33		211		206		140		35.6		43.9	
Zinc	Zn	mg/kg	85.1		11.7		66.1		11.3		34		66.3		98.1		92.7		73.8		72.3		60.1		106		82		83.8		66		82.6	
Mercury	Hg	mg/kg	0.212		0.03	J	0.207		0.108		0.045		0.057		0.052		0.064		0.042		0.056		0.161		0.238		0.045		0.022	J	0.046		0.083	

Notes:
PQL - practical quantitation limit
[a] 'Composite 4 Greenstone' sample detection limit or PQL is 10x higher (raised due to matrix interference).
[b] Laboratory qualifiers:
B - detected in method blank
J - estimated value
H - holding time exceeded
[c] Higher MDL and PQL for CS-01 sample.

Location	Units	750-Seep					850-Seep											1000-Seep		
Date		4/28/2014	4/29/2015	4/28/2016	4/25/2017	4/15/2018	4/10/2013	4/17/2013	4/30/2013	5/3/2013	5/23/2013	6/10/2013	4/28/2014	4/29/2015	4/28/2016	4/25/2017	4/9/2018	4/28/2016	4/25/2017	4/9/2018
Type		Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Total	Total	Total	Total	Total	Total	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved
Metals																				
Antimony (Sb)	µg/L	0.50 J	0.87 J	0.58 J	0.28 J	0.61	3.5	3.8	3.6	3.5	3.5	3.8	3	2.9	2.6	3.1	2.9	7.1	3.3	0.15
Arsenic (As)	µg/L	7.8	1.9 J	6.9	5.4	4.9	0.94	1.3	0.71	0.79	1.1	0.65	2.6	1.4 J	2.7	2.5	2.2	4.5	6.3	0.94
Barium (Ba)	µg/L	85	73				33	35	34	34	39	35	32	32						
Beryllium (Be)	µg/L	ND	ND	<0.050	<0.05	0.057	<0.1	<0.10	<0.020	<0.10	<0.10	<0.10	ND	ND	<0.050	<0.05	0.059	<0.050	<0.05	0.12
Cadmium (Cd)	µg/L	ND	ND	<0.034	0.083 J	0.067	0.81	0.8	0.72	0.82	0.78	0.75	0.71 J	0.86 J	0.037 J	1.0	1.0	0.048 J	<1.0	0.043
Chromium (Cr)	µg/L	ND	2.4 J	<0.15	<0.15	0.15	<0.5	<0.50	<0.080	0.63	0.8	<0.50	ND	1.7 J	<0.15	0.38 J	0.15	<0.15	<0.15	0.15
Cobalt (Co)	µg/L	0.046 J	0.083 J				0.45	0.57	0.49	0.39	0.44	0.35	0.28 J	0.17 J						
Copper (Cu)	µg/L	3.8	3.8	13	2.9	2.8	1.2	1.3	1.7	1.3	1.8	1.2	2.1	2.4	16	5.1	11	12	1.2 J	9.6
Iron (Fe)	µg/L						54	74		<50		<50								
Lead (Pb)	µg/L	ND	ND	<0.021	<0.021	0.024	<0.25	<0.25	<0.020	<0.25	<0.25	<0.25	ND	ND	<0.021	<0.021	0.047	<0.021	<0.021	0.031
Mercury (Hg)	µg/L	ND	ND	<0.030	<0.030	0.029	<1.0	<1.0	<0.1	<1.0	<1.0	<1.0	ND	ND	<0.030	<0.030	0.029	<0.030	<0.030	0.029
Molybdenum (Mo)	µg/L	130	39				110	110	110	110	110	99	120	130						
Nickel (Ni)	µg/L	2.7	3.1	4.3	6.2	12	48	63	58	47	51	51	65	53	37	60	55	10	2	5.6
Selenium (Se)	µg/L	7.7	5.6	3.9	1.7 J	3.2	26	26	24	21	22	21	34	29	34	41	41	2.3	0.71	23
Silver (Ag)	µg/L	ND	0.026 J	<0.015	<0.015	0.015	<0.1	<0.10	<0.020	<0.10	<0.10	<0.10	ND	ND	<0.015	<0.015	0.015	<0.015	<0.015	0.015
Thallium (Tl)	µg/L	ND	ND	<0.025	<0.025	0.025	0.17	0.15	0.16	0.17	0.15	0.17	0.056 J	0.18 J	0.086 J	0.17 J	0.2	0.035 J	<0.025	0.025
Vanadium (V)	µg/L	220	58				140	140	150	140	140	140	120	120						
Zinc (Zn)	µg/L	ND	ND	4.8 J	<2.2	2.5	110	120	120	110	120	110	140	130	34	170	150	7.6	5.8	8
General Chemistry																				
Calcium (Ca)	mg/L	24	32	22	34	23		160	140	160	160	160	190	190	190	200	160	160	44	190
Magnesium (Mg)	mg/L	6.9	7.3	6.0	8.7	6		51	49	55	53	51	62	65	63	69	54	91	47	77
Sodium (Na)	mg/L	270	59	240	190	180							20	22	22	23	19	39	25	35
Potassium (K)	mg/L	2.1	1.8	1.8	1.5	1.6							1.1	1.6	1.9	2.1	1.6	2.1	1.8	1.5
Bicarbonate	mg/L	190	71	190	190	190							270	280	230	270	270	270	170	210
Chloride	mg/L	16	2.4	7.6	5.6	7.2							16	17	15	16	17	130	18	34
Fluoride	mg/L	ND	0.091	0.086	0.042 J	0.057							ND	0.13	0.076	0.089	0.11	0.27	0.16	0.38
Sulfate	mg/L	430	170	350	290	300							500	490	460	470	450	330	150	690
Hardness (as $CaCO_3$)	mg/L	89	110	79	120	82		586	558	628	616	603	740	750	720	790	630	780	300	800
Total Dissolved Solids (TDS)	mg/L	860	410	870	760	840	900	900	1,000	980	930	970	980	1000	870	980	1000	940	440	1300
Total Suspended Solids (TSS)	mg/L	ND	25	27	560	4800	<1	250	1	1.2	1.6	2.5	28	1.3	6.8	1.1	1	<0.83	<0.71	17
Nitrate (as NO_3)	mg/L-NO_3	2.9	ND	2.4	0.51	1.4							1.2	2.9	8.9	22	9.9	0.21 J	4.3	8.7
pH	s.u.	7.74	8.44	8.48	8.26	8.59			7.36		7.13	7.32	7.6	7	8.17	7.32	7.93	8.93	8.30	7.67
Specific Conductance	µmhos/cm	1418	478	1172	924	1,041			1,120		1,145	1,090	769	1256	1203	1,248	1,991	1427	619	1,548
ORP	mV	109.8	68.6	242.8	191.3				145.8		115.1	125.7	83.7	79.7	244.2	97.4		270.2	104.6	
Dissolved Oxygen	mg/L	7.9	6.82	4.13	8.92				7.56		10.01	6.63	9.23	10.14	4.59	7.73	8.06	6.35	7.55	8.06
Turbidity	NTU	272	9.12	45.2	81	3000			2.93		4	1.9	3.81	0.42	1.89	0.28	9.35	0.30	20.7	4.94
Temperature	°C	23.1	25.67	22.72	16.15	23.54			18.29		15.68	19.33	18.41	16.91	17.54	16.37	22.12	16.46	17.48	18.21
Estimated Flow Rate (GPM)		Less than 1	Less than 1	2	5	1							100	350	300			10		

Notes:
J = estimated value

Appendix D Figures



LEGEND

- Sample Location
- Amended Reclamation Boundary
- Final Permanente Ridge
- Assessor's Parcel Boundary
- Rock Plant Reserve (±31 acres)
- North Highwasll Reserve (+101 acres)
- Lay-Back Area (±20 acres)
- North Quarry Backfill (± 93 acres)
- West Materials Storage (WMSA) (±218 acres)
- Property Boundary

REFERENCES

1) USGS 1/9th Arc NED DEM based off of 2006 LIDAR Survey
2) Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
3) Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
4) Former Ridgecrest created from 1952 Cupertino and 1955 Mindego Hills Quadrangle USGS Topographic Maps.

1,200 0 1,200 Feet

1 in = 1,300 feet

PROJECT

PERMANENTE QUARRY
SANTA CLARA COUNTY, CA

TITLE

GEOCHEMICAL CHARACTERIZATION SAMPLING

GOLDER

PROJECT No.		063-7109-914	FILE No.	Soil_characterzation_Dave.mxd
DESIGN	MM	4/2/2013	SCALE: 1:15,600	REV. 0
GIS	MR	3/26/2019		
CHECK	GW	3/26/2019		
REVIEW	GW	3/26/2019		

FIGURE D1

Map Document: G:\GIS\Sites\Lehigh Permanente Quarry\Maps\General\Soil characterzation Dave.mxd / Modified 3/26/2019 1:39:22 PM by MRahimi / Exported 3/26/2019 1:39:28 PM by MRahimi

Appendix E

WMSA Characterization

WMSA Characterization

WMSA Overburden Materials

A materials characterization report was prepared for the WMSA by SLR (formerly SES) (SLR, 2014) based on a program approved by the Water Board that included advancing borings in the WMSA. Of the 992 feet of total drilling footage in the WMSA, the proportions of each lithology encountered were: 66% greenstone; 23% limestone; 9% rock plant fines (byproduct of aggregate processing – low-grade limestone); and 1% chert.

Field observations and laboratory analysis of samples collected from the WMSA demonstrate that, consistent with the samples collected from within the North Quarry, the materials stored in the WMSA are classified as having no acid rock drainage (ARD) potential. Some detections of extractable concentrations of selenium, arsenic, mercury, and vanadium in the soil/material exceeded groundwater or aquatic habitat ESLs. Extractable concentrations of selenium was detected up to 1.5 µg/L in greenstone and 15 µg/L in limestone-containing material (rock plant fines). SLR found that the moisture properties observed in the WMSA were generally dry to slightly damp. Based on field observations, SLR suggested that little or no infiltration occurred through these areas, and the flow of water from the WMSA to underlying native material and groundwater was expected to be minimal.

Storm Water Runoff Characterizations

Storm-related runoff and seepage samples from the WMSA were collected during three storm events over the 2013/2014 rainy season to evaluate storm-related runoff and seepage water quality from the WMSA (Golder, 2014). The work was completed prior to the completion of any reclamation activities. The dissolved selenium concentrations in WMSA runoff samples ranged from an estimated value of 0.7 µg/L to 30 µg/L. For the seepage samples, dissolved selenium concentrations ranged from 14 µg/L to 16 µg/L. The total and dissolved selenium concentrations were similar for the runoff samples, indicating that selenium is primarily present in the dissolved phase. This indicates that when WMSA material is exposed to both water and oxygen in an uncontrolled environment, the leaching of constituents of concern, such as selenium, increases, to potentially levels above surface water quality requirements. Use of WMSA material as a backfill source must consider this circumstance such that the material is efficiently saturated (thus promoting reducing conditions) or placed within a North Quarry location where the migration of water is not expected to create impacts. The results indicated that monitored petroleum hydrocarbons, VOCs, SVOCs, PCBs, pesticides and cyanide were not present in runoff and seepage samples at detectable concentrations, or concentrations that would exceed water quality objectives.

WMSA Quarterly Groundwater Monitoring Program

Groundwater monitoring wells and surface water sampling sites in the WMSA and Permanente Creek have been sampled quarterly since September 2015 (Golder, 2018) under the Water Board's direction. Monitoring locations are shown in Figure 2.4. Table E1 and Figures E1 through E10 show results for select parameters from September 2015 and June 2018; Appendix B contains comprehensive results. The monitoring wells are located around the perimeter or within the footprint of the WMSA and are screened in the underlying materials. Surface water sampling was conducted at locations in Permanente Creek adjacent to the WMSA.

The following summarizes the key findings from the groundwater monitoring program, along with other data relevant to the proposed change to the backfilling of the North Quarry described above:

- Twelve quarterly sampling events have been completed up to second quarter 2018. The COCs detected are related to metals where limited detections of organics have occurred in the WMSA. Of the metals, results indicate that selenium is the primary COC and is predominately in the dissolved phase.

- Of the 14 monitoring wells in the WMSA, WMSA-DMW-2 (prior to redevelopment in 2015), -3S, -4, and -11 had detections of selenium above 5 µg/L. Well WMSA-DMW-3S, located by Permanente Creek, appears to be seasonally influenced as it exhibits the highest concentrations in March and June each year. The selenium concentrations in WMSA-DMW-3S have decreased from 2016 to 2018. Wells WMSA-DMW-4 and -11 are within the WMSA unit (see below for further discussion). The other wells within the WMSA continue to show low level detections of selenium less than 5 µg/L, including the three deeper WMSA wells (WMSA-DMW-1D, -4D, and -8D).

- Under average flow conditions, Permanente Creek is gaining by the upper parts of the WMSA and losing along the segment adjacent to the North Quarry. Dissolved selenium in the quarterly WMSA surface water samples ranged from non-detect to 14 µg/L with the more elevated level likely due to legacy issues that will continue to be addressed under the WDRs to mitigate concentrations.

- The quarterly groundwater data supports SLR's 2014 conclusion that little or no infiltration occurs through the WMSA to underlying native material and groundwater. However, some areas where elevated concentrations of selenium are detected (*e.g.,* WMSA-DMW-4, -11), are at/near areas that are more newly placed or where disturbance of limestone-containing material has occurred for facility operations/ management. These disturbed areas also coincide to areas where the thickness of the unsaturated zone is less compared to the main portions of the WMSA. The combination of the disturbed material and limited unsaturated zone is leading to increase mobility of selenium to groundwater when the material undergoes wet-dry cycles.

This expanded body of data permits a more refined assessment of the water quality effects associated with backfilling the North Quarry solely using WMSA material. The WMSA is composed primarily of overburden rock (e.g., greenstone and graywacke); however, the stockpiles also contain some limestone. It appears that selenium occurs in association with sulfides present in the limestone and is released following sulfide oxidation. WMSA materials in their present state do not appear to be significantly affecting groundwater quality, based on post-2012 investigations and monitoring. Data collected since shows that the WMSA was placed at grade (thus, not in direct contact with groundwater), and the overburden is largely dry. Much of the material has been buried at depth for many years and is exposed to limited oxygen and appears not to be exposed to the wet-dry cycle that tends to maximize the generation of selenium. While certain areas in more recently disturbed overburden show elevated concentrations of selenium, these areas are localized and can be managed by regrading, removal, or capping to protect water quality.

The WDRs do not expressly permit or prohibit the placement of WMSA material in the North Quarry as backfill; however, it must be demonstrated that any requested backfill activities will not unreasonably affect groundwater and potentially hydrologically connected surface water. The material within the WMSA

contains approximately 32% by volume of limestone-containing material (SES, 2014) and has been designated as a Group B mining waste. When the WMSA material is buried at depth (e.g., in the WMSA or bottom of quarry), it is less likely to be exposed to oxygen and thus becomes less reactive where metals are not anticipated to readily leach into water. This is supported by the existing WMSA groundwater data from the groundwater monitoring program. The thickness of the WMSA also appears to be providing attenuation where infiltrated water is generally not impacting groundwater. However, once exposed to oxygen or oxygenated water, such as by disturbing and bringing WMSA material back to the surface, the material will undergo oxidation, which will cause any sulfides present to react and promote leaching of metals into surrounding water once it is contact with water. A likely example of this process was observed in the groundwater data from monitoring wells located along the eastern portion of the WMSA/western portion of the North Quarry area where the area was recently disturbed and an increase of selenium concentrations in groundwater has been observed. Otherwise, the groundwater quality data from monitoring wells installed otherwise around the WMSA indicates that the WMSA has not substantially impacted groundwater quality.

By implementing the 2012 Reclamation Plan “as approved” there is a greater potential that the backfilling activities will cause the water quality underlying the North Quarry to deteriorate and lead to a more ubiquitous problem. Once backfilling of the North Quarry is completed, materials in the North Quarry will saturate with a combination of groundwater, surface water, and direct precipitation. At various levels within the North Quarry (and at various timeframes), anaerobic conditions will become established in the backfilled materials and mitigate selenium leachate production. Anaerobic conditions may not be achieved in the upper elevations of the backfill, concurrently with groundwater levels reaching equilibrium. Thus, the prudent approach to use of WMSA materials is to use them strategically during the North Quarry backfilling process, if needed, to ensure optimum conditions exist to minimize leaching of constituents, such as selenium.

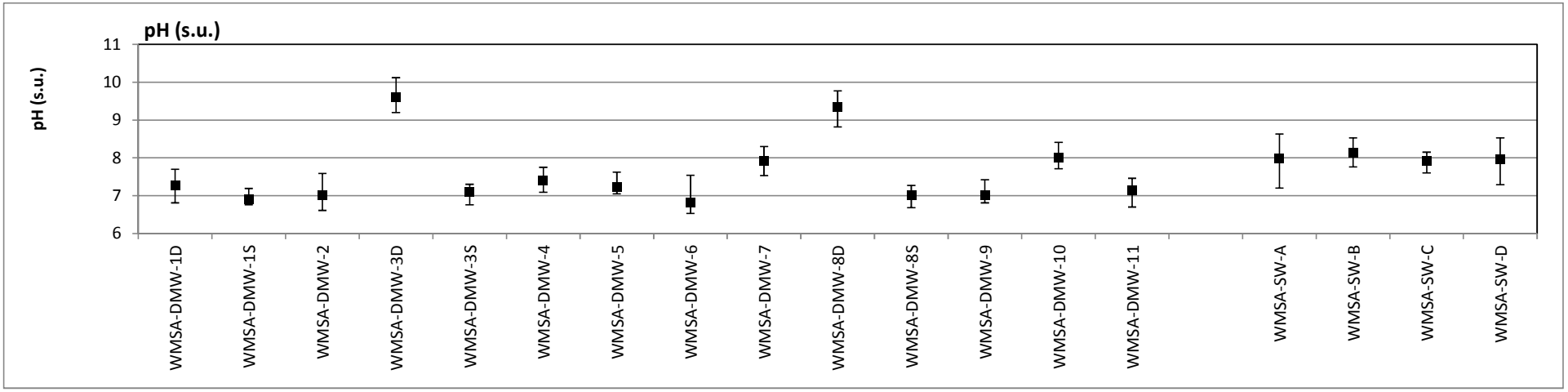
Appendix E Tables

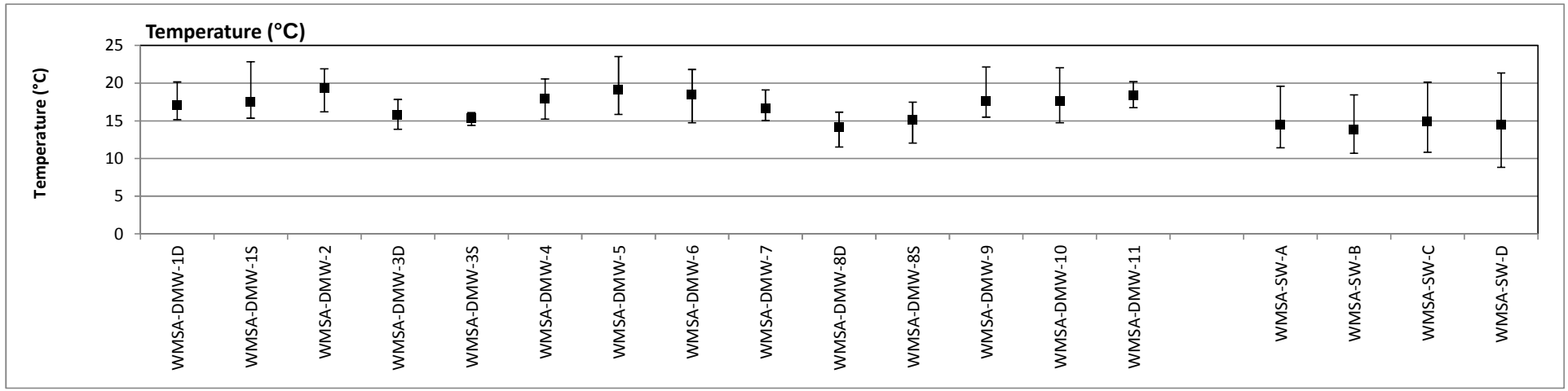
WMSA Water Quality Data Summary - Select Parameters

Monitor Location	No. of Sampling Events	Average Concentrations (a)													
		Hg (D)	Sb (D)	As (D)	Be (D)	Cd (D)	Cr (D)	Cu (D)	Pb (D)	Ni (D)	Se (D)	Ag (D)	Tl (D)	Zn (D)	Cr-VI (D)
		(ng/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
West Materials Storage Area - Groundwater															
WMSA-DMW-1D	12	0.42	0.17	0.89	0.07	0.07	0.52	0.48	0.07	2.53	0.46	0.11	0.08	2.84	0.05
WMSA-DMW-1S	12	0.36	0.21	0.60	0.07	0.10	0.54	0.68	0.07	18.33	0.47	0.11	0.08	3.48	0.05
WMSA-DMW-2	12	6.79	1.52	1.27	0.06	0.07	0.61	1.01	0.07	5.78	3.02	0.12	0.08	259.95	0.05
WMSA-DMW-3D	12	1.27	0.17	0.68	0.05	0.07	0.99	0.97	0.08	0.46	0.44	0.10	0.08	2.49	0.11
WMSA-DMW-3S	12	0.53	0.18	0.54	0.05	0.07	0.51	0.77	0.08	3.70	10.40	0.10	0.08	3.78	0.13
WMSA-DMW-4	12	0.61	0.17	0.73	0.07	0.07	0.75	0.64	0.07	2.77	14.26	0.11	0.08	3.05	0.13
WMSA-DMW-5	12	0.57	0.40	0.90	0.06	0.07	0.48	1.28	0.08	3.94	0.47	0.11	0.08	2.46	0.07
WMSA-DMW-6	12	1.23	0.27	0.96	0.06	0.07	0.83	1.44	0.07	4.37	0.54	0.11	0.08	4.88	0.07
WMSA-DMW-7	12	0.21	0.21	0.98	0.05	0.07	0.53	0.37	0.07	0.57	0.42	0.10	0.08	2.15	0.05
WMSA-DMW-8D	12	1.12	0.19	1.07	0.06	0.07	0.73	1.14	0.08	0.37	0.45	0.11	0.09	2.41	0.05
WMSA-DMW-8S	12	0.51	0.17	0.47	0.06	0.07	0.79	1.03	0.08	2.51	2.74	0.11	0.09	3.30	0.49
WMSA-DMW-9	12	3.19	0.18	0.61	0.07	0.07	0.75	0.70	0.07	2.44	0.78	0.11	0.08	3.04	0.16
WMSA-DMW-10	12	0.30	0.15	2.11	0.05	0.07	0.52	0.47	0.08	0.66	0.42	0.10	0.08	2.31	0.05
WMSA-DMW-11	12	0.39	0.16	0.48	0.05	0.10	0.67	0.52	0.06	2.89	9.59	0.11	0.07	5.04	0.66
West Materials Storage Area - Surface Water															
WMSA-SW-A	12	0.26	0.17	0.48	0.07	0.07	0.81	0.66	0.07	1.06	0.50	0.11	0.08	2.48	0.46
WMSA-SW-B	10	0.23	0.19	0.40	0.06	0.07	0.67	0.52	0.07	1.04	0.44	0.09	0.09	2.26	0.50
WMSA-SW-C	12	0.43	0.17	0.51	0.07	0.07	0.63	0.84	0.08	3.00	5.59	0.11	0.08	4.49	0.40
WMSA-SW-D	10	0.45	0.19	0.42	0.06	0.07	0.57	0.78	0.07	2.22	4.92	0.09	0.09	2.79	0.41

Notes:
(a) Average concentrations presented. Non-detect concentrations assumed equal to the detection limit in calculation of average.
(D) - dissolved phase

Appendix E Figures





LEGEND

Maximum
Average
Minimum

CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
PERMANENTE
QUARRY

TITLE
WMSA Water Quality
pH and Temperature

PROJECT NO.	CONTROL	REV.	FIGURE
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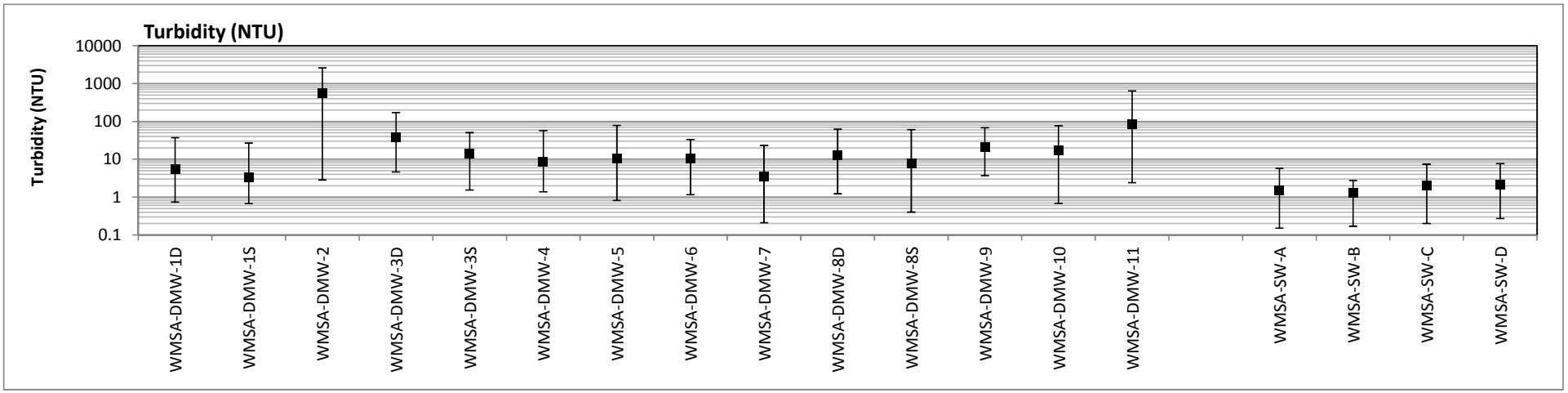

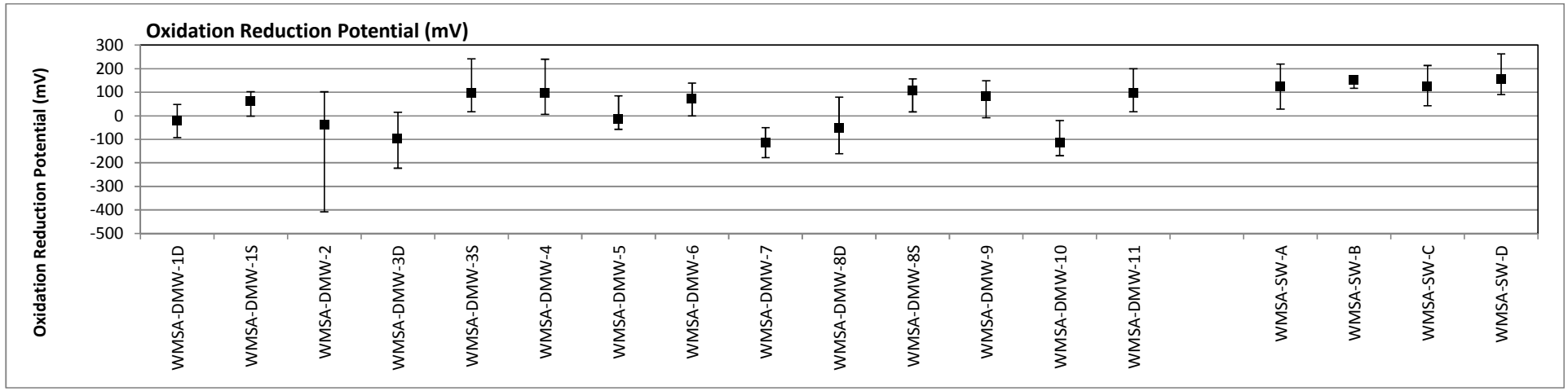

LEGEND

Maximum
Average
Minimum

CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
PERMANENTE
QUARRY

TITLE
WMSA Water Quality
Turbidity and ORP

PROJECT NO.	CONTROL	REV.	FIGURE
18104578		A	E2

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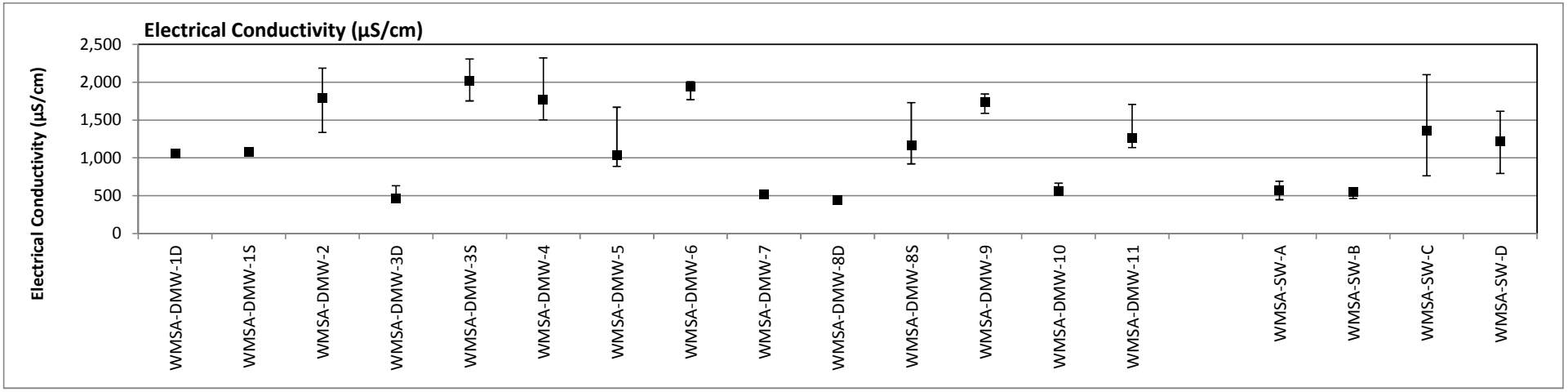

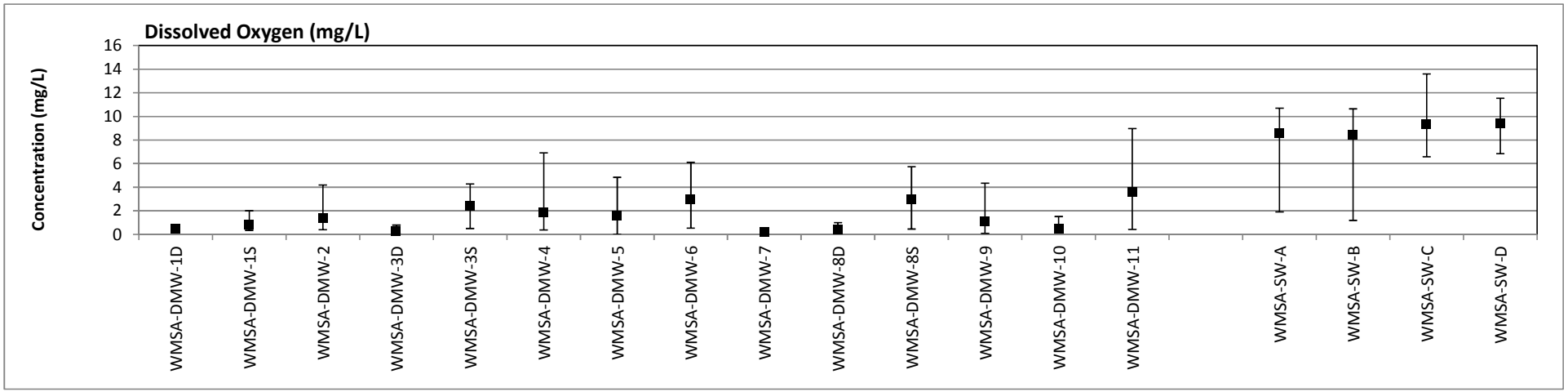

LEGEND

Maximum
Average
Minimum

CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
PERMANENTE
QUARRY

TITLE
WMSA Water Quality
EC and DO

PROJECT NO.	CONTROL	REV.	FIGURE
18104578		A	E3

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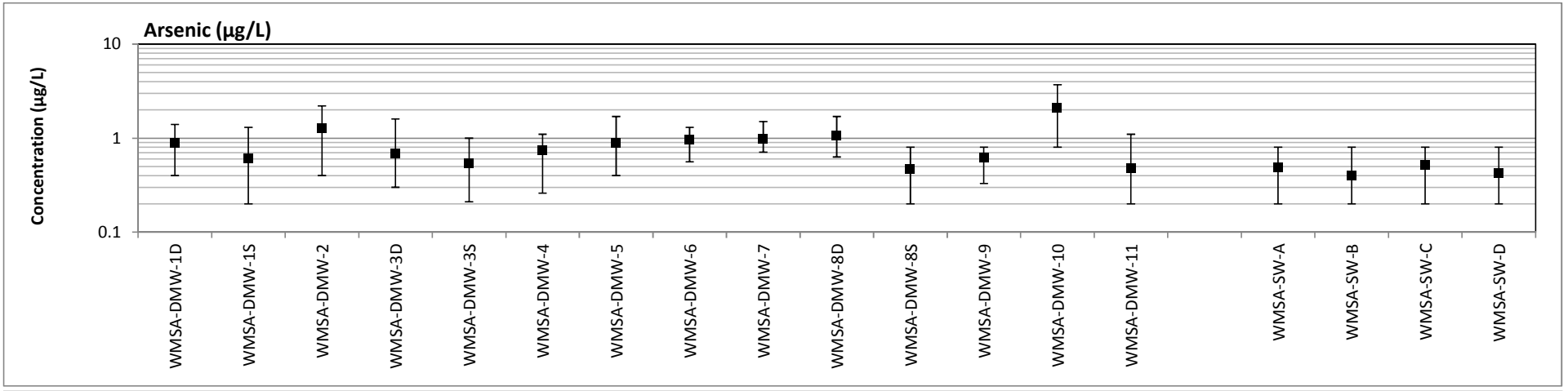

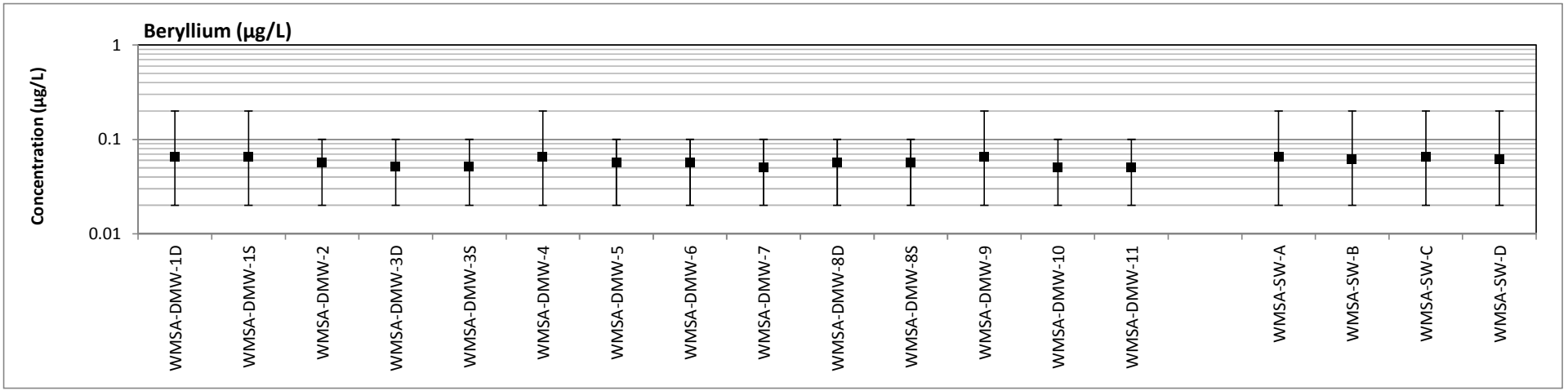

LEGEND

Maximum
Average
Minimum
Dissolved metals

CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
PERMANENTE
QUARRY

TITLE
WMSA Water Quality
Arsenic and Beryllium

PROJECT NO.	CONTROL	REV.	FIGURE
18104578		A	E4

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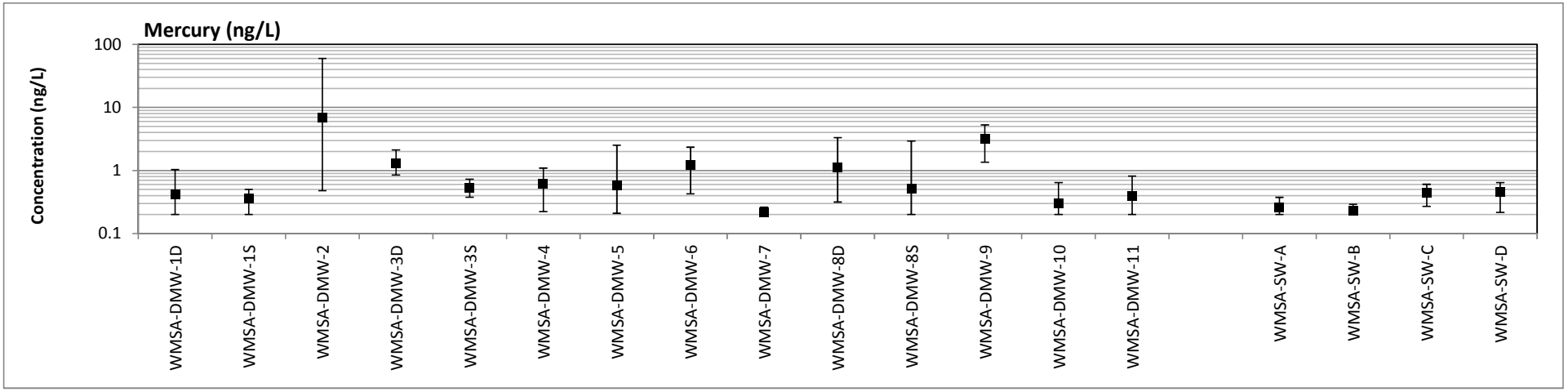

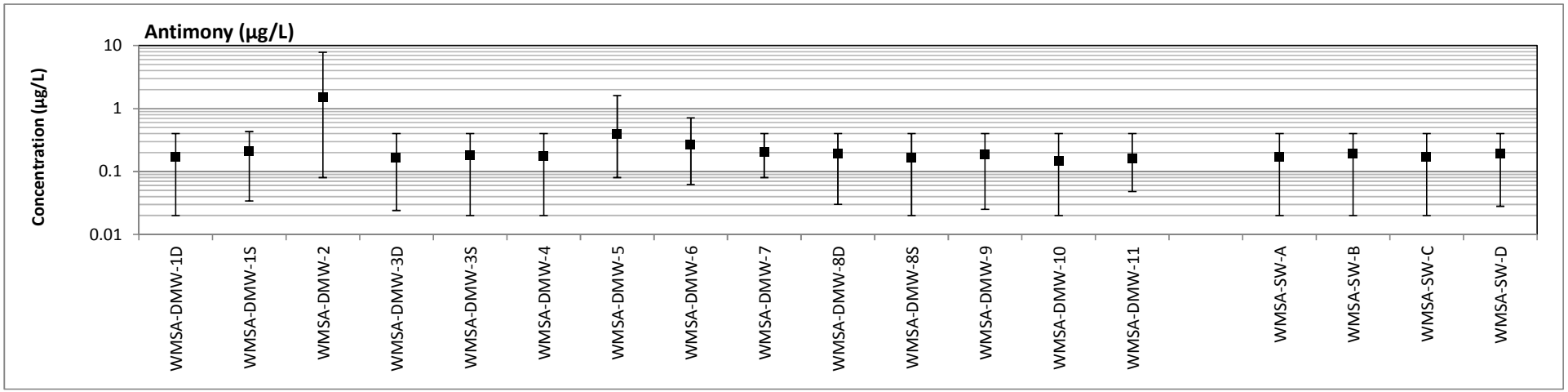

LEGEND

Maximum
Average
Minimum

Dissolved Metals

CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
Permanente Quarry

TITLE
WMSA Water Quality
Mercury and Antimony

PROJECT NO.	CONTROL	REV.	FIGURE
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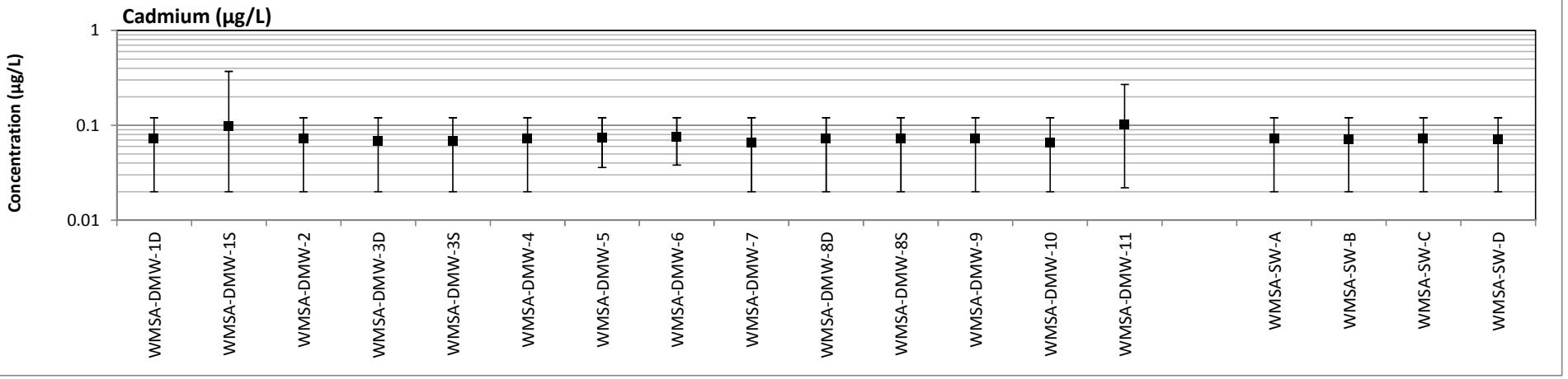

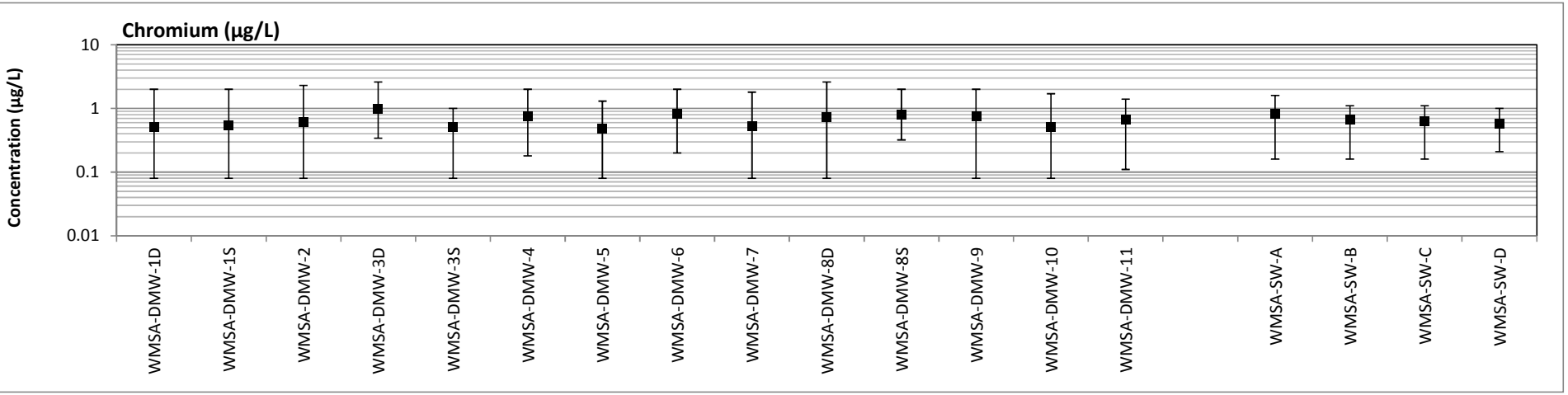

LEGEND

Maximum
Average
Minimum

Dissolved metals

CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
PERMANENTE
QUARRY

TITLE
WMSA Water Quality
Cadmium and Chromium

PROJECT NO.	CONTROL	REV.	FIGURE
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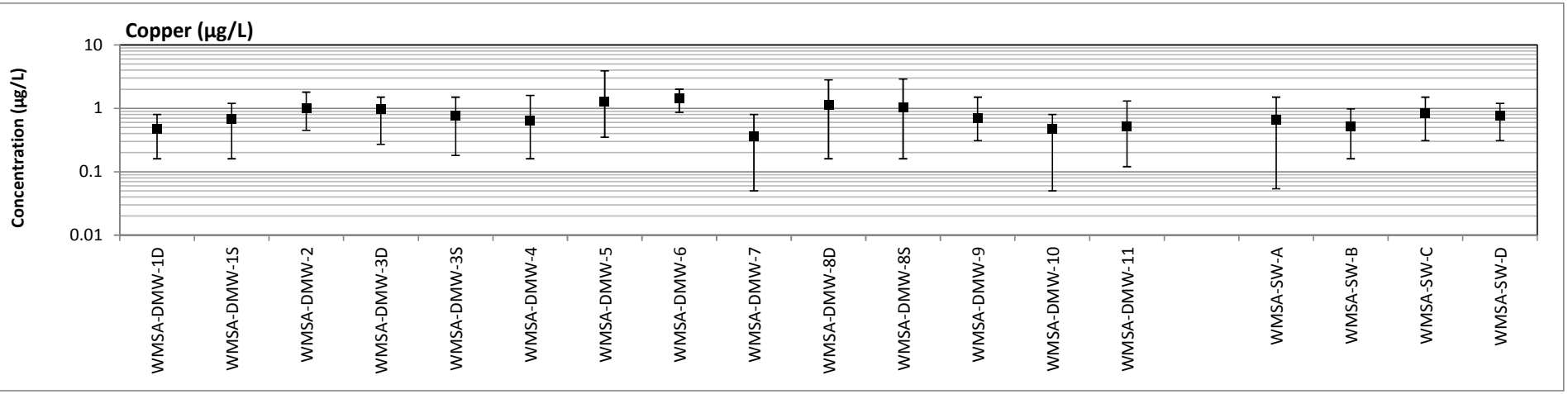
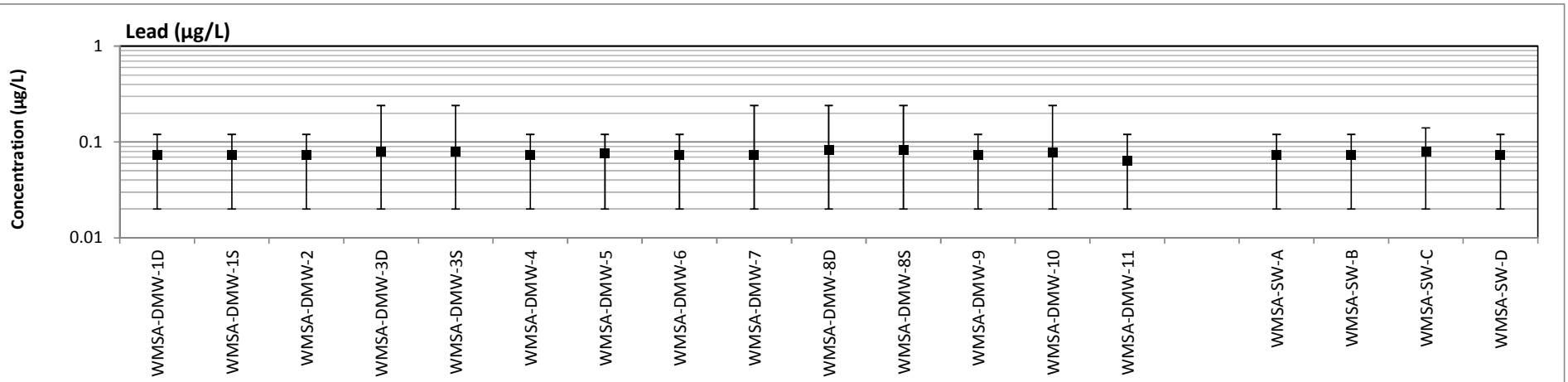
0





LEGEND

Maximum
Average
Minimum

Dissolved metals

CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
PERMANENTE
QUARRY

TITLE
WMSA Water Quality
Copper and Lead

PROJECT NO.	CONTROL	REV.	FIGURE
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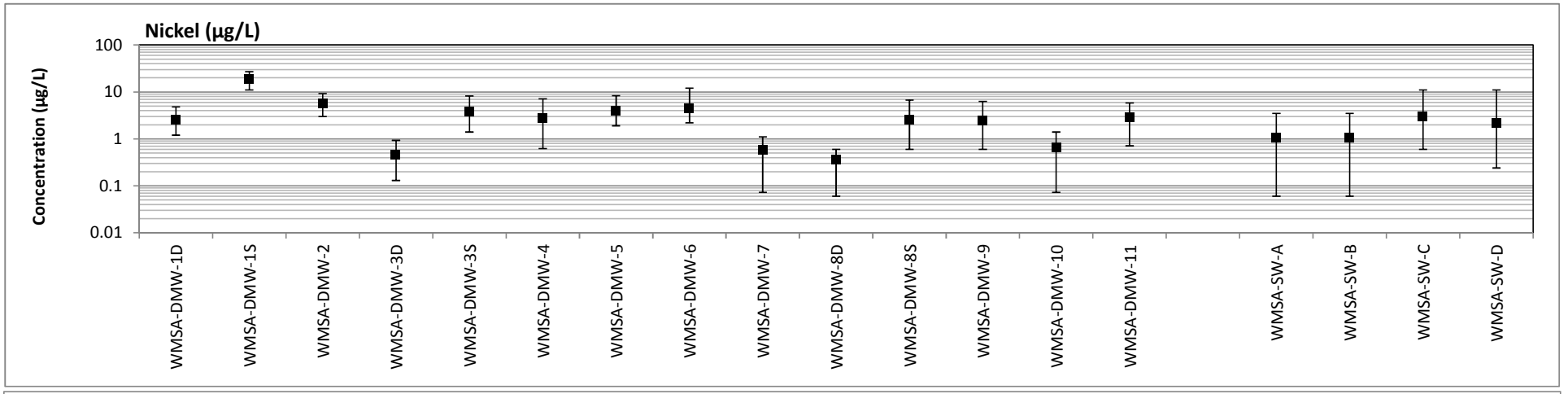
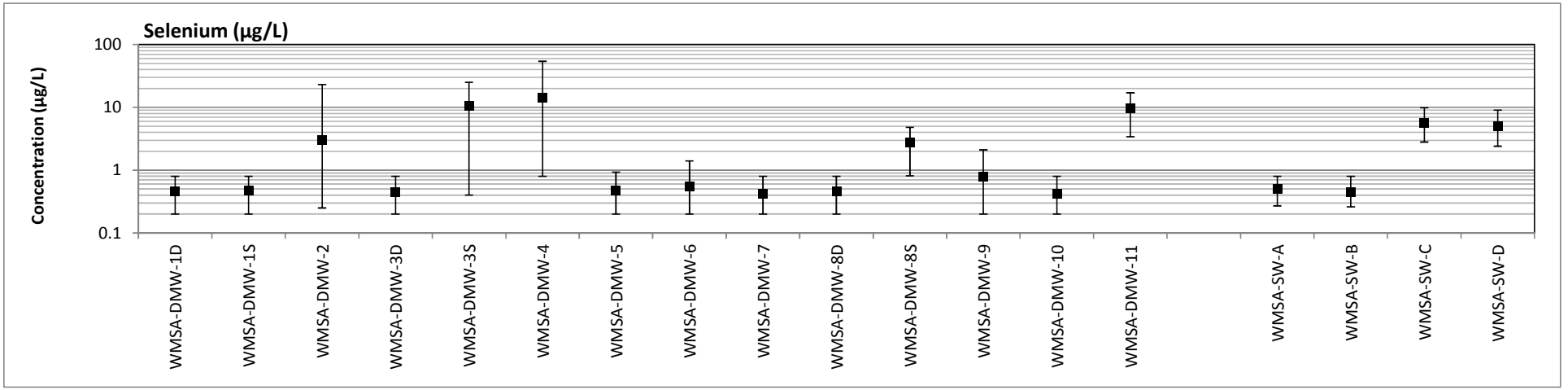
0





LEGEND

Maximum
Average
Minimum

Dissolved metals

CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
PERMANENTE
QUARRY

TITLE
WMSA Water Quality
Nickel and Selenium

PROJECT NO.	CONTROL	REV.	FIGURE
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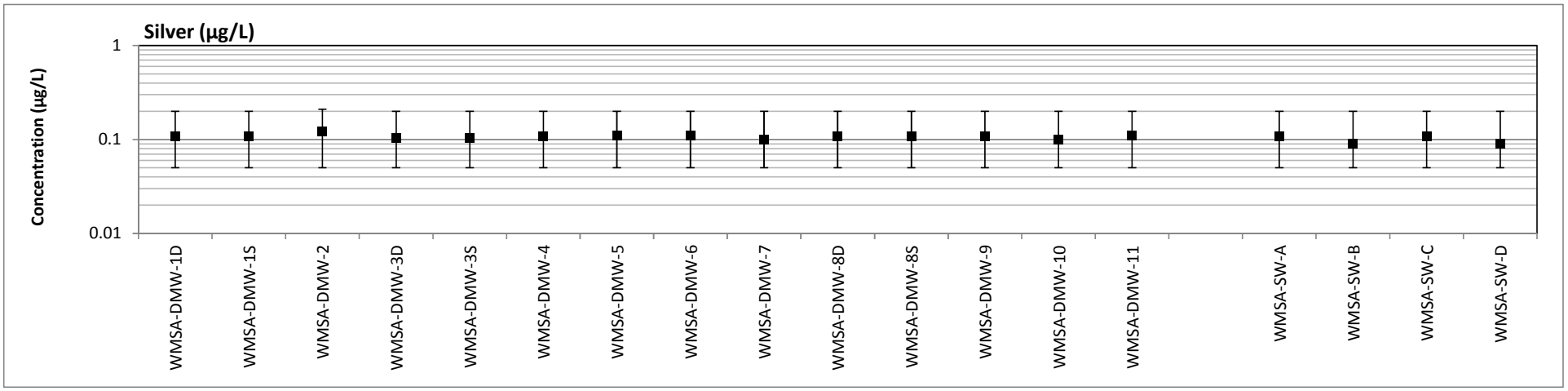

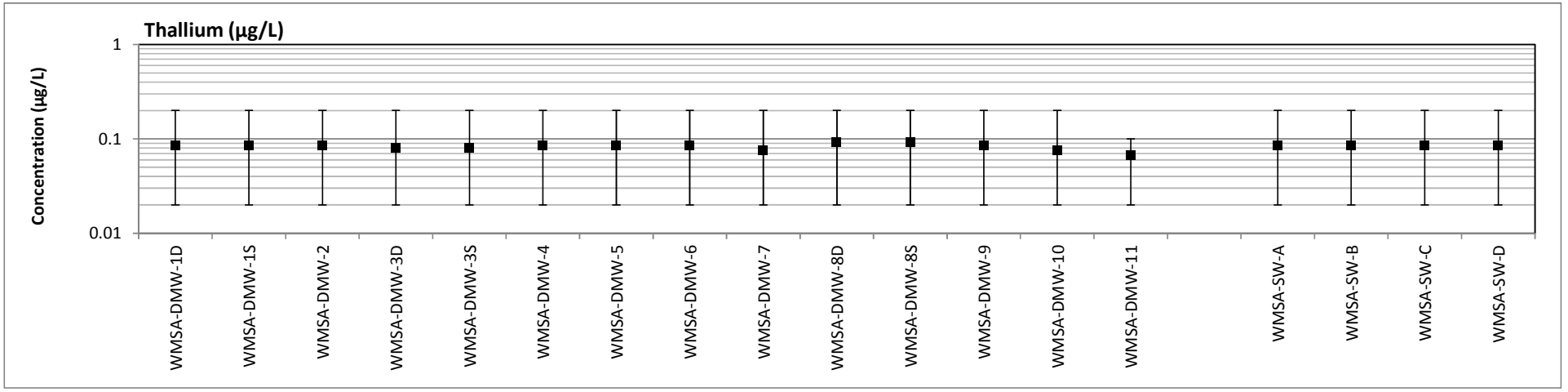

LEGEND

Maximum
Average
Minimum

Dissolvled metals

CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
PERMANENTE
QUARRY

TITLE
WMSA and EMSA Water Quality
Silver and Thallium

PROJECT NO.	CONTROL	REV.	FIGURE
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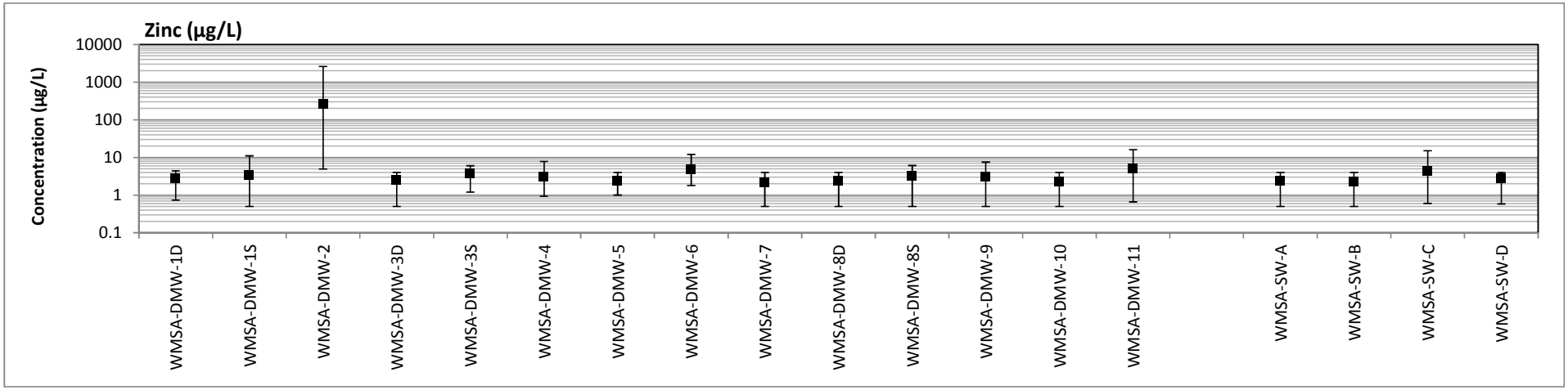

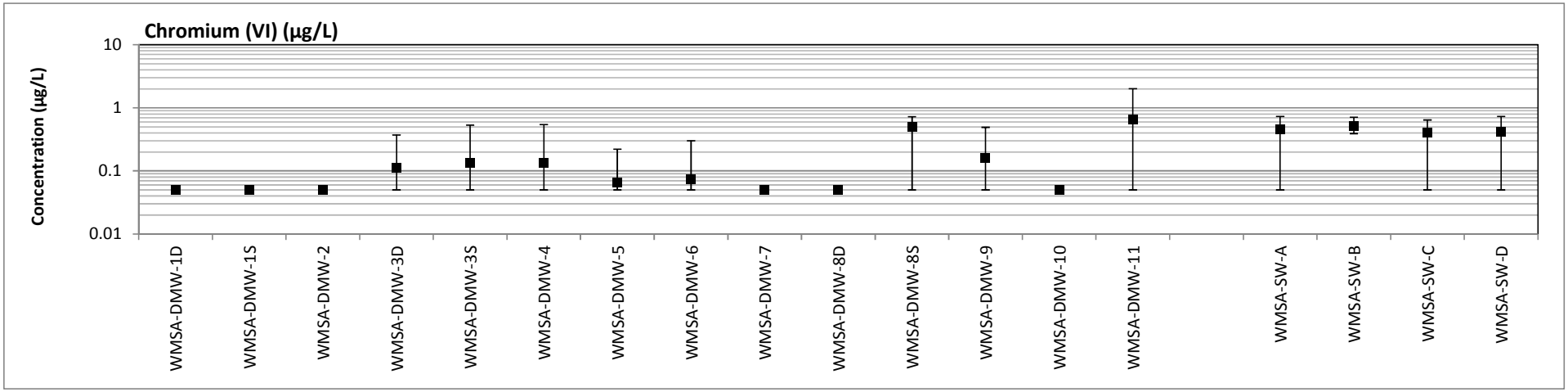

LEGEND

Maximum
Average
Minimum

Dissolved metals

CLIENT
Permanente Quarry Reclamation Plan Update

CONSULTANT
GOLDER

PROJECT
PERMANENTE
QUARRY

TITLE
WMSA and EMSA Water Quality
Zinc and Chromium (VI)

PROJECT NO.	CONTROL	REV.	FIGURE
18104578		A	E10

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1 in
0

Appendix F

Water Quality Estimation

Appendix F

post-reclamation steady-state selenium concentration calculation and assumptions

Inputs

1) catchment area/exposed walls (acres)

total acres	280	
greenstone/backfill unsaturated	190	
limestone	33	
quarry floor	93	(backfill footprint)

2) Assumed Se (ug/L) conc. when steady state reached (water at 990 elev)

limestone SW	30	wall washing and STLC results
greenstone SW	2.5	greenstone/graywacke exposed areas
groundwater	2	inflow (HG series)
quarry floor	1	backfill material

based on existing data; concentration assumed constant

all inputs are assumed to mix completely prior to output

3) runoff coefficient/direct precip infiltration

0.85 based on Chang (2019)

1 footprint of backfill area (quarry floor)

4) groundwater inflow from model

80 gpm

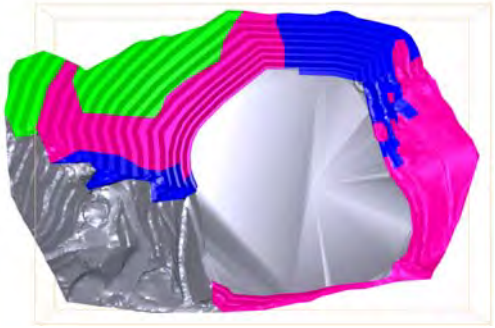
5) annual precip average

22.4 inches/year

Month			Quarry Water I/O (cubic ft)					Se mass (kg/month)					Estimated
	precip (in)	days	sw limestone	sw greenstone	quarry floor	gw	total inflow sum	sw limestone	sw greenstone	quarry floo	gw	Se sum (kg/m	Se Conc (ug/L)
1	3.7	31	377,833	2,163,475	1,244,521	477,433	4,263,263	0.32	0.15	0.04	0.03	0.54	4.4
2	4.9	28	500,374	2,865,143	1,648,149	431,230	5,444,896	0.42	0.20	0.05	0.02	0.70	4.5
3	3.3	31	336,987	1,929,586	1,109,978	477,433	3,853,984	0.29	0.14	0.03	0.03	0.48	4.4
4	1.7	30	173,599	994,029	571,807	462,032	2,201,467	0.15	0.07	0.02	0.03	0.26	4.2
5	0.3	31	30,635	175,417	100,907	477,433	784,392	0.03	0.01	0.00	0.03	0.07	3.1
6	0.1	30	10,212	58,472	33,636	462,032	564,352	0.01	0.00	0.00	0.03	0.04	2.5
7	0.0	31	204	1,169	673	477,433	479,480	0.00	0.00	0.00	0.03	0.03	2.0
8	0.0	31	0	0	0	477,433	477,433	0.00	0.00	0.00	0.03	0.03	2.0
9	0.1	30	10,212	58,472	33,636	462,032	564,352	0.01	0.00	0.00	0.03	0.04	2.5
10	0.8	31	81,694	467,778	269,086	477,433	1,295,991	0.07	0.03	0.01	0.03	0.14	3.7
11	2.8	30	285,928	1,637,225	941,800	462,032	3,326,984	0.24	0.12	0.03	0.03	0.41	4.4
12	4.7	31	479,951	2,748,198	1,580,878	477,433	5,286,460	0.41	0.19	0.04	0.03	0.67	4.5
Annual	**22.4**	**365**	**2,287,629**	**13,098,966**	**7,535,070**	**5,621,390**	**28,543,055**	**1.9**	**0.9**	**0.2**	**0.3**	**3.4**	**4.2**

Month	50% increase		Quarry Water I/O (cubic ft)					Se mass (kg/month)					Estimated
	precip (in)	days	sw limestone	sw greenstone	quarry floor	gw	total inflow sum	sw limestone	sw greenstone	quarry floo	gw	Se sum (kg/m	Se Conc (mg/L)
1	5.55	31	566,750	3,245,213	1,866,781	477,433	6,156,178	0.48	0.23	0.05	0.03	0.79	4.5
2	7.35	28	750,561	4,297,715	2,472,224	431,230	7,951,730	0.64	0.30	0.07	0.02	1.04	4.6
3	4.95	31	505,480	2,894,379	1,664,967	477,433	5,542,259	0.43	0.20	0.05	0.03	0.71	4.5
4	2.55	30	260,399	1,491,044	857,710	462,032	3,071,185	0.22	0.11	0.02	0.03	0.38	4.3
5	0.45	31	45,953	263,125	151,361	477,433	937,872	0.04	0.02	0.00	0.03	0.09	3.4
6	0.15	30	15,318	87,708	50,454	462,032	615,512	0.01	0.01	0.00	0.03	0.05	2.7
7	0.00	31	306	1,754	1,009	477,433	480,503	0.00	0.00	0.00	0.03	0.03	2.0
8	0.00	31	0	0	0	477,433	477,433	0.00	0.00	0.00	0.03	0.03	2.0
9	0.15	30	15,318	87,708	50,454	462,032	615,512	0.01	0.01	0.00	0.03	0.05	2.7
10	1.20	31	122,541	701,668	403,628	477,433	1,705,270	0.10	0.05	0.01	0.03	0.19	4.0
11	4.20	30	428,892	2,455,837	1,412,699	462,032	4,759,460	0.36	0.17	0.04	0.03	0.60	4.5
12	7.05	31	719,926	4,122,298	2,371,317	477,433	7,690,974	0.61	0.29	0.07	0.03	1.00	4.6
Annual	33.60	**365**	**3,431,443**	**19,648,449**	**11,302,604**	**5,621,390**	**40,003,887**	**2.9**	**1.4**	**0.3**	**0.3**	**4.9**	**4.4**

Month	50% decrease		Quarry Water I/O (cubic ft)					Se mass (kg/month)					Estimated
	precip (in)	days	sw limestone	sw greenstone	quarry floor	gw	total inflow sum	sw limestone	sw greenstone	quarry floo	gw	Se sum (kg/m	Se Conc (mg/L)
1	1.85	31	188,917	1,081,738	622,260	477,433	2,370,348	0.16	0.08	0.02	0.03	0.28	4.2
2	2.45	28	250,187	1,432,572	824,075	431,230	2,938,063	0.21	0.10	0.02	0.02	0.36	4.3
3	1.65	31	168,493	964,793	554,989	477,433	2,165,709	0.14	0.07	0.02	0.03	0.25	4.1
4	0.85	30	86,800	497,015	285,903	462,032	1,331,750	0.07	0.04	0.01	0.03	0.14	3.8
5	0.15	31	15,318	87,708	50,454	477,433	630,913	0.01	0.01	0.00	0.03	0.05	2.7
6	0.05	30	5,106	29,236	16,818	462,032	513,192	0.00	0.00	0.00	0.03	0.03	2.3
7	0.00	31	102	585	336	477,433	478,456	0.00	0.00	0.00	0.03	0.03	2.0
8	0.00	31	0	0	0	477,433	477,433	0.00	0.00	0.00	0.03	0.03	2.0
9	0.05	30	5,106	29,236	16,818	462,032	513,192	0.00	0.00	0.00	0.03	0.03	2.3
10	0.40	31	40,847	233,889	134,543	477,433	886,712	0.03	0.02	0.00	0.03	0.08	3.3
11	1.40	30	142,964	818,612	470,900	462,032	1,894,508	0.12	0.06	0.01	0.03	0.22	4.1
12	2.35	31	239,975	1,374,099	790,439	477,433	2,881,947	0.20	0.10	0.02	0.03	0.35	4.3
Annual	11.20	**365**	**1,143,814**	**6,549,483**	**3,767,535**	**5,621,390**	**17,082,223**	**1.0**	**0.5**	**0.1**	**0.3**	**1.9**	**3.8**



43560 sqft in acre

	sqft	acres		Breakdown of acreage based on Stantec provided data	
backfill	6417071	182			
grstone	3187672	73		315	acres total NQ catchment (Chang, 2019)
grstone	1161855	27		35	acres excluded from western portion of NQ
limestone	1441654	33	(shown in blue)		based on drainage configuration
		315	total	280	total
quarry floc	4036284	93			



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APPENDIX I
DRAINAGE REPORT

DRAINAGE REPORT

FOR THE

PERMANENTE QUARRY

RECLAMATION PLAN AMENDMENT

February 1, 2019

Wayne W. Chang, MS, PE 46548

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FOR REVIEW ONLY

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A. Hydrologic Input Data and Analyses
B. Unit Hydrograph Analyses
C. Desiltation Basin Analyses

MAP POCKET

Existing Condition Work Map
Proposed Condition Work Map

FOR REVIEW ONLY

INTRODUCTION

Lehigh Southwest Cement Company (Lehigh) operates the Permanente Quarry (Quarry), which is a limestone and aggregate mining operation located within the county of Santa Clara foothills west of the city of Cupertino (see Figure 1, "Regional Location," Figure 2, "Site Location," and Figure 3, "Existing Conditions Aerial and Nomenclature" at the back of this report). Lehigh operates the Quarry under an approved 2012 *Reclamation Plan Amendment for Permanente Quarry* (2012 RPA). The primary feature of the 2012 RPA is to reclaim the central mining excavation, known as the North Quarry, by backfilling the excavation with 48 million tons of overburden that is currently stockpiled on-site in an area known as the West Materials Storage Area (WMSA).

The WMSA is at the western end of the 2012 RPA area and north of Permanente Creek. The WMSA has historically been used for overburden material storage. The North Quarry is immediately east of the WMSA and also north of Permanente Creek. The North Quarry has historically been and is currently being used for extraction. Under the 2012 RPA, the majority of the storm runoff from the North Quarry and WMSA will ultimately be conveyed to Permanente Creek.

The current application proposes to update the reclamation plan to incorporate the results of various hydrologic and geotechnical investigations that have occurred since 2012. The modifications are designed to incorporate backfill that would be superior to the approved plan while updating reclamation planning for continued mineral production. The planned mining and reclamation activities include regrading the north highwall reserve at an approximately 1H:1V (45 degree) overall slope angle and lowering the north crest to an approximate elevation of 1,400 mean sea level (msl). Limestone will be extracted down to 550 msl. Slide waste (greenstone) not suitable for aggregate production will be placed permanently on the North Quarry floor and/or the WMSA.

The existing Rock Plant supports an aggregate processing plant and is located at the southeast corner of the 2012 RPA area. An adjacent limestone reserve is within vested property and the 2012 RPA area. The Rock Plant Reserve development will include a site-specific design for surface water runoff as well as fill and topsoil placement for reclamation. The mining and reclamation activities specifically include development of the highwall at an approximately 1H:1V overall slope angle to a floor elevation of approximately 915 feet msl.

This report contains drainage analyses of the post-reclamation flow rates from the proposed North Quarry, WMSA, and Rock Plant Reserve (Study Area). The majority of the post-reclamation flows will be conveyed to Permanente Creek. Santa Clara County's 2007 *Drainage Manual* indicates that new storm drain systems and channels shall be designed to convey the 10-year storm without surcharge, and a safe release shall be provided for the 100-year flow. Furthermore, the Surface Mining and Reclamation Act (SMARA) states that erosion control methods shall be designed for the 20-year storm, and shall control erosion and sedimentation during operations as well as after reclamation is complete (see *California Code of Regulations*, Title 14, Section 3706). The *Drainage Manual* provides parameters for the 25-year storm event, but not the 20-year event. The 25-year event was analyzed in this report in order to satisfy the

requirements for the 10- and 20-year events. Since the 25-year event is greater than these two events, the 25-year results will provide a greater factor-of-safety in the drainage design. The 100-year event was also analyzed in accordance with the *Drainage Manual* criteria.

Furthermore, this report contains analyses for temporary desiltation basins that will capture storm runoff from the combined North Quarry/WMSA and the Rock Plant Reserve. The basins, as well as other interim erosion control measures, will be used until the vegetation establishes. The desiltation basins have been sized according to criteria from the State Water Resources Control Board (SWRCB) and the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP).

HYDROLOGIC ANALYSES

Hydrologic analyses were performed for the existing (pre-project) and proposed (post-project or reclaimed) conditions in the North Quarry and WMSA as well as the Rock Plant Reserve. The Santa Clara County 2007 *Drainage Manual* allows the rational method for drainage areas smaller than 200 acres (with no detention, no substantial surface storage effect, and no large areas of pervious soils) and the unit hydrograph method for areas greater than 200 acres. The rational method was used to analyze a portion of the pre-project drainage area in the North Quarry and WMSA that flows northerly and is smaller than 200 acres. The rational method was also used to analyze the Rock Plant Reserve since it covers less than 200 acres. On the other hand, the unit hydrograph method (described in the second half of this section) was used to analyze the portion of the combined North Quarry and WMSA drainage area larger than 200 acres. The hydrologic analyses were performed for the 25- and 100-year storm events.

Rational Method

The rational method input parameters are summarized below, and the supporting data is included in Appendix A:

- Rainfall Intensity: The 25- and 100-year intensity-duration-frequency curves were established using the Return Period-Duration-Specific (TDS) Regional Equation. The mean annual precipitation value used in the TDS equation is 28 inches.

- Drainage area: The existing condition (pre-project) drainage basins were delineated from the base topography of the site. The proposed condition (post-reclamation) drainage basins were delineated from the base topography and the proposed Reclamation Plan Amendment grading representing the ultimate configuration (Phase III for the North Quarry and WMSA, and Phase II for the Rock Plant Reserve). The overall existing condition drainage area was set equal to the overall proposed condition drainage area to allow a comparison of the results. The Rational Method Work Maps in the map pocket at the back of this report contain the existing topography, proposed grading, basin boundaries, rational method node numbers, and basin areas.

- Hydrologic soil groups: The hydrologic soil group was determined from “Figure B-1, Soil Texture and Mean Annual Precipitation Depths for the Santa Clara Basin” in SCVURPPP’s

June 2016, *C.3. Stormwater Handbook.* The soil type at the site is entirely within group B. Discussions with Golder indicated that the reclaimed hydrologic soil group will be similar to the undisturbed soil group.

- Runoff coefficients: The existing and proposed site conditions within the Study Area (see the Existing Condition Hydrologic Work Map and Proposed Condition Hydrologic Work Map in the map pocket for the drainage basins that define the Study Area) contain negligible impervious surfaces and a surface condition representative of a mineral extraction site. The current *Drainage Manual* provides a table (Table 3-1) of runoff coefficients for various land uses ranging from natural cover (parks, agricultural, open space, and shrub land) to development types (residential, commercial, industrial, and paved/impervious surfaces). The project site does not specifically fall within any of the *Drainage Manual's* land use categories. The pre-project site contains hilly terrain, with exposed rock/gravel surfaces, limited vegetal cover, and little surface storage. The post-project site will contain hilly terrain, gravel/rock surfaces, hydroseeded and planted surfaces, and little surface storage. Since the current *Drainage Manual* does not specifically address the pre- and post-project conditions, Land Development Engineering provided Table 4 from the County's previous drainage manual as a guideline to develop a runoff coefficient for mined areas.

  For existing conditions at the North Quarry and WMSA, the selected values from Table 4 are a relief of 0.40, soil infiltration of 0.15, vegetal cover of 0.20, and surface storage of 0.15. This yields a runoff coefficient of 0.90. For existing conditions at the Rock Plant Reserve, the selected values from Table 4 are a relief of 0.40, soil infiltration of 0.15, vegetal cover of 0.10, and surface storage of 0.20. This yields a runoff coefficient of 0.85.

  For proposed conditions at the North Quarry and WMSA, the same values for existing conditions were used. For proposed conditions at the Rock Plant Reserve, the selected values from Table 4 are a relief of 0.40, soil infiltration of 0.15, vegetal cover of 0.15, and surface storage of 0.15. This yields a runoff coefficient of 0.85. It should be noted that the runoff coefficients from Table 4 can be higher that runoff coefficients based on the *Drainage Manual.*

- Flow lengths and elevations: The flow lengths and elevations were obtained from the topographic mapping and Reclamation Plan Amendment reclamation grading. The initial time of concentration for each initial subarea was calculated using a spreadsheet based on the Kirpich equation from the *Drainage Manual.*

  The flow lengths in an initial subarea start at the most hydraulically distant (or highest) point in a drainage basin in accordance with the typical rational method procedure (this is discussed on page 17 of the *Drainage Manual).*

The rational method analyses were performed using the CivilDesign Universal Rational Method Hydrology Program. This program was customized to meet the Santa Clara County hydrologic criteria. The County's intensity-duration data was input into the program. The times of concentration for initial subareas were calculated using a spreadsheet of the Kirpich equation, which is included in Appendix A. The initial time of concentration values from the spreadsheet

were entered as user-specified data in the program. After the initial subarea is modeled, the program can route the flow in channels, streets, pipes, etc. The channel routing routine was used to model the flow in natural drainages and proposed flow paths. The program also allows for flow in separate streams to be confluenced.

The CivilDesign program requires a land use to be entered (e.g., undeveloped dense cover, etc.). However, the runoff coefficients used by the program were based on user-defined values defined above, rather than the program specified land use and soil group. Therefore, while the land uses listed in the output provide a general description of the land use, they were not used for determination of the runoff coefficients.

The overall 25- and 100-year existing and proposed condition rational method output are included in Appendix A and summarized in Tables 1 and 2 for each major drainage basin. The existing condition runoff from the area tributary to rational method node 4 flows north away from the site, to node 14 flows to Permanente Creek, and to node 22 flows south away from the site. The proposed condition runoff from the area tributary to rational method node 18 flows to Permanente Creek, while the proposed condition runoff from node 22 flows south away from the site.

Runoff from the area tributary to existing condition node 4 will be directed to Permanente Creek under proposed conditions, so the existing condition runoff to the north will be reduced by the project. Table 1 and 2 indicate that the project will increase runoff to the south by a small amount. The small increase will have minimal impact on an adjacent quarry.

Rational Method Node (source/flow direction)	Area, acres	25-Year Flow, cfs[1]	100-Year Flow, cfs[1]
4 (from NQ/WMSA to North)	19.10	40	48
14 (from RPR to Permanente Creek)	55.71	97	118
22 (from RPR to South)	0.52	1.1	1.3

[1]cubic feet per second

Table 1. Summary of Overall Existing Condition Rational Method Results

Rational Method Node (source/flow direction)	Area, acres	25-Year Flow, cfs[1]	100-Year Flow, cfs[1]
18 (from RPR to Permanente Creek)	54.69	90	110
22 (from RPR to South)	1.54	3.0	3.6

[1]cubic feet per second

Table 2. Summary of Overall Proposed Condition Rational Method Results

Unit Hydrograph Method

The majority of the North Quarry and WMSA are located within a large drainage area that will ultimately flow into Permanente Creek after the site is reclaimed. The existing and proposed

condition drainage areas along Permanente Creek are larger than 200 acres, so the unit hydrograph method was used to analyze these regions. The unit hydrograph input parameters are summarized below, and the supporting data is included in Appendix B:

- Rainfall Pattern: The 24-hour, 5-minute rainfall pattern given in Appendix D of the *Drainage Manual* was used. The 25- and 100-year, 24-hour precipitation values were determined using the TDS equation and are 6.15 and 7.63 inches, respectively.

- Drainage area: The existing condition (pre-project) drainage basin was delineated from the base topography prepared for the site. The proposed condition (post-reclamation) drainage basin was delineated from either the base topography prepared for the site in combination with the proposed Reclamation Plan Amendment grading representing the ultimate (Phase III) North Quarry and WMSA configurations. The Unit Hydrograph Work Maps in the map pocket at the back of this report contain the existing topography, proposed grading, basin boundaries, flow paths, centroids, and basin areas.

- Hydrologic soil groups: The hydrologic soil group was determined from "Figure 1, Soil Texture and Mean Annual Precipitation Depths for the Santa Clara Basin" in SCVURPPP's June 2016, *C.3. Stormwater Handbook.* The soil type at the site is entirely within group B.

- Curve Number: The existing and proposed site conditions within the project footprint contain negligible impervious surfaces. The existing condition was assigned a curve number of 86, which reflects barren cover (rock, eroded, and graded land) under soil group B and antecedent moisture condition II. The CN was adjusted to AMC II-1/2 (CN = 90) in accordance with County procedures. The proposed condition curve number was based on the shrub land category (CN = 62 for poor cover, soil group B, and AMC II) since the reclaimed land forms will be revegetated. The CN was adjusted to AMC II-1/2 (CN = 71) for the 25- and 100-year analyses. The initial abstraction was equal to 0.2[(1000/CN) – 10] inches (or 0.22 for the existing condition and 0.82 for the proposed condition).

- SCS Lag: The SCS lag was calculated using the formula in the *Drainage Manual.* The flow lengths, elevations, effective slope, and the centroid were obtained from the topographic mapping and/or Reclamation Plan Amendment final reclamation design. The existing and proposed condition watershed roughnesses were assigned a value of 0.070 to represent a drainage basin with minimal urbanization. The duration of the unit hydrograph was calculated based on 1/4 the lag time. From this, the SCS was estimated to be 0.55 hours for existing conditions and 0.44 hours for proposed conditions.

The US Army Corps of Engineers' HEC-1 program was used for the unit hydrograph analyses. The results are included in Appendix B and summarized in Table 3 and 4. The overall rational method and unit hydrograph post-project flow rates from the WMSA/North Quarry will be similar to the pre-project flow rates.

Region	Area, ac	25-Year Flow, cfs	100-Year Flow, cfs
WMSA/North Quarry	381.46	316	410

Table 3. Summary of Existing Condition Unit Hydrograph Method Results

Region	Area, ac	25-Year Flow, cfs	100-Year Flow, cfs
WMSA/North Quarry	400.56	166	257

Table 4. Summary of Proposed Condition Unit Hydrograph Method Results

The combined rational method and unit hydrograph results show that the project will result in an overall decrease in the 25- and 100-year existing condition flow rates. The combined 25-year flow rate reduces from 413 (316+97=413) to 256 cfs (166+90=256), while the combined 100-year flow rate reduces from 528 (410+118=528) to 367 (257+110=367) cfs.

Under existing conditions, the majority of the North Quarry and WMSA runoff is captured in the quarry pit. Historically, before quarry operations, the majority of the North Quarry and WMSA runoff would enter Permanente Creek without being captured by a pit. The proposed project will ultimately fill the pit, so reclamation will eliminate pit capture and reestablish surface runoff to Permanente Creek. The Federal Emergency Management Agency (FEMA) has established an existing condition 100-year flow rate in Permanente Creek below the site and delineated the associated floodplain. Hydrologic analyses performed for the 2012 RPA demonstrated that the post-reclamation condition will not adversely increase the FEMA 100-year flow rate nor floodplain. Therefore, the project will not increase the risk of downstream flooding as defined by FEMA.

DESILTATION BASIN ANALYSES

A primary water quality pollutant generated from the North Quarry, WMSA, and Rock Plant Reserve will be sediment. The final slopes, benches, and pads will be planted with grasses, shrubs, and trees to prevent erosion. In the interim period before the vegetation has established, best management practices including temporary desiltation basins will be installed. A temporary desiltation basin will be constructed near the location where storm runoff discharges from the North Quarry/WMSA and from the Rock Plant Reserve. The two desiltation basins will be maintained until the vegetation has established. Two methodologies have been considered for sizing each desiltation basin. First, SCVURPPP outlines volume-based treatment control sizing in their *C.3. Stormwater Handbook.* Second, the State Water Resources Control Board (SWRCB) *Water Quality Order 99-08-DWQ* (as amended by *2010-0014-DWQ* and *2012-0006-DWQ*) provides sediment basin sizing criteria.

The SCVURPPP's preferred method for sizing volume-based treatment controls is to use the California Stormwater Quality Association Stormwater BMP Handbook approach, which is

included in the *C.3. Stormwater Handbook*. An analysis using this approach is given in Appendix C for the drainage area tributary to the North Quarry/WMSA desiltation basin and Rock Plant Reserve desiltation basin. A spreadsheet is included in Appendix C containing the results for each basin.

The SWRCB procedure is recommended for construction sites with exposed surfaces, which is appropriate for the project. Their procedure is based on the equation:

$A_S = 1.2Q / V_S$ where A_S is the minimum surface area for trapping soil particles of a certain size, sf
Q is the discharge, cfs
V_S is the settling velocity, fps

SWRCB recommends that Q be based on the 10-year event. However, the 25-year event was used in order to meet the Surface Mining and Reclamation Act's 20-year event requirement for erosion control. A particle size distribution was provided by Golder Associates, Inc. that generally represents the waste rock that will be stored. The distribution is included in Appendix C and shows that nearly 93 percent of the material will be larger than 0.074 mm (No. 200 sieve size). Sediment smaller than the No. 200 sieve typically occur in suspension and are less prone to settling. The Regional Water Quality Control Board, San Francisco Bay Region's *Erosion and Sediment Control Field Manual* provides settling velocities for several particle sizes. The settling velocity for a particle size of 0.05 mm (0.0062 feet per second) was selected because this size is smaller than 0.074 mm. A spreadsheet was created for the SWRCB equation and is included in Appendix C.

The desiltation basins shall be constructed to exceed the volume from the SCVURPPP equation or the surface area from the SWRCB equation. The SWRCB recommends that the basin length be twice the width, and the storage depth be between 3 to 5 feet. The SCVURPPP method results in smaller sizing. The contractor will be responsible for field fitting the basins based on the actual topographic conditions encountered during grading. At least one-foot of freeboard shall be provided in the basins.

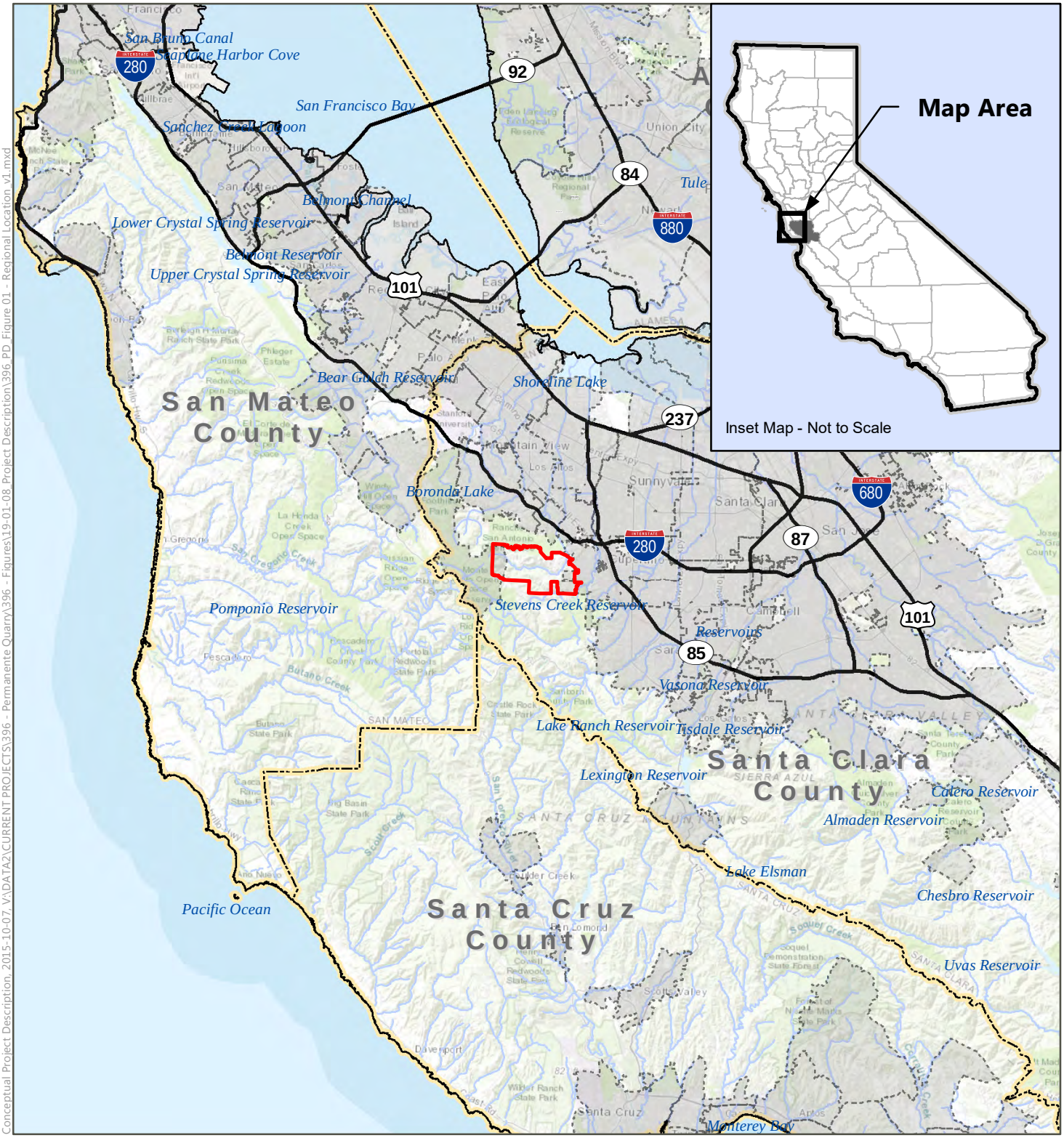
The outlet works for the desiltation basins shall be sized to pass the 100-year flow rates. Normal depth analyses provide the minimum outlet pipe sizes (assuming a 2 percent slope) for the desiltation basin serving the North Quarry and WMSA as well as the desiltation basin serving the Rock Plant Reserve. The analyses are included in Appendix C and indicate that a 54-inch HDPE is need for the North Quarry and WMSA runoff, while a 42-inch HDPE is needed for the Rock Plant Reserve runoff. Adjustments to the outlet pipe design may need to be made based on the actual field conditions. The basins can be designed to connect to water treatment systems, if necessary, to meet Regional Water Quality Control Board requirements and permits.

A riser shall be installed within each desiltation basin to allow sediment to be captured in the basins. Weir flow analyses for the risers are included in Appendix C assuming the riser diameter is the same as the associated outlet pipe diameter. The results show that the head required to convey the 100-year flow out of the North Quarry and WMSA riser is 3.57 feet, while the head required for the Rock Plant Reserve Riser is 2.39 feet. The basins shall be designed with

adequate freeboard to provide the necessary head. The head can be reduced if the riser diameters are increased.

CONCLUSION

Drainage analyses have been performed for the North Quarry, West Materials Storage Area, and Rock Plant Reserve at the Permanente Quarry. The reclamation will ultimately include revegetation. There are minimal impervious areas proposed under the Reclamation Plan Amendment. As a result, the proposed reclamation will have a low runoff potential and will not impact the overall surface flow volumes. Temporary best management practices will be installed at the site post-reclamation until the vegetation is established. The BMPs include desiltation basins, which have been sized based on the SCVURPPP and SWRCB guidelines. As a result, the site has been designed for both the required design and water quality flow rates, and meets SMARA's current standards (*California Code of Regulations*, Title 14, Section 3706) for erosion and sediment control. Since reclamation will not occur for many years, the BMPs shall be re-evaluated during reclamation and redesigned to meet water quality standards at the time of construction, as needed.



Conceptual Project Description, 2015-10-07, V:\DATA2\CURRENT PROJECTS\396 - Permanente Quarry\396 - Figures\19-01-08_Project Description\396_PD_Figure 01 - Regional Location_v1.mxd

SOURCES: ESRI World Shaded Relief accessed Jan. 2019, ESRI World Topographic Map accessed Jan. 2019; ESRI World Streetmap, 2009; compiled by Benchmark Resources in 2019

NOTES: This figure was prepared for land use planning and informational purposes only. The information shown and its accuracy are refelctive of the date the data was accessed or produced.

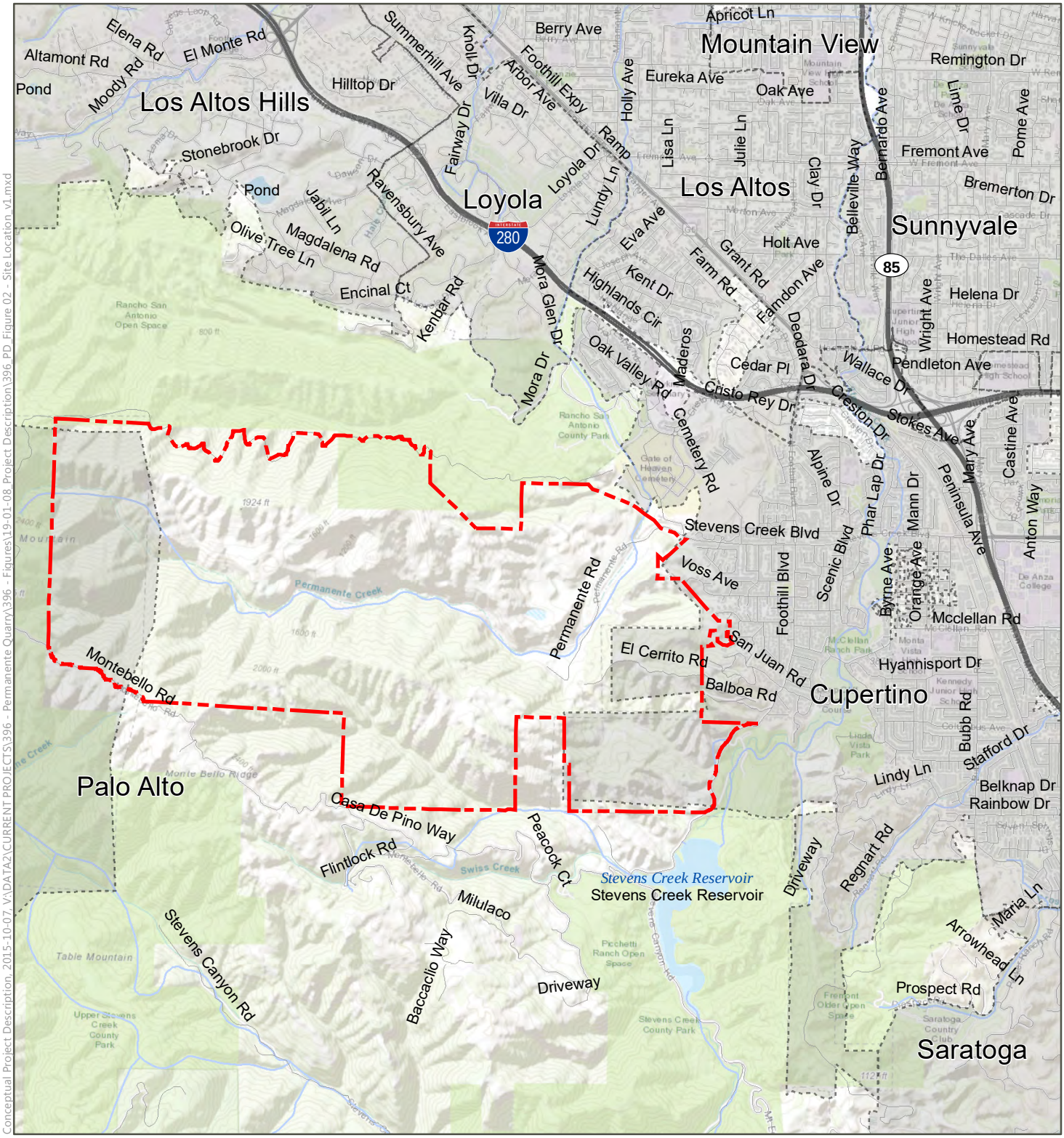
Site Boundary
City Boundary
County Boundary
Major Highway
River
Water Body

BENCHMARK RESOURCES

N

0 3 6 12 Miles

Regional Location
PERMANENTE QUARRY
PROJECT DESCRIPTION
Figure 1



Conceptual Project Description, 2015-10-07, V:\DATA2\CURRENT PROJECTS\396 - Permanente Quarry\396 - Figures\19-01-08_Project Description\396_PD_Figure 02 - Site Location_v1.mxd

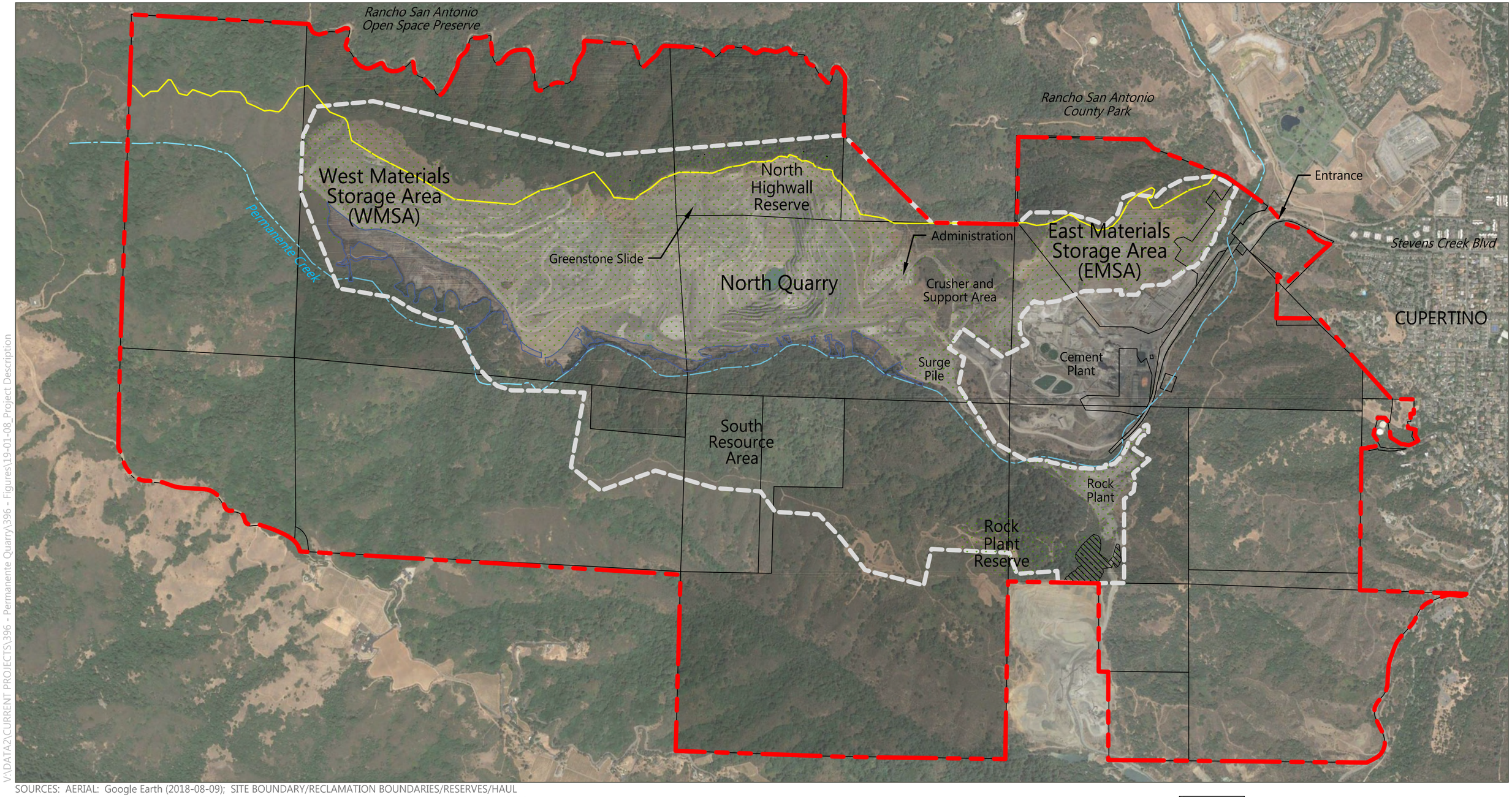
SOURCES: ESRI World Shaded Relief accessed Jan.l 2019, ESRI World Topographic Map accessed Jan 2019; ESRI World Streetmap, 2009; adapted by Benchmark Resources in 2019

NOTES: This figure was prepared for land use planning and informational purposes only. The information shown and its accuracy are refelctive of the date the data was accessed or produced.

BENCHMARK RESOURCES

0 2,000 4,000 8,000 Feet

Site Location
PERMANENTE QUARRY
PROJECT DESCRIPTION
Figure 2



SOURCES: AERIAL: Google Earth (2018-08-09); SITE BOUNDARY/RECLAMATION BOUNDARIES/RESERVES/HAUL ROUTE AREAS: Lehigh Southwest Cement Company, generated in 2018; compiled by Benchmark Resources in 2019

NOTES:

1. Reclamation plan boundary includes *Rock Plant Haul Road Reclamation Plan Amendment* modifications.

Property Boundary
Reclamation Plan Boundary
Permanente Parcels
Permanente Ridge
Permanente Creek
Vested Parcels
Rock Plant Haul Road
Reclamation Plan Amendment Area

BENCHMARK RESOURCES

N

0 700 1,400 2,800 Feet

Existing Conditions Aerial and Nomenclature

PERMANENTE QUARRY PROJECT DESCRIPTION

Figure 3

V:\DATA2\CURRENT PROJECTS\396 - Permanente Quarry\396 - Figures\19-01-08_Project Description

APPENDIX A

HYDROLOGIC INPUT DATA

AND ANALYSES

RATIONAL METHOD INPUT DATA

25-Year Return Period

Duration	A	B	MAP, in	x, in	I, in/hr
5	0.230641	0.002691	28	0.3060	3.672
10	0.287566	0.004930	28	0.4256	2.554
15	0.348021	0.005594	28	0.5047	2.019
30	0.443761	0.008719	28	0.6879	1.376
60	0.508791	0.016680	28	0.9758	0.976
120	0.612629	0.031025	28	1.4813	0.741
180	0.689252	0.044264	28	1.9286	0.643
360	0.693566	0.083195	28	3.0230	0.504
24-hour	0.675008	0.195496	28	6.1489	for UH calc

100-Year Return Period

Duration	A	B	MAP, in	x, in	I, in/hr
5	0.269993	0.003580	28	0.3702	4.443
10	0.315263	0.007312	28	0.5200	3.120
15	0.421360	0.006957	28	0.6162	2.465
30	0.553934	0.009857	28	0.8299	1.660
60	0.626608	0.019201	28	1.1642	1.164
120	0.732944	0.036193	28	1.7463	0.873
180	0.816471	0.051981	28	2.2719	0.757
360	0.776677	0.101053	28	3.6062	0.601
24-hour	0.814046	0.243391	28	7.6290	for UH calc

KIRPICH EQUATION FOR INITIAL SUBAREAS

Existing Conditions

Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
3-4	1,540.0	1,392.5	714	0.21	12.3
10-12	1,601.0	1,330.0	886	0.31	12.3
20-22	1,042.0	982.0	213	0.28	10.8

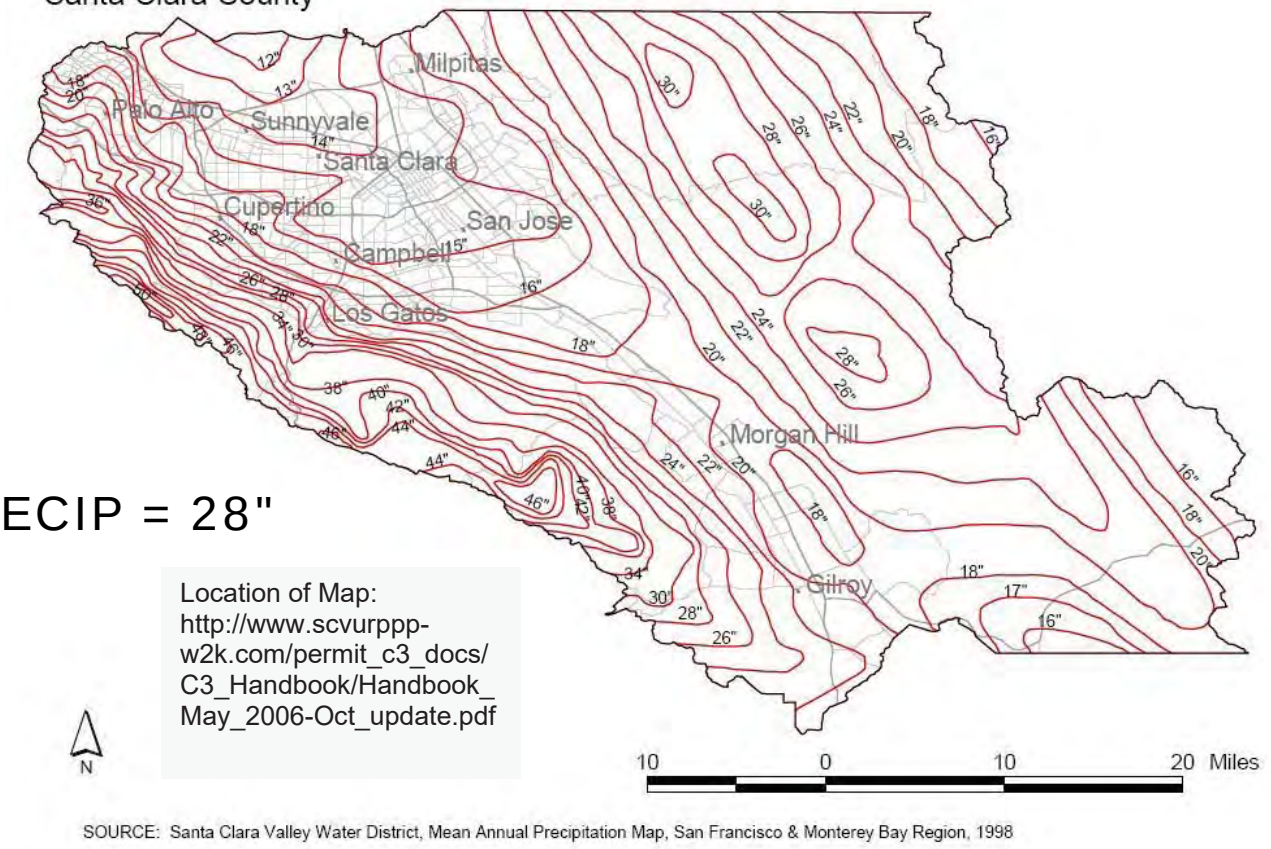
Proposed Conditions

Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
10-12	1,531.0	1,288.0	944	0.26	12.6
20-22	1,154.0	970.0	930	0.20	12.8

Table B-2: Parameters $A_{T,D}$ and $B_{T,D}$ for TDS Equation

Return Period/Duration	$A_{T,D}$	$B_{T,D}$
25-YR RETURN PERIOD		
5-min	0.230641	0.002691
10-min	0.287566	0.004930
15-min	0.348021	0.005594
30-min	0.443761	0.008719
1-hr	0.508791	0.016680
2-hr	0.612629	0.031025
3-hr	0.689252	0.044264
6-hr	0.693566	0.083195
12-hr	0.725892	0.132326
24-hr	0.675008	0.195496
48-hr	0.989588	0.264703
72-hr	0.967854	0.316424
50-YR RETURN PERIOD		
5-min	0.249324	0.003241
10-min	0.300971	0.006161
15-min	0.384016	0.006315
30-min	0.496301	0.009417
1-hr	0.568345	0.017953
2-hr	0.672662	0.033694
3-hr	0.754661	0.048157
6-hr	0.740666	0.092105
12-hr	0.779967	0.147303
24-hr	0.747121	0.219673
48-hr	1.108358	0.295510
72-hr	1.075643	0.353143
100-YR RETURN PERIOD		
5-min	0.269993	0.003580
10-min	0.315263	0.007312
15-min	0.421360	0.006957
30-min	0.553934	0.009857
1-hr	0.626608	0.019201
2-hr	0.732944	0.036193
3-hr	0.816471	0.051981
6-hr	0.776677	0.101053
12-hr	0.821859	0.162184
24-hr	0.814046	0.243391
48-hr	1.210895	0.325943
72-hr	1.175000	0.389038

Figure A-2
Mean Annual Precipitation Map
Santa Clara County



SOURCE: Santa Clara Valley Water District, Mean Annual Precipitation Map, San Francisco & Monterey Bay Region, 1998

Figure A-2: Mean Annual Precipitation, Santa Clara County

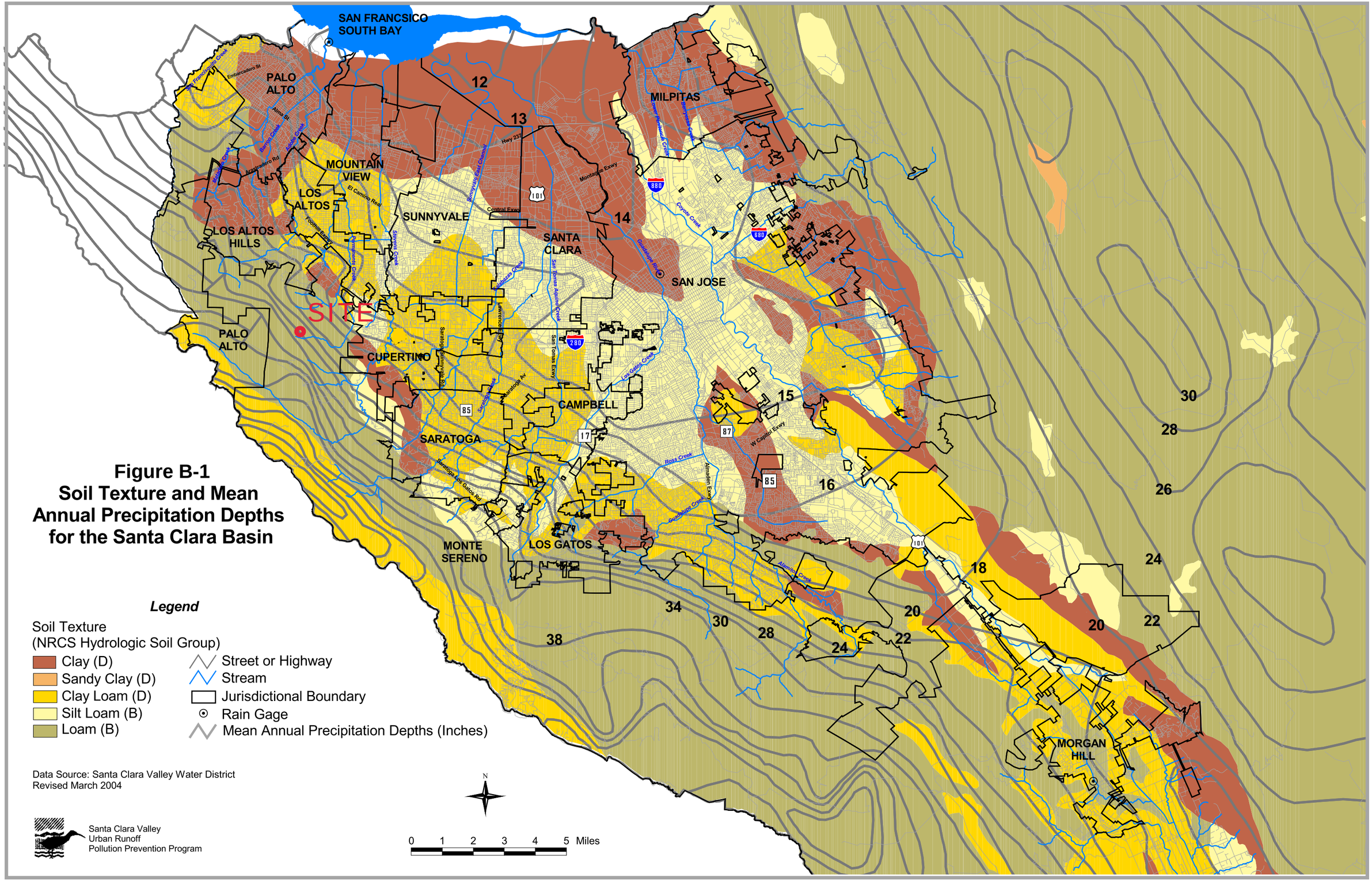


Figure B-1
Soil Texture and Mean Annual Precipitation Depths for the Santa Clara Basin

Table 4

Runoff Coefficients for Agricultural and Open Areas *

RUNOFF PRODUCING CHARACTERISTICS	WATERSHED CHARACTERISTICS			
	A RELIEF	B SOIL INFILTRATION	C VEGETAL COVER	D SURFACE STORAGE
EXTREME	0.40 Steep rugged terrain average slopes greater than 30%	0.20 No effective soil cover; either rock or thin soil mantle negligible infiltration capacity	0.20 No effective plant cover; bare or very sparse soil cover	0.20 Negligible; surface depression few and shallow; drainage ways steep and small, no ponds or marshes
HIGH	0.30 Hilly with average slopes of 10 to 30%	0.15 Slow to take up water; clay or other soil of low infiltration capacity such as heavy gumbo	0.15 Poor to fair; clean cultivated crops or poor natural cover; less than 10% of area under good cover	0.15 Low; well defined system of small drainage ways; no ponds or marshes
NORMAL	0.20 Rolling with average slopes of 5 to 10%	0.10 Normal, deep loam	0.10 Fair to good; about 50% of area in good grass land, woodland or equivalent cover	0.10 Normal; considerable surface depression storage; typical of prairie lands; lakes, ponds and marshes less than 20% of area
LOW	0.10 Relatively flat land average slopes 0 to 5%	0.05 High; deep sand or other soil that takes up water readily and rapidly	0.05 Good to excellent; about 90% of area in good grass land, woodland or equivalent cover	0.05 High; surface depression storage high; drainage system not sharply defined, Lg. flood plain storage; large number of ponds and marshes

NOTE: Runoff coefficient is equal to sum of coefficients from the appropriate block in Rows A, B, C and D.

* After H. L. Cook, as published in Engineering for Agricultural Drainage, by Harry B. Roe and Quincy C. Ayres, McGraw-Hill Book Co., Inc., New York, 1954, p. 105.

EXISTING CONDITION
(PRE-PROJECT)
ANALYSES

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 01/26/19

Permanente Quarry
Existing Conditions
25-Year Flow Rate
County of Santa Clara Rational Method

********* Hydrology Study Control Information **********

Program License Serial Number 4028

Rational hydrology study storm event year is 25.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		3.672(In.)
2	10.000		2.554(In.)
3	15.000		2.019(In.)
4	30.000		1.376(In.)
5	60.000		0.976(In.)
6	120.000		0.741(In.)
7	180.000		0.643(In.)
8	360.000		0.504(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows

```
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ..... qn
TC = t of stream with largest q


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   714.000(Ft.)
Top (of initial area) elevation =  1540.000(Ft.)
Bottom (of initial area) elevation =  1392.500(Ft.)
Difference in elevation =   147.500(Ft.)
Slope =    0.20658  s(%)=      20.66
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.308(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
Subarea runoff =     39.673(CFS)
Total initial stream area =       19.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       12.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   886.000(Ft.)
Top (of initial area) elevation =  1601.000(Ft.)
Bottom (of initial area) elevation =  1330.000(Ft.)
Difference in elevation =   271.000(Ft.)
Slope =    0.30587  s(%)=      30.59
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.308(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      8.769(CFS)
Total initial stream area =        4.470(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       14.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1330.000(Ft.)
Downstream point elevation =   814.000(Ft.)
```

```
Channel length thru subarea  =  1964.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     59.028(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     59.028(CFS)
Depth of flow =   1.007(Ft.), Average velocity =  11.696(Ft/s)
Channel flow top width =    7.027(Ft.)
Flow Velocity =   11.70(Ft/s)
Travel time  =    2.80 min.
Time of concentration =   15.10 min.
Critical depth =      1.625(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.015(In/Hr) for a    25.0 year storm
Subarea runoff =     87.751(CFS) for     51.240(Ac.)
Total runoff =     96.520(CFS)   Total area =      55.710(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   213.000(Ft.)
Top (of initial area) elevation =  1042.000(Ft.)
Bottom (of initial area) elevation =   982.000(Ft.)
Difference in elevation =    60.000(Ft.)
Slope =    0.28169  s(%)=      28.17
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.800 min.
Rainfall intensity =      2.468(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      1.091(CFS)
Total initial stream area =        0.520(Ac.)
End of computations, total study area =          75.330 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 01/26/19

Permanente Quarry
Existing Conditions
100-Year Flow Rate
County of Santa Clara Rational Method

********* Hydrology Study Control Information **********

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		4.443(In.)
2	10.000		3.120(In.)
3	15.000		2.465(In.)
4	30.000		1.660(In.)
5	60.000		1.164(In.)
6	120.000		0.873(In.)
7	180.000		0.757(In.)
8	360.000		0.601(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows

```
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ..... qn
TC = t of stream with largest q


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   714.000(Ft.)
Top (of initial area) elevation =  1540.000(Ft.)
Bottom (of initial area) elevation =  1392.500(Ft.)
Difference in elevation =   147.500(Ft.)
Slope =    0.20658  s(%)=      20.66
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.819(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
Subarea runoff =     48.453(CFS)
Total initial stream area =       19.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       12.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   886.000(Ft.)
Top (of initial area) elevation =  1601.000(Ft.)
Bottom (of initial area) elevation =  1330.000(Ft.)
Difference in elevation =   271.000(Ft.)
Slope =    0.30587  s(%)=      30.59
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.819(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =     10.710(CFS)
Total initial stream area =        4.470(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       14.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1330.000(Ft.)
Downstream point elevation =   814.000(Ft.)
```

```
Channel length thru subarea  =  1964.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     72.092(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     72.092(CFS)
Depth of flow =   1.115(Ft.), Average velocity =  12.355(Ft/s)
Channel flow top width =    7.462(Ft.)
Flow Velocity =   12.36(Ft/s)
Travel time  =    2.65 min.
Time of concentration =   14.95 min.
Critical depth =      1.797(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.472(In/Hr) for a   100.0 year storm
Subarea runoff =    107.650(CFS) for     51.240(Ac.)
Total runoff =    118.359(CFS)   Total area =      55.710(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   213.000(Ft.)
Top (of initial area) elevation =  1042.000(Ft.)
Bottom (of initial area) elevation =   982.000(Ft.)
Difference in elevation =    60.000(Ft.)
Slope =    0.28169  s(%)=      28.17
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.800 min.
Rainfall intensity =      3.015(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      1.333(CFS)
Total initial stream area =        0.520(Ac.)
End of computations, total study area =          75.330 (Ac.)
```

PROPOSED CONDITION
(POST-PROJECT)
ANALYSES

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 01/26/19

Permanente Quarry
Proposed Conditions
25-Year Flow Rate
County of Santa Clara Rational Method

********* Hydrology Study Control Information **********

Program License Serial Number 4028

Rational hydrology study storm event year is 25.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		3.672(In.)
2	10.000		2.554(In.)
3	15.000		2.019(In.)
4	30.000		1.376(In.)
5	60.000		0.976(In.)
6	120.000		0.741(In.)
7	180.000		0.643(In.)
8	360.000		0.504(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows

```
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ..... qn
TC = t of stream with largest q


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       12.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   944.000(Ft.)
Top (of initial area) elevation =  1531.000(Ft.)
Bottom (of initial area) elevation =  1288.000(Ft.)
Difference in elevation =   243.000(Ft.)
Slope =    0.25742  s(%)=      25.74
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.600 min.
Rainfall intensity =      2.276(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =     14.779(CFS)
Total initial stream area =        7.640(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       14.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1288.000(Ft.)
Downstream point elevation =  1285.000(Ft.)
Channel length thru subarea  =   615.000(Ft.)
Channel base width    =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     23.416(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     23.416(CFS)
Depth of flow =   1.710(Ft.), Average velocity =   2.526(Ft/s)
Channel flow top width =    8.840(Ft.)
Flow Velocity =    2.53(Ft/s)
Travel time  =    4.06 min.
Time of concentration =   16.66 min.
Critical depth =      1.125(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.948(In/Hr) for a    25.0 year storm
Subarea runoff =     14.786(CFS) for      8.930(Ac.)
Total runoff =     29.565(CFS)   Total area =      16.570(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1285.000(Ft.)
Downstream point elevation =   911.000(Ft.)
Channel length thru subarea  =  1291.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     35.988(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     35.988(CFS)
Depth of flow =   0.757(Ft.), Average velocity =  10.540(Ft/s)
Channel flow top width =    6.026(Ft.)
Flow Velocity =   10.54(Ft/s)
Travel time  =    2.04 min.
Time of concentration =   18.70 min.
Critical depth =      1.250(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.860(In/Hr) for a    25.0 year storm
Subarea runoff =     11.386(CFS) for      7.200(Ac.)
Total runoff =     40.951(CFS)   Total area =      23.770(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       16.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Time of concentration =    18.70 min.
Rainfall intensity =      1.860(In/Hr) for a    25.0 year storm
Subarea runoff =     39.740(CFS) for     25.130(Ac.)
Total runoff =     80.691(CFS)   Total area =      48.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       18.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   911.000(Ft.)
Downstream point elevation =   805.000(Ft.)
Channel length thru subarea  =   831.000(Ft.)
Channel base width    =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     85.468(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
```

```
Flow(q) thru subarea =     85.468(CFS)
Depth of flow =   1.464(Ft.), Average velocity =  11.849(Ft/s)
Channel flow top width =    7.855(Ft.)
Flow Velocity =   11.85(Ft/s)
Travel time  =    1.17 min.
Time of concentration =   19.87 min.
Critical depth =      2.125(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.810(In/Hr) for a    25.0 year storm
Subarea runoff =      8.910(CFS) for      5.790(Ac.)
Total runoff =     89.601(CFS)   Total area =      54.690(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   930.000(Ft.)
Top (of initial area) elevation =  1154.000(Ft.)
Bottom (of initial area) elevation =   970.000(Ft.)
Difference in elevation =   184.000(Ft.)
Slope =    0.19785  s(%)=      19.78
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.800 min.
Rainfall intensity =      2.254(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      2.951(CFS)
Total initial stream area =        1.540(Ac.)
End of computations, total study area =          56.230 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 01/26/19

Permanente Quarry
Proposed Conditions
100-Year Flow Rate
County of Santa Clara Rational Method

********* Hydrology Study Control Information **********

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		4.443(In.)
2	10.000		3.120(In.)
3	15.000		2.465(In.)
4	30.000		1.660(In.)
5	60.000		1.164(In.)
6	120.000		0.873(In.)
7	180.000		0.757(In.)
8	360.000		0.601(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows

```
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ..... qn
TC = t of stream with largest q


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       12.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   944.000(Ft.)
Top (of initial area) elevation =  1531.000(Ft.)
Bottom (of initial area) elevation =  1288.000(Ft.)
Difference in elevation =   243.000(Ft.)
Slope =    0.25742  s(%)=      25.74
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.600 min.
Rainfall intensity =      2.779(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =     18.049(CFS)
Total initial stream area =        7.640(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       14.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1288.000(Ft.)
Downstream point elevation =  1285.000(Ft.)
Channel length thru subarea  =   615.000(Ft.)
Channel base width    =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     28.598(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     28.598(CFS)
Depth of flow =   1.873(Ft.), Average velocity =   2.658(Ft/s)
Channel flow top width =    9.490(Ft.)
Flow Velocity =    2.66(Ft/s)
Travel time  =    3.86 min.
Time of concentration =   16.46 min.
Critical depth =      1.250(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.387(In/Hr) for a   100.0 year storm
Subarea runoff =     18.118(CFS) for      8.930(Ac.)
Total runoff =     36.167(CFS)   Total area =      16.570(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1285.000(Ft.)
Downstream point elevation =   911.000(Ft.)
Channel length thru subarea  =  1291.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     44.025(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     44.025(CFS)
Depth of flow =   0.842(Ft.), Average velocity =  11.163(Ft/s)
Channel flow top width =    6.368(Ft.)
Flow Velocity =   11.16(Ft/s)
Travel time  =    1.93 min.
Time of concentration =   18.38 min.
Critical depth =      1.391(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.283(In/Hr) for a   100.0 year storm
Subarea runoff =     13.975(CFS) for      7.200(Ac.)
Total runoff =     50.141(CFS)   Total area =      23.770(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       16.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Time of concentration =    18.38 min.
Rainfall intensity =      2.283(In/Hr) for a   100.0 year storm
Subarea runoff =     48.775(CFS) for     25.130(Ac.)
Total runoff =     98.917(CFS)   Total area =      48.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       18.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   911.000(Ft.)
Downstream point elevation =   805.000(Ft.)
Channel length thru subarea  =   831.000(Ft.)
Channel base width    =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    104.773(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
```

```
Flow(q) thru subarea =    104.773(CFS)
Depth of flow =   1.609(Ft.), Average velocity =  12.485(Ft/s)
Channel flow top width =    8.434(Ft.)
Flow Velocity =   12.49(Ft/s)
Travel time  =    1.11 min.
Time of concentration =   19.49 min.
Critical depth =      2.344(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.224(In/Hr) for a   100.0 year storm
Subarea runoff =     10.945(CFS) for      5.790(Ac.)
Total runoff =    109.861(CFS)   Total area =      54.690(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   930.000(Ft.)
Top (of initial area) elevation =  1154.000(Ft.)
Bottom (of initial area) elevation =   970.000(Ft.)
Difference in elevation =   184.000(Ft.)
Slope =    0.19785  s(%)=      19.78
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.800 min.
Rainfall intensity =      2.753(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      3.604(CFS)
Total initial stream area =        1.540(Ac.)
End of computations, total study area =          56.230 (Ac.)
```

APPENDIX B

UNIT HYDROGRAPH ANALYSES

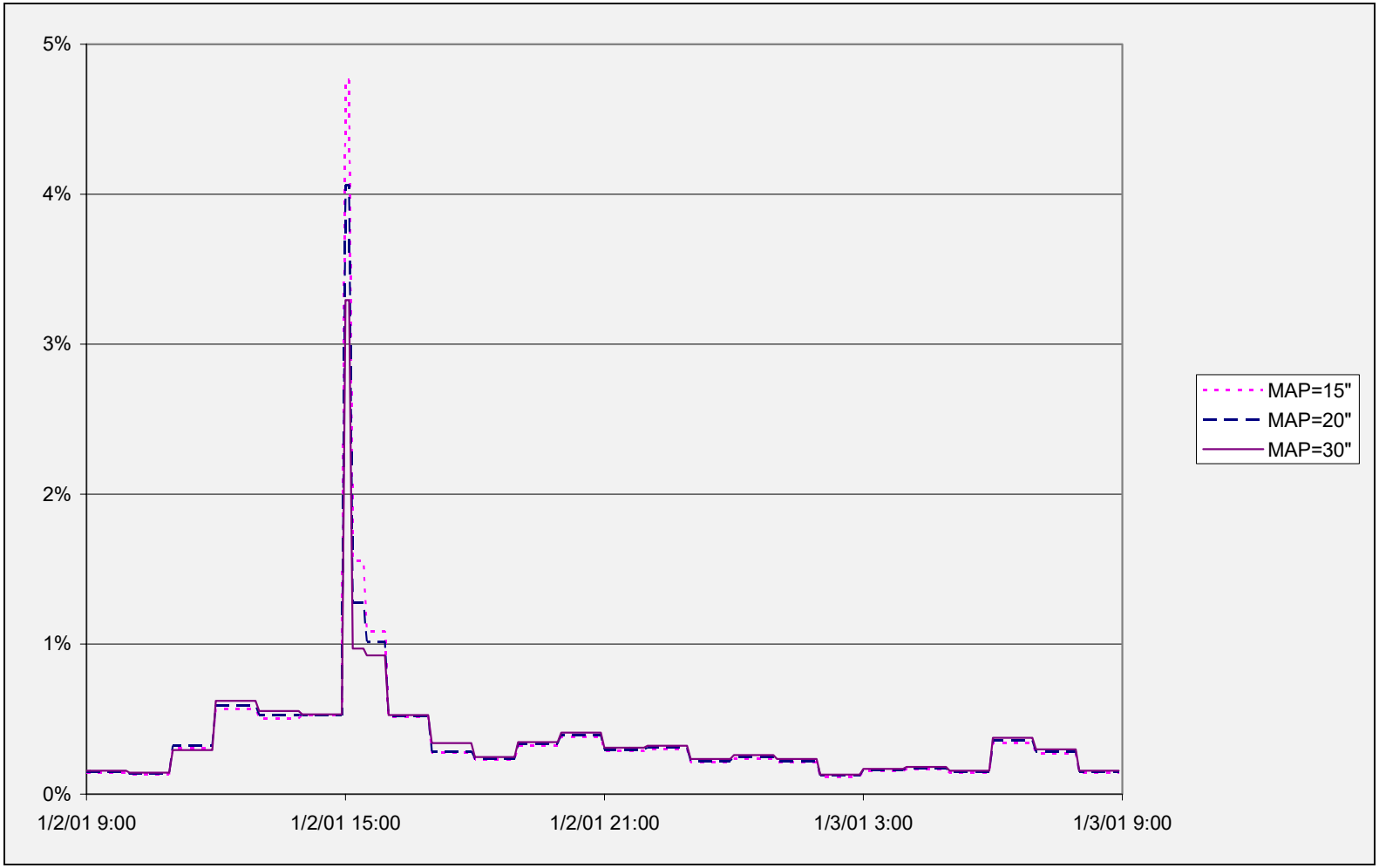


Figure D-1: Normalized Rainfall Pattern

Table D-1: Fractions of Total Rainfall for 24-Hour, 5-Minute Pattern

Time Starting	Fraction of Total Rainfall (%) *MAP=15″*	Fraction of Total Rainfall (%) *MAP=20″*	Fraction of Total Rainfall (%) *MAP=30″*
0:00	0.1412	0.1482	0.1558
1:00	0.1294	0.1358	0.1429
2:00	0.3080	0.3223	0.2945
3:00	0.5667	0.5930	0.6214
4:00	0.5051	0.5285	0.5538
5:00	0.5272	0.5266	0.5324
6:00	4.760	4.060	3.2950
6:10	1.554	1.275	0.9700
6:30	1.085	1.0169	0.9253
7:00	0.5177	0.5229	0.5263
8:00	0.2763	0.2860	0.3410
9:00	0.2302	0.2384	0.2478
10:00	0.3223	0.3337	0.3469
11:00	0.3799	0.3933	0.4089
12:00	0.2878	0.2979	0.3098
13:00	0.2993	0.3099	0.3222
14:00	0.2118	0.2223	0.2338
15:00	0.2353	0.2470	0.2597
16:00	0.2118	0.2223	0.2338
17:00	0.1177	0.1235	0.1299
18:00	0.1530	0.1605	0.1688
19:00	0.1647	0.1729	0.1818
20:00	0.1412	0.1482	0.1558
21:00	0.3412	0.3581	0.3766
22:00	0.2706	0.2840	0.2987
23:00	0.1412	0.1482	0.1558

Table E-1: Curve Numbers for AMC II

Land Use Type	Hydrologic Condition	Hydrologic Soil Group A	B	C	D
Open Water (100% Impervious)	good				
	fair				
	poor				
Low Density Residential (25% Impervious)	good	35	48	66	70
	fair	44	58	71	74
	poor	64	68	78	79
High Density Residential (50% Impervious)	good	35	48	65	70
	fair	44	58	71	74
	poor	64	68	78	79
Commercial/Industrial (80% Impervious)	good	35	48	65	70
	fair	44	58	71	74
	poor	64	68	78	79
Bare Rock/Sand/Clay (Imperviousness Varies)					
Quarries/Gravel Pits (0 % Impervious)	good	0	0	0	0
	fair	0	0	0	0
	poor	0	0	0	0
Deciduous Forest (0% Impervious)	good	27	30	41	48
	fair	35	48	57	63
	poor	48	66	74	79
Evergreen Forest (0% Impervious)	good	37	43	62	70
	fair	45	57	69	80
	poor	58	71	85	90
Mixed Forest	good	32	36	51	59
	fair	40	52	63	72
	poor	53	68	80	85
Shrub Land (0% Impervious)	good	27	43	60	68
	fair	35	51	65	72
	poor	48	62	72	78
Orchards (1% Impervious)	good	39	52	66	71
	fair	43	65	76	82
	poor	57	73	82	86
Vineyards (1% Impervious)	good	64	70	77	80
	fair	67	75	82	85
	poor	71	80	87	90
Grassland (0% Impervious)	good	38	50	69	76
	fair	48	60	74	80
	poor	58	70	80	84
Pasture/Hay (0% Impervious)	good	34	50	69	76
	fair	44	60	74	80
	poor	64	70	80	84
Row Crops (1% Impervious)	good	64	70	77	80
	fair	67	75	82	85
	poor	71	80	87	90
Small Grains (0% Impervious)	good	48	58	70	74
	fair	49	59	71	75
	poor	50	60	71	75
Fallow (1% Impervious)	good	64	68	78	79
	fair	70	77	84	86
	poor	77	86	91	94
Urban Recreational (10% Impervious)	good	34	48	66	70
	fair	44	58	71	74
	poor	64	64	78	79

Table E-2: Conversion of AMC II Curve Numbers to Other AMC Values

AMC II	AMC I	AMC III	AMC II-1/4	AMC II-1/2		AMC II	AMC I	AMC III	AMC II-1/4	AMC II-1/2
100	100	100	100	100		61	41	78	65.5	70
99	97	100	99.5	100		60	40	78	64.5	69
98	94	99	98.5	99		59	39	77	63.5	68
97	91	99	97.5	98		58	38	76	62.5	67
96	89	99	97	98		57	37	75	61.5	66
95	87	98	96	97		56	36	75	61	66
94	85	98	95	96		55	35	74	60	65
93	83	98	94.5	96		54	34	73	59	64
92	81	97	93.5	95		53	33	72	58	63
91	80	97	92.5	94		52	32	71	57	62
90	78	96	91.5	93		51	31	70	56	61
89	76	96	91	93		50	31	70	55	60
88	75	95	90	92		49	30	69	54	59
87	73	95	89	91		48	29	68	53	58
86	72	94	88	90		47	28	67	52	57
85	70	94	87.5	90		46	27	66	51	56
84	68	93	86.5	89		45	26	65	50	55
83	67	93	85.5	88		44	25	64	49	54
82	66	92	84.5	87		43	25	63	48	53
81	64	92	84	87		42	24	62	47	52
80	63	91	83	86		41	23	61	46	51
79	62	91	82	85		40	22	60	45	50
78	60	90	81	84		39	21	59	44	49
77	59	89	80	83		38	21	58	43	48
76	58	89	79.5	83		37	20	57	42	47
75	57	88	78.5	82		36	19	56	41	46
74	55	88	77.5	81		35	18	55	40	45
73	54	87	76.5	80		34	18	54	39	44
72	53	86	75.5	79		33	17	53	38	43
71	52	86	75	79		32	16	52	37	42
70	51	85	74	78		31	16	51	36	41
69	50	84	73	77		30	15	50	35	40
68	48	84	72	76		25	12	43	29.5	34
67	47	83	71	75		20	9	37	24.5	29
66	46	82	70	74		15	6	30	19	23
65	45	82	69.5	74		10	4	22	13	16
64	44	81	68.5	73		5	2	13	7	9
63	43	80	67.5	72		0	0	0	0	0

EXISTING CONDITION
(PRE-PROJECT)
ANALYSES

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   26JAN19  TIME  21:59:20   *
*                                       *
*****************************************
```


```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```


```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X       XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX  XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9.....10

                       *DIAGRAM
*** FREE ***
             1         ID   PERMANENTE QUARRY
             2         ID   EXISTING CONDITIONS
             3         ID   25-YEAR FLOW RATE
             4         ID   COUNTY OF SANTA CLARA HYDROGRAPH METHOD
             5         IT       5       0       0     300
             6         IO       5       2

             7         KK WMSA-NQ
             8         IN       5
             9         PB    6.15
            10         PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
            11         PI  0.0015  0.0015  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014   0.001
            12         PI  0.0014  0.0014  0.0014  0.0014  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
            13         PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0062  0.0062  0.0062   0.006
            14         PI  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0055   0.005
            15         PI  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055   0.005
            16         PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
            17         PI  0.0053  0.0053  0.0345  0.0345  0.0103  0.0103  0.0103  0.0103  0.0094   0.009
            18         PI  0.0094  0.0094  0.0094  0.0094  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
            19         PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0033  0.0033  0.0033   0.003
            20         PI  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0025   0.002
            21         PI  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025   0.002
            22         PI  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034   0.003
            23         PI  0.0034  0.0034  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041   0.004
            24         PI  0.0041  0.0041  0.0041  0.0041  0.0031  0.0031  0.0031  0.0031  0.0031   0.003
            25         PI  0.0031  0.0031  0.0031  0.0031  0.0031  0.0031  0.0032  0.0032  0.0032   0.003
            26         PI  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0023   0.002
            27         PI  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
            28         PI  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026   0.002
            29         PI  0.0026  0.0026  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
            30         PI  0.0023  0.0023  0.0023  0.0023  0.0013  0.0013  0.0013  0.0013  0.0013   0.001
            31         PI  0.0013  0.0013  0.0013  0.0013  0.0013  0.0013  0.0017  0.0017  0.0017   0.001
            32         PI  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0018   0.001
            33         PI  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018   0.001
            34         PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
            35         PI  0.0015  0.0015  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037   0.003
            36         PI  0.0037  0.0037  0.0037  0.0037  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
            37         PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0015  0.0015  0.0015   0.001
            38         PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015
            39         BA  0.5960
            40         LS    0.22      90
            41         UD     .55
            42         ZZ



                SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    7     WMSA-NQ

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   26JAN19  TIME  21:59:20   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

PERMANENTE QUARRY
EXISTING CONDITIONS
25-YEAR FLOW RATE
COUNTY OF SANTA CLARA HYDROGRAPH METHOD

6 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	2	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

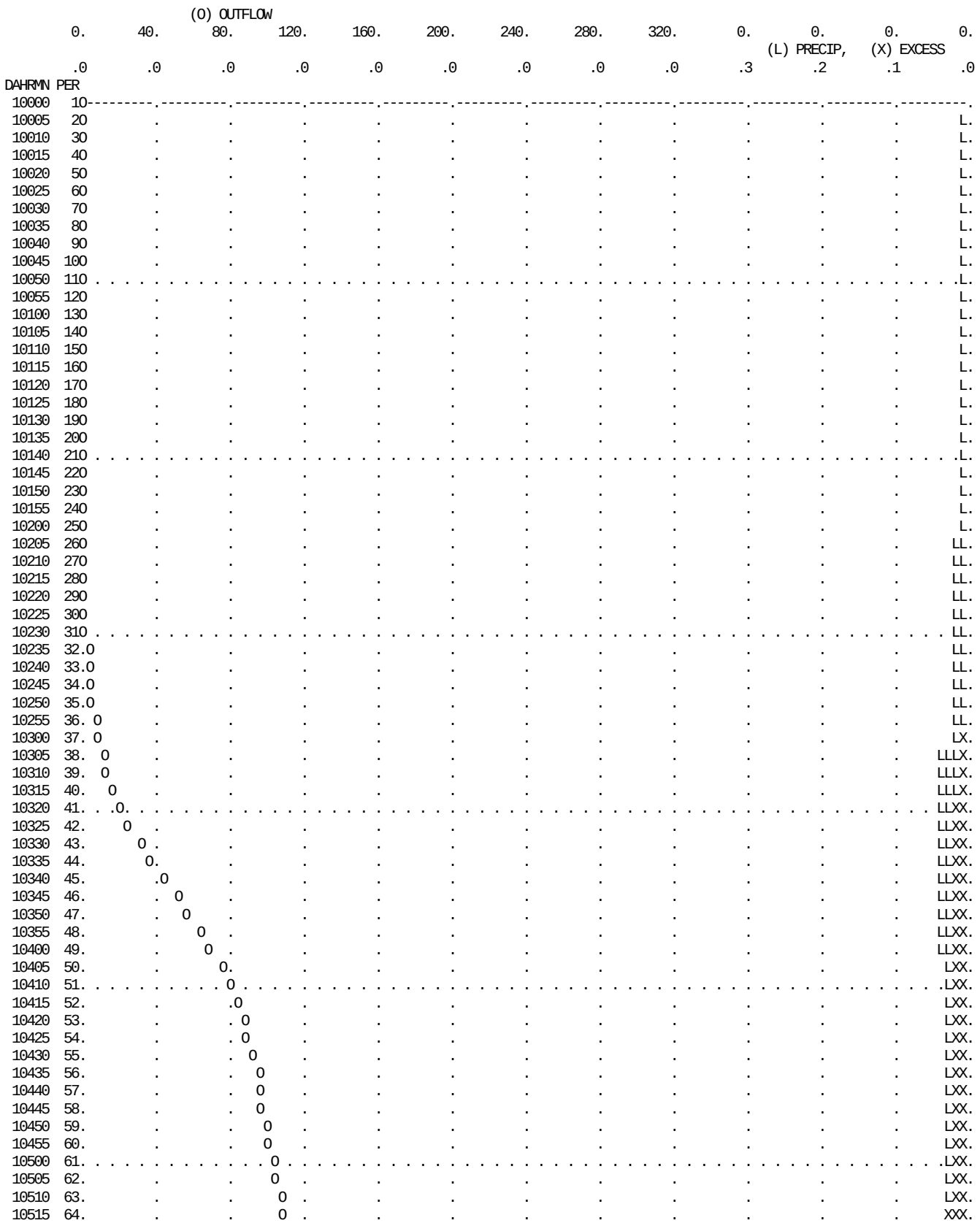
NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1 0	STARTING DATE
ITIME	0000	STARTING TIME
NQ	300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2 0	ENDING DATE
NDTIME	0055	ENDING TIME
ICENT	19	CENTURY MARK

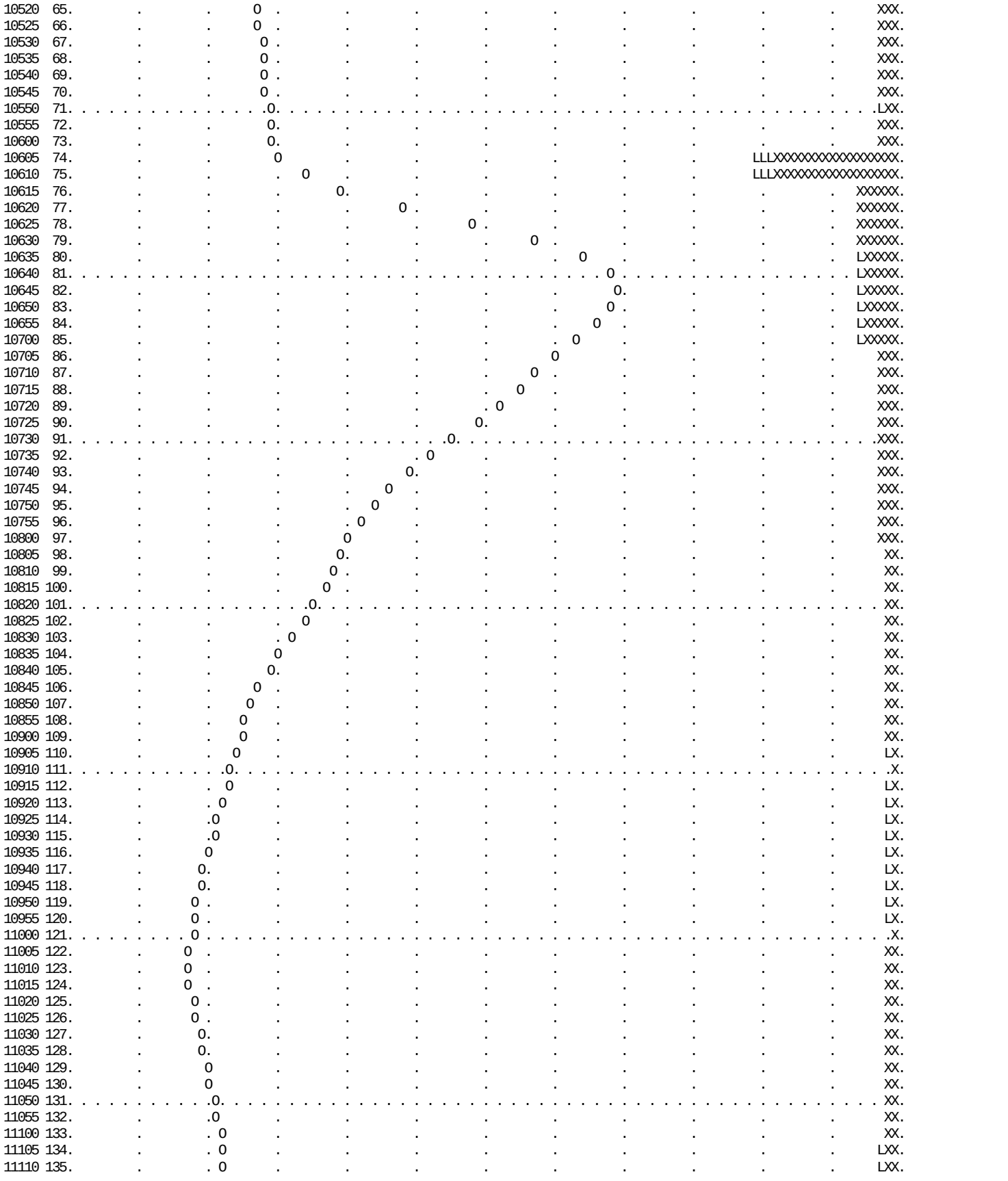
COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

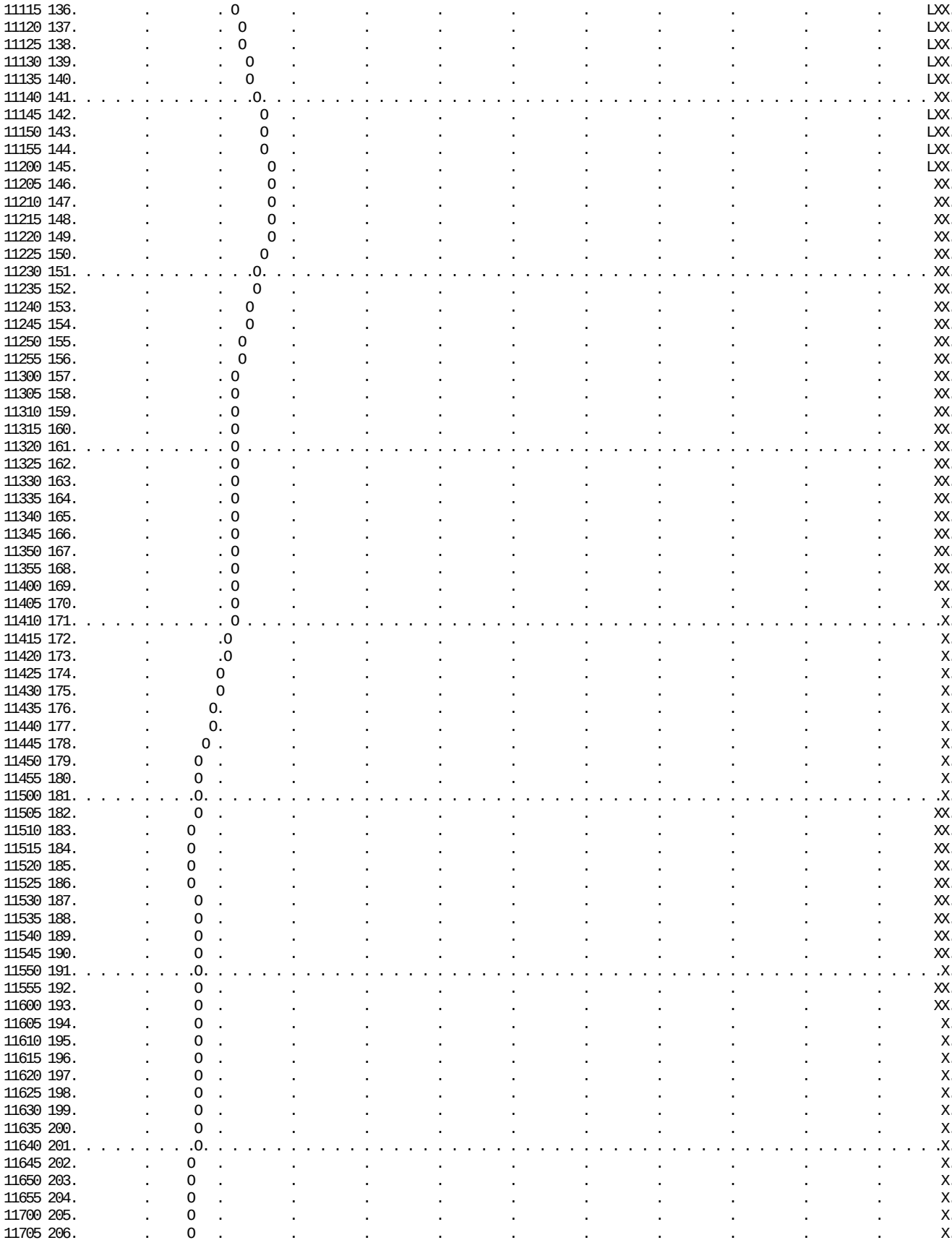
ENGLISH UNITS

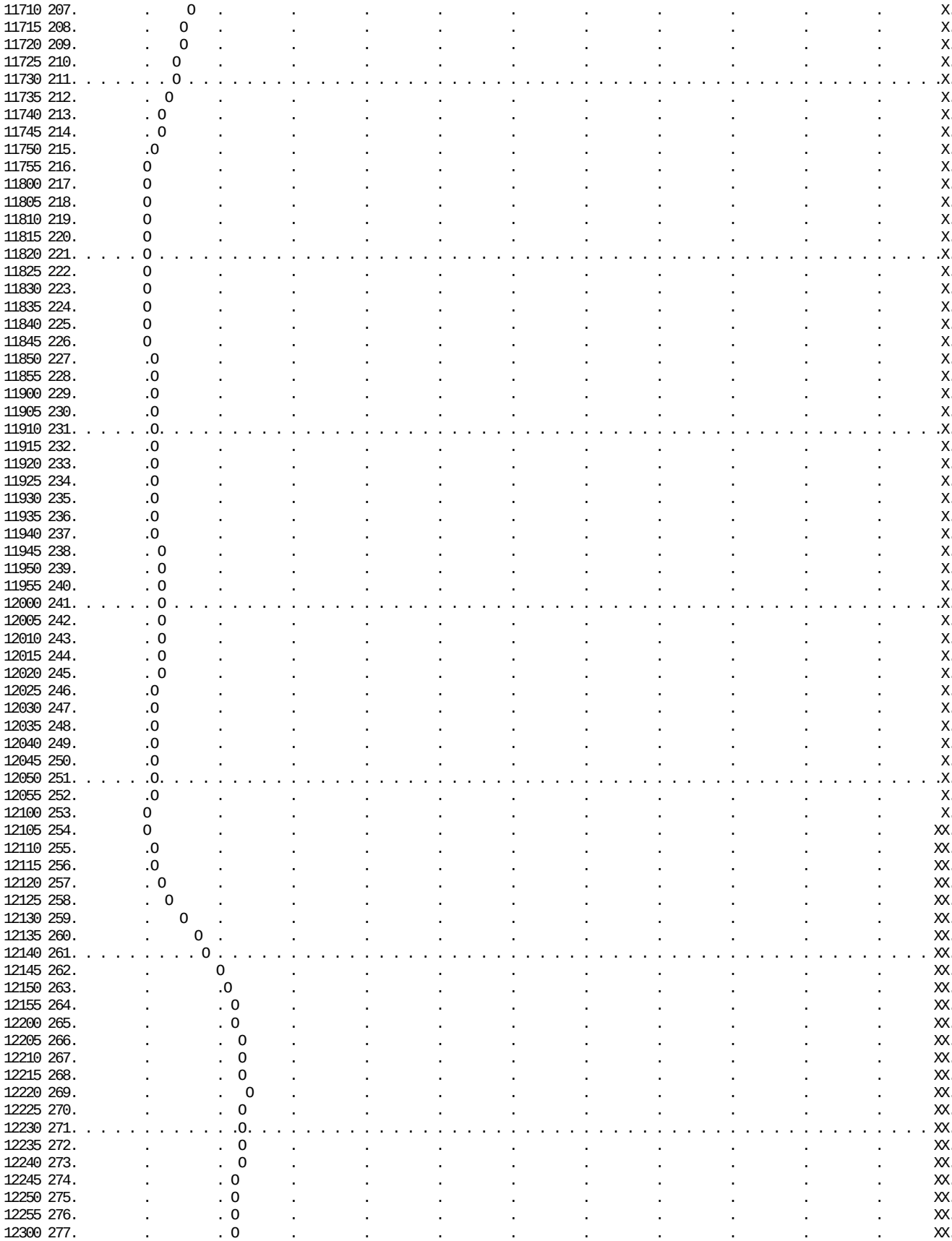
DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

STATION WMSA-NQ










12305 278.
12310 279.
12315 280.
12320 281.
12325 282.
12330 283.
12335 284.
12340 285.
12345 286.
12350 287.
12355 288.
20000 289.
20005 290.
20010 291.
20015 292.
20020 293.
20025 294.
20030 295.
20035 296.
20040 297.
20045 298.
20050 299.
20055 300.

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	WMSA-NQ	316.	6.75	145.	80.	77.	.60		

*** NORMAL END OF HEC-1 ***

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   26JAN19  TIME  21:59:57   *
*                                       *
*****************************************
```


```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*          (916) 756-1104           *
*                                   *
*************************************
```


```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X       XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
         LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

                       *DIAGRAM
*** FREE ***
              1        ID   PERMANENTE QUARRY
              2        ID   EXISTING CONDITIONS
              3        ID   100-YEAR FLOW RATE
              4        ID   COUNTY OF SANTA CLARA HYDROGRAPH METHOD
              5        IT       5       0       0     300
              6        IO       5       2

              7        KK WMSA-NQ
              8        IN       5
              9        PB    7.63
             10        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             11        PI  0.0015  0.0015  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014   0.001
             12        PI  0.0014  0.0014  0.0014  0.0014  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             13        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0062  0.0062  0.0062   0.006
             14        PI  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0055   0.005
             15        PI  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055   0.005
             16        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             17        PI  0.0053  0.0053  0.0345  0.0345  0.0103  0.0103  0.0103  0.0103  0.0094   0.009
             18        PI  0.0094  0.0094  0.0094  0.0094  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             19        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0033  0.0033  0.0033   0.003
             20        PI  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0025   0.002
             21        PI  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025   0.002
             22        PI  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034   0.003
             23        PI  0.0034  0.0034  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041   0.004
             24        PI  0.0041  0.0041  0.0041  0.0041  0.0031  0.0031  0.0031  0.0031  0.0031   0.003
             25        PI  0.0031  0.0031  0.0031  0.0031  0.0031  0.0031  0.0032  0.0032  0.0032   0.003
             26        PI  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0023   0.002
             27        PI  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             28        PI  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026   0.002
             29        PI  0.0026  0.0026  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             30        PI  0.0023  0.0023  0.0023  0.0023  0.0013  0.0013  0.0013  0.0013  0.0013   0.001
             31        PI  0.0013  0.0013  0.0013  0.0013  0.0013  0.0013  0.0017  0.0017  0.0017   0.001
             32        PI  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0018   0.001
             33        PI  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018   0.001
             34        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             35        PI  0.0015  0.0015  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037   0.003
             36        PI  0.0037  0.0037  0.0037  0.0037  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             37        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0015  0.0015  0.0015   0.001
             38        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015
             39        BA  0.5960
             40        LS    0.22      90
             41        UD     .55
             42        ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW

NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

7 WMSA-NQ

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   26JAN19  TIME  21:59:57   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

PERMANENTE QUARRY
EXISTING CONDITIONS
100-YEAR FLOW RATE
COUNTY OF SANTA CLARA HYDROGRAPH METHOD

6 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	2	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

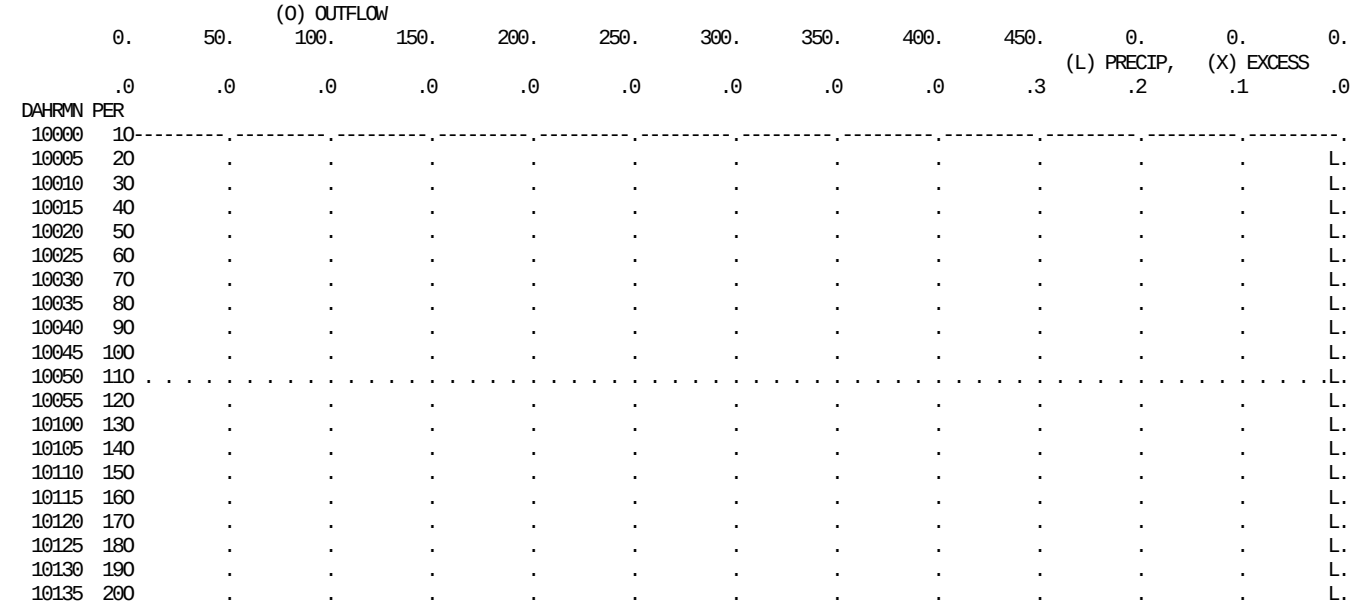
NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1 0	STARTING DATE
ITIME	0000	STARTING TIME
NQ	300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2 0	ENDING DATE
NDTIME	0055	ENDING TIME
ICENT	19	CENTURY MARK

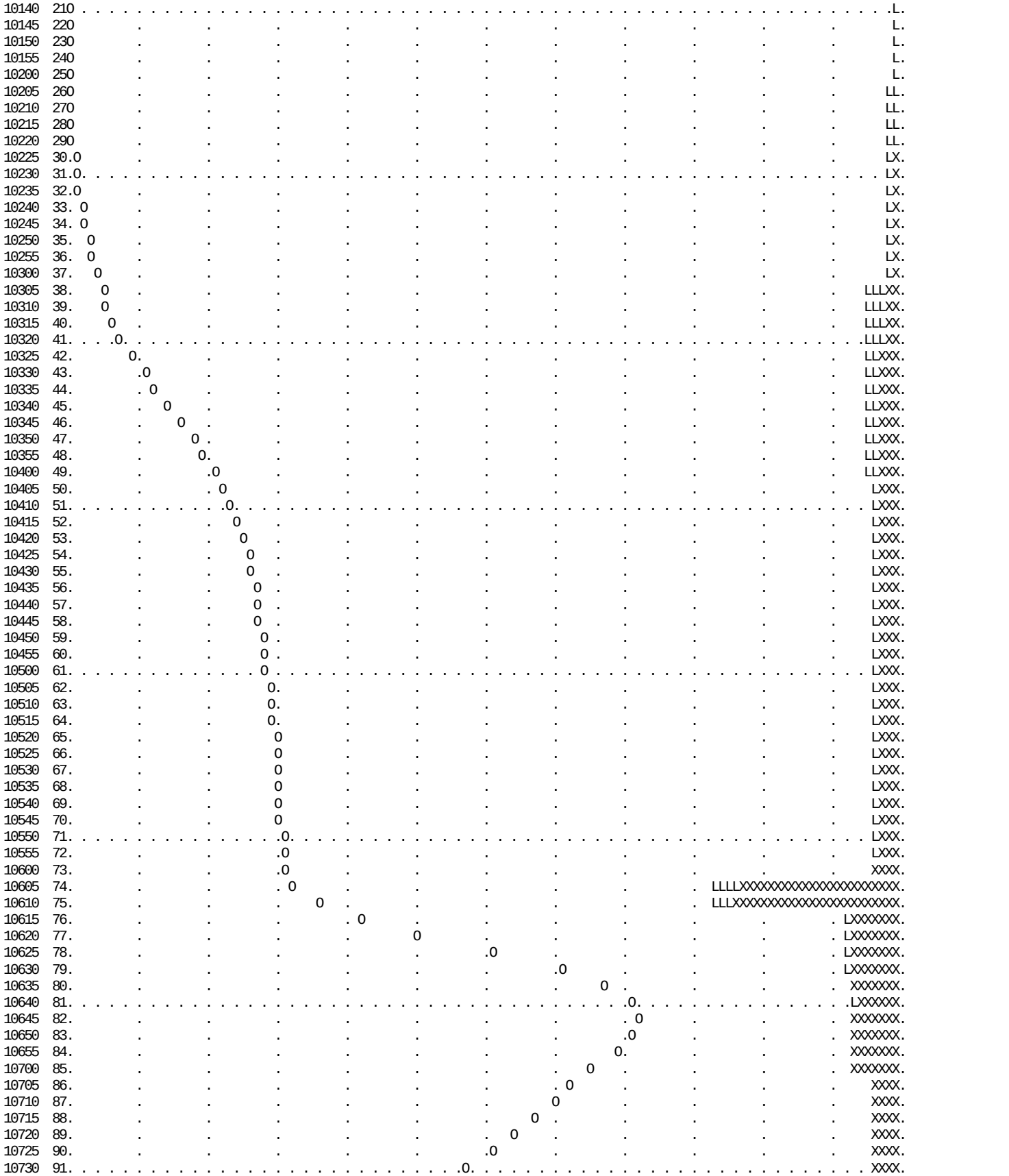
COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

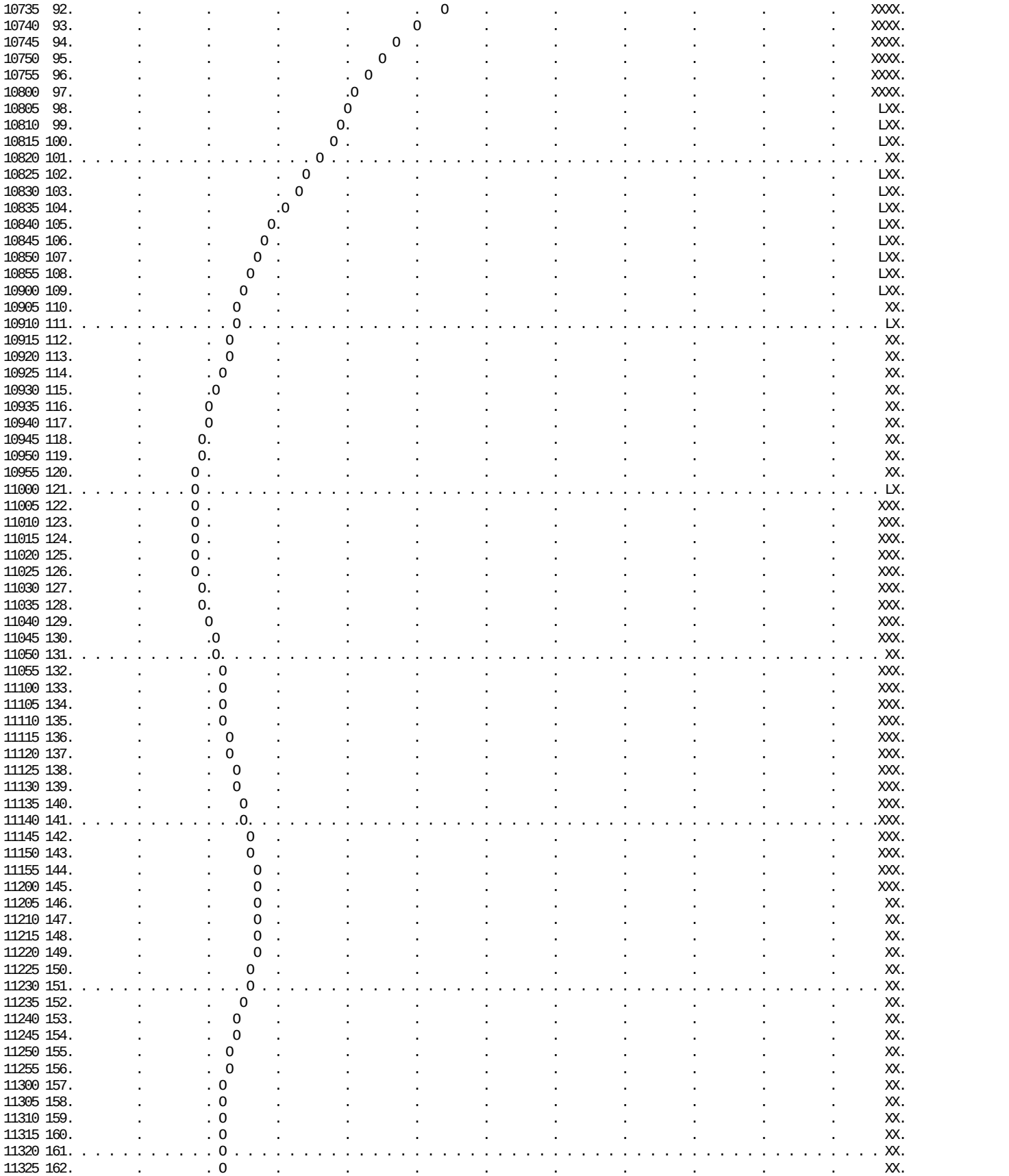
ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

1 STATION WMSA-NQ







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11330 163.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11335 164.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11340 165.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11345 166.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11350 167.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11355 168.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11400 169.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11405 170.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11410 171. . . . . . . . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
11415 172.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11420 173.        .        .0      .        .        .        .        .        .        .        .        .      XX.
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11440 177.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11445 178.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11450 179.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11455 180.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11500 181. . . . . . . . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11505 182.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11510 183.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11515 184.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11520 185.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11525 186.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11530 187.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11535 188.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11540 189.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11545 190.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11550 191. . . . . . . . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11555 192.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11600 193.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11605 194.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11610 195.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11615 196.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11620 197.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11625 198.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11630 199.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11635 200.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11640 201. . . . . . . . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11645 202.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11650 203.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11655 204.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11700 205.        .        .0      .        .        .        .        .        .        .        .        .      XX.
11705 206.        .        .0      .        .        .        .        .        .        .        .        .       X.
11710 207.        .        .0      .        .        .        .        .        .        .        .        .       X.
11715 208.        .        .0      .        .        .        .        .        .        .        .        .       X.
11720 209.        .        .0      .        .        .        .        .        .        .        .        .       X.
11725 210.        .        .0      .        .        .        .        .        .        .        .        .       X.
11730 211. . . . . . . . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11735 212.        .        .0      .        .        .        .        .        .        .        .        .       X.
11740 213.        .        .0      .        .        .        .        .        .        .        .        .       X.
11745 214.        .        .0      .        .        .        .        .        .        .        .        .       X.
11750 215.        .        .0      .        .        .        .        .        .        .        .        .       X.
11755 216.        .        .0      .        .        .        .        .        .        .        .        .       X.
11800 217.        .        .0      .        .        .        .        .        .        .        .        .       X.
11805 218.        .        .0      .        .        .        .        .        .        .        .        .       X.
11810 219.        .        .0      .        .        .        .        .        .        .        .        .       X.
11815 220.        .        .0      .        .        .        .        .        .        .        .        .       X.
11820 221. . . . . . . . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11825 222.        .        .0      .        .        .        .        .        .        .        .        .       X.
11830 223.        .        .0      .        .        .        .        .        .        .        .        .       X.
11835 224.        .        .0      .        .        .        .        .        .        .        .        .       X.
11840 225.        .        .0      .        .        .        .        .        .        .        .        .       X.
11845 226.        .        .0      .        .        .        .        .        .        .        .        .       X.
11850 227.        .        .0      .        .        .        .        .        .        .        .        .       X.
11855 228.        .        .0      .        .        .        .        .        .        .        .        .       X.
11900 229.        .        .0      .        .        .        .        .        .        .        .        .       X.
11905 230.        .        .0      .        .        .        .        .        .        .        .        .       X.
11910 231. . . . . . . . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11915 232.        .        .0      .        .        .        .        .        .        .        .        .       X.
11920 233.        .        .0      .        .        .        .        .        .        .        .        .       X.
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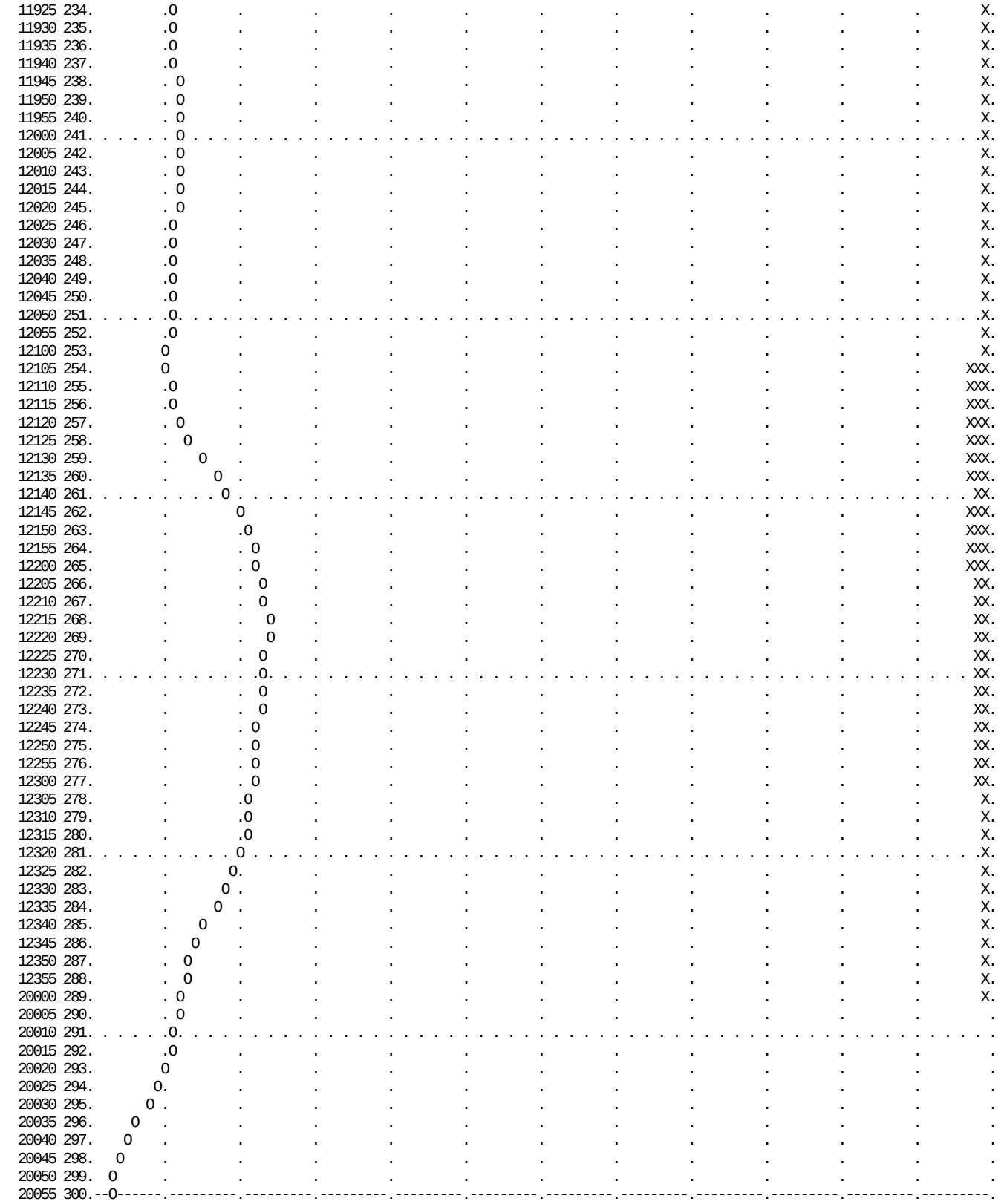


RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND

TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	WMSA-NQ	410.	6.75	191.	103.	99.	.60		

*** NORMAL END OF HEC-1 ***

PROPOSED CONDITION
(POST-PROJECT)
ANALYSES

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   26JAN19  TIME  21:59:38   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X        XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9.....10

                       *DIAGRAM
*** FREE ***
              1        ID   PERMANENTE QUARRY
              2        ID   PROPOSED CONDITIONS
              3        ID   25-YEAR FLOW RATE
              4        ID   COUNTY OF SANTA CLARA HYDROGRAPH METHOD
              5        IT       5       0       0     300
              6        IO       5       2

              7        KK WMSA-NQ
              8        IN       5
              9        PB    6.15
             10        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             11        PI  0.0015  0.0015  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014   0.001
             12        PI  0.0014  0.0014  0.0014  0.0014  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             13        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0062  0.0062  0.0062   0.006
             14        PI  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0055   0.005
             15        PI  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055   0.005
             16        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             17        PI  0.0053  0.0053  0.0345  0.0345  0.0103  0.0103  0.0103  0.0103  0.0094   0.009
             18        PI  0.0094  0.0094  0.0094  0.0094  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             19        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0033  0.0033  0.0033   0.003
             20        PI  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0025   0.002
             21        PI  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025   0.002
             22        PI  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034   0.003
             23        PI  0.0034  0.0034  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041   0.004
             24        PI  0.0041  0.0041  0.0041  0.0041  0.0031  0.0031  0.0031  0.0031  0.0031   0.003
             25        PI  0.0031  0.0031  0.0031  0.0031  0.0031  0.0031  0.0032  0.0032  0.0032   0.003
             26        PI  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0023   0.002
             27        PI  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             28        PI  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026   0.002
             29        PI  0.0026  0.0026  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             30        PI  0.0023  0.0023  0.0023  0.0023  0.0013  0.0013  0.0013  0.0013  0.0013   0.001
             31        PI  0.0013  0.0013  0.0013  0.0013  0.0013  0.0013  0.0017  0.0017  0.0017   0.001
             32        PI  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0018   0.001
             33        PI  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018   0.001
             34        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             35        PI  0.0015  0.0015  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037   0.003
             36        PI  0.0037  0.0037  0.0037  0.0037  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             37        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0015  0.0015  0.0015   0.001
             38        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015
             39        BA  0.6259
             40        LS    0.82      71
             41        UD     .44
             42        ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW

NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

7 WMSA-NQ

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   26JAN19  TIME  21:59:38   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

PERMANENTE QUARRY
PROPOSED CONDITIONS
25-YEAR FLOW RATE
COUNTY OF SANTA CLARA HYDROGRAPH METHOD

6 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	2	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

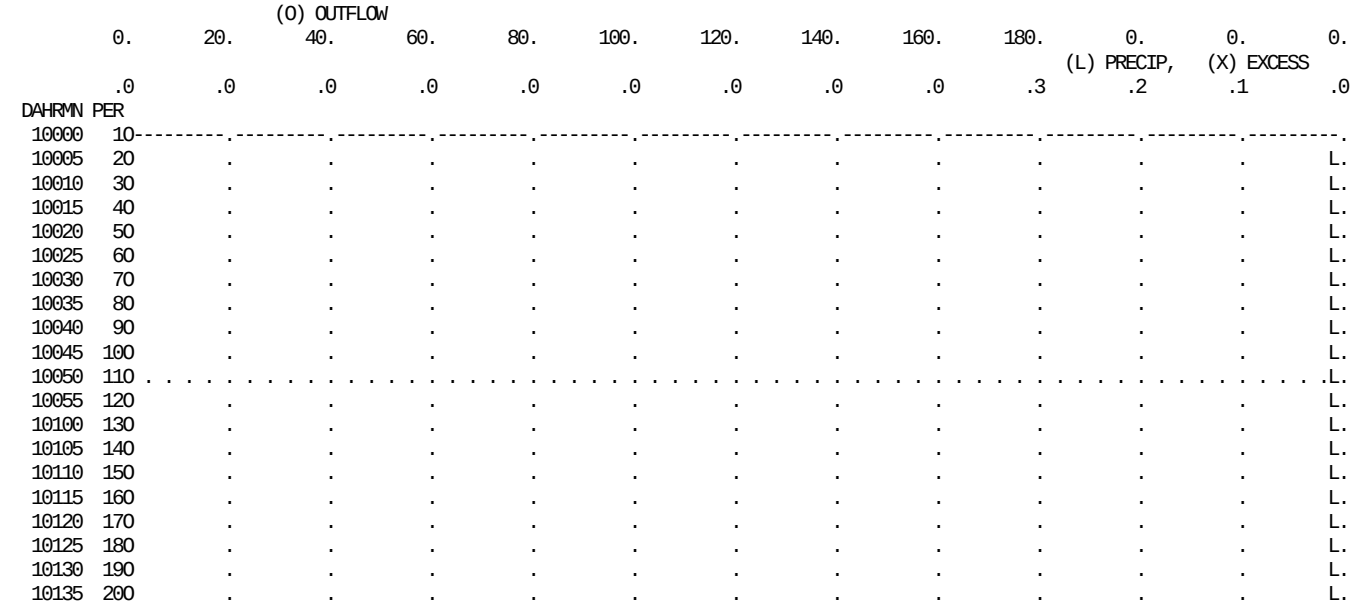
NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1 0	STARTING DATE
ITIME	0000	STARTING TIME
NQ	300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2 0	ENDING DATE
NDTIME	0055	ENDING TIME
ICENT	19	CENTURY MARK

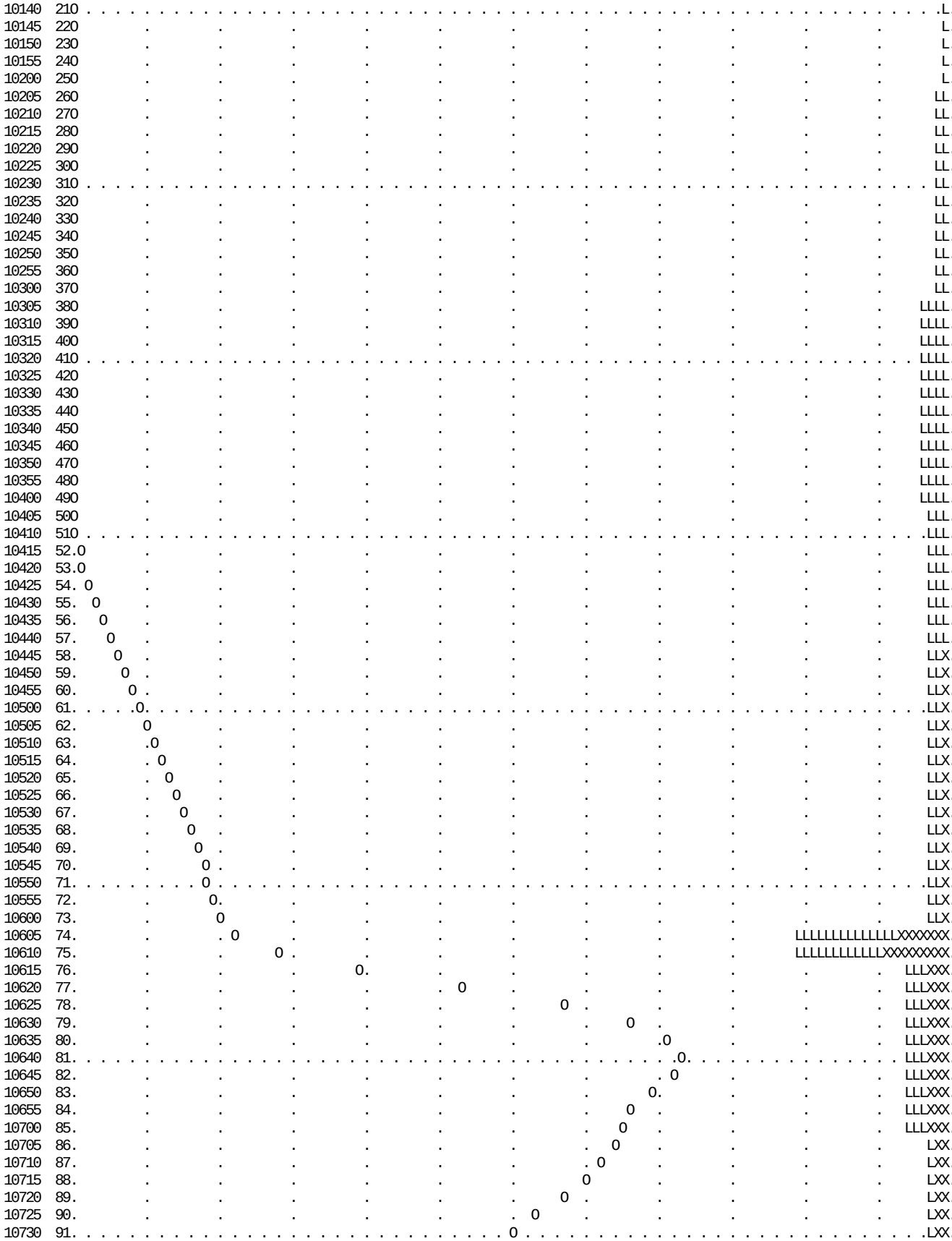
COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

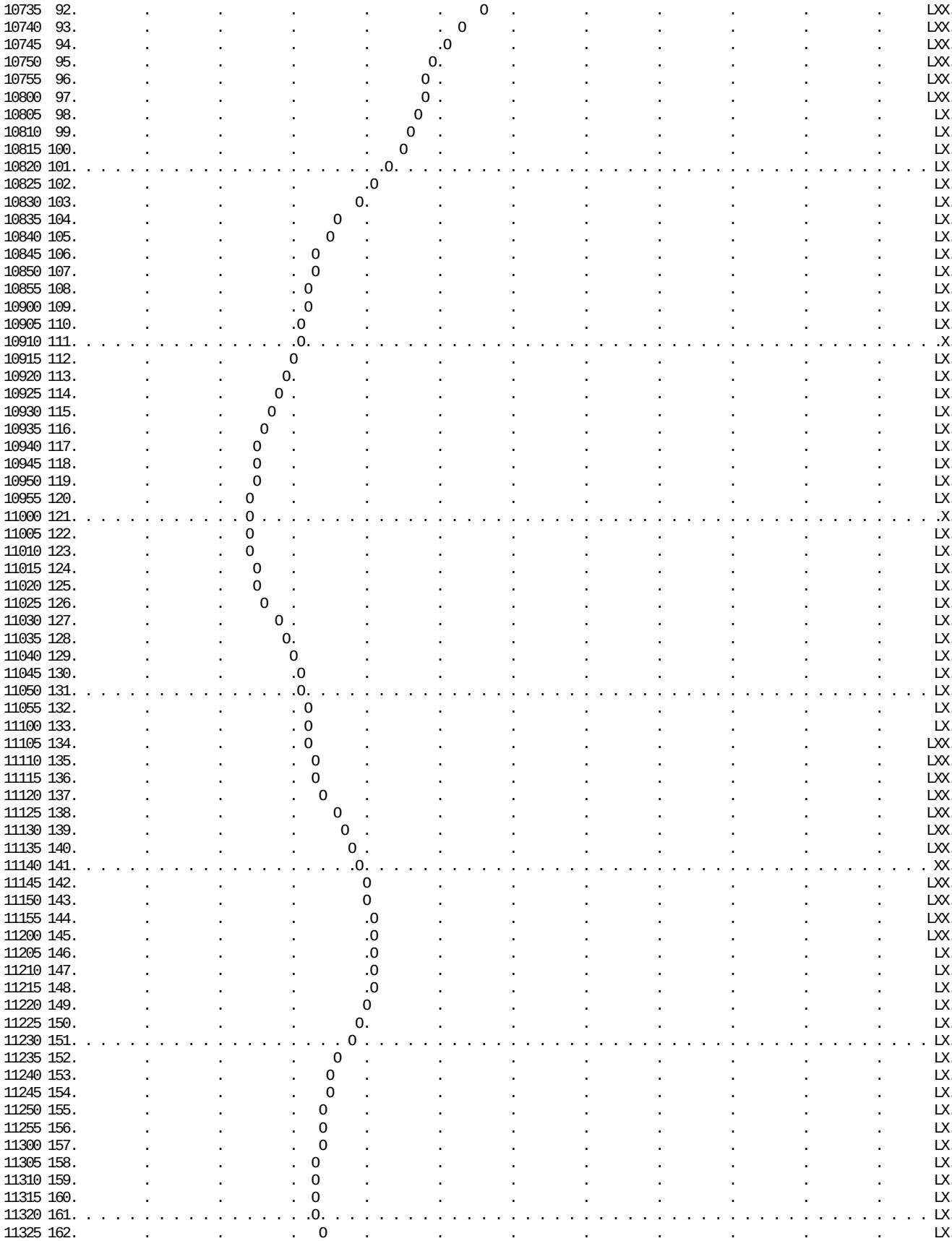
ENGLISH UNITS

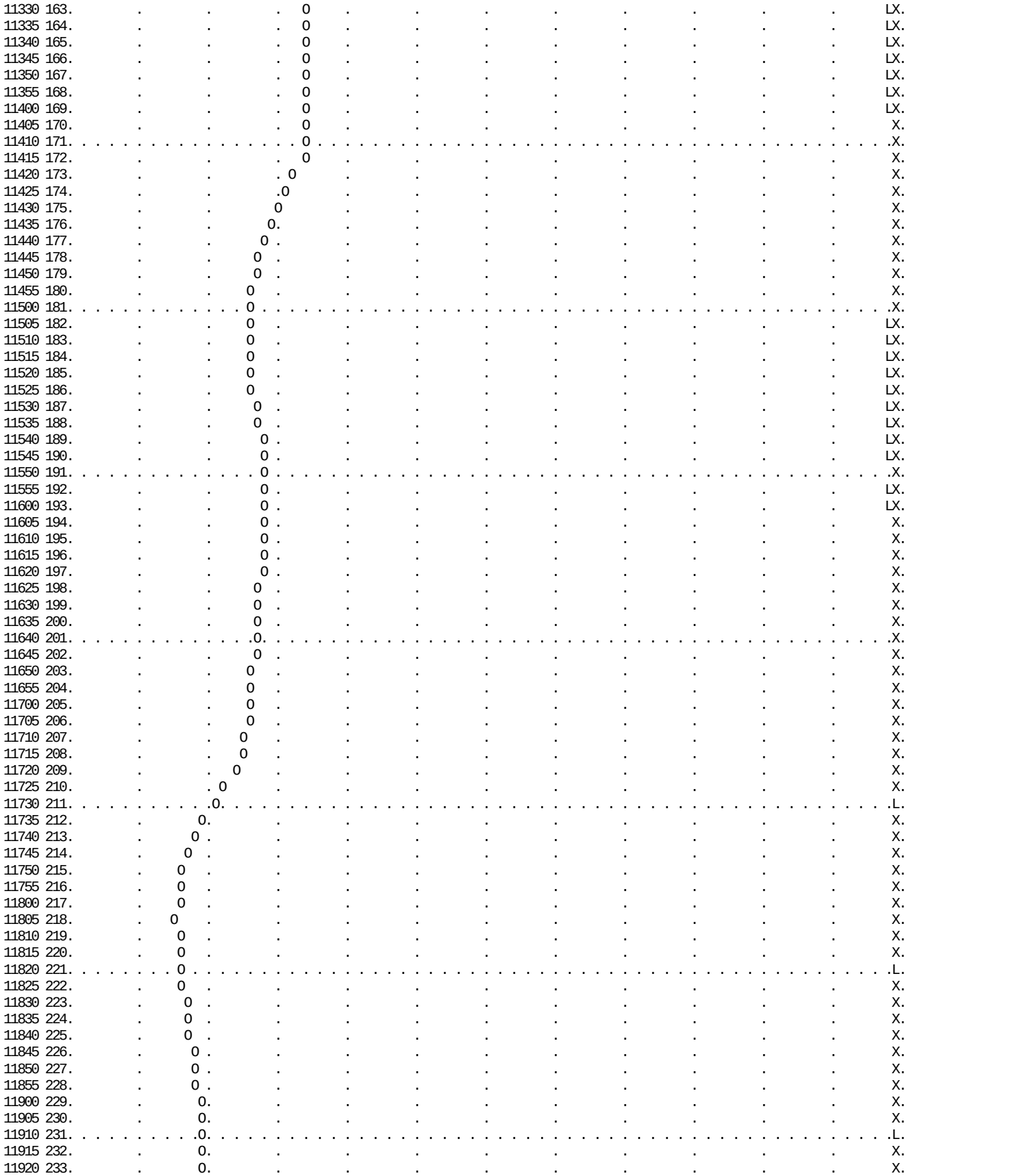
DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

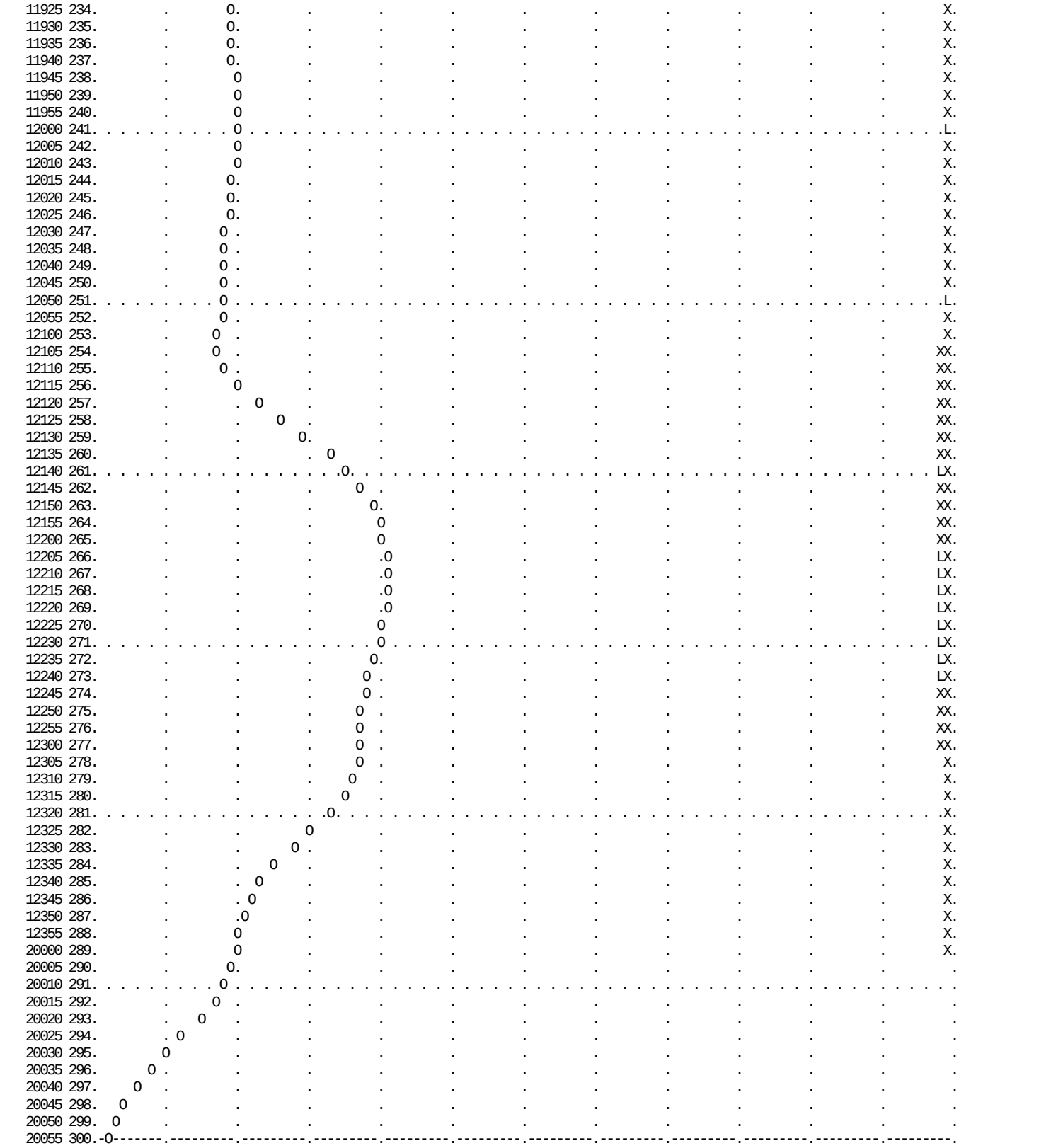
1 STATION WMSA-NQ











RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND

TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	WMSA-NQ	166.	6.67	85.	51.	49.	.63		

*** NORMAL END OF HEC-1 ***

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   26JAN19  TIME  22:00:12   *
*                                       *
*****************************************
```


```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```


```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X       XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX   XXXXX        XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9.....10

                       *DIAGRAM
*** FREE ***
              1        ID   PERMANENTE QUARRY
              2        ID   PROPOSED CONDITIONS
              3        ID   100-YEAR FLOW RATE
              4        ID   COUNTY OF SANTA CLARA HYDROGRAPH METHOD
              5        IT       5       0       0     300
              6        IO       5       2

              7        KK WMSA-NQ
              8        IN       5
              9        PB    7.63
             10        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             11        PI  0.0015  0.0015  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014   0.001
             12        PI  0.0014  0.0014  0.0014  0.0014  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             13        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0062  0.0062  0.0062   0.006
             14        PI  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0055   0.005
             15        PI  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055   0.005
             16        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             17        PI  0.0053  0.0053  0.0345  0.0345  0.0103  0.0103  0.0103  0.0103  0.0094   0.009
             18        PI  0.0094  0.0094  0.0094  0.0094  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             19        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0033  0.0033  0.0033   0.003
             20        PI  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0025   0.002
             21        PI  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025   0.002
             22        PI  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034   0.003
             23        PI  0.0034  0.0034  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041   0.004
             24        PI  0.0041  0.0041  0.0041  0.0041  0.0031  0.0031  0.0031  0.0031  0.0031   0.003
             25        PI  0.0031  0.0031  0.0031  0.0031  0.0031  0.0031  0.0032  0.0032  0.0032   0.003
             26        PI  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0023   0.002
             27        PI  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             28        PI  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026   0.002
             29        PI  0.0026  0.0026  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             30        PI  0.0023  0.0023  0.0023  0.0023  0.0013  0.0013  0.0013  0.0013  0.0013   0.001
             31        PI  0.0013  0.0013  0.0013  0.0013  0.0013  0.0013  0.0017  0.0017  0.0017   0.001
             32        PI  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0018   0.001
             33        PI  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018   0.001
             34        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             35        PI  0.0015  0.0015  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037   0.003
             36        PI  0.0037  0.0037  0.0037  0.0037  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             37        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0015  0.0015  0.0015   0.001
             38        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015
             39        BA  0.6259
             40        LS    0.82      71
             41        UD     .44
             42        ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW

NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

7 WMSA-NQ

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   26JAN19  TIME  22:00:12   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

PERMANENTE QUARRY
PROPOSED CONDITIONS
100-YEAR FLOW RATE
COUNTY OF SANTA CLARA HYDROGRAPH METHOD

6 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	2	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

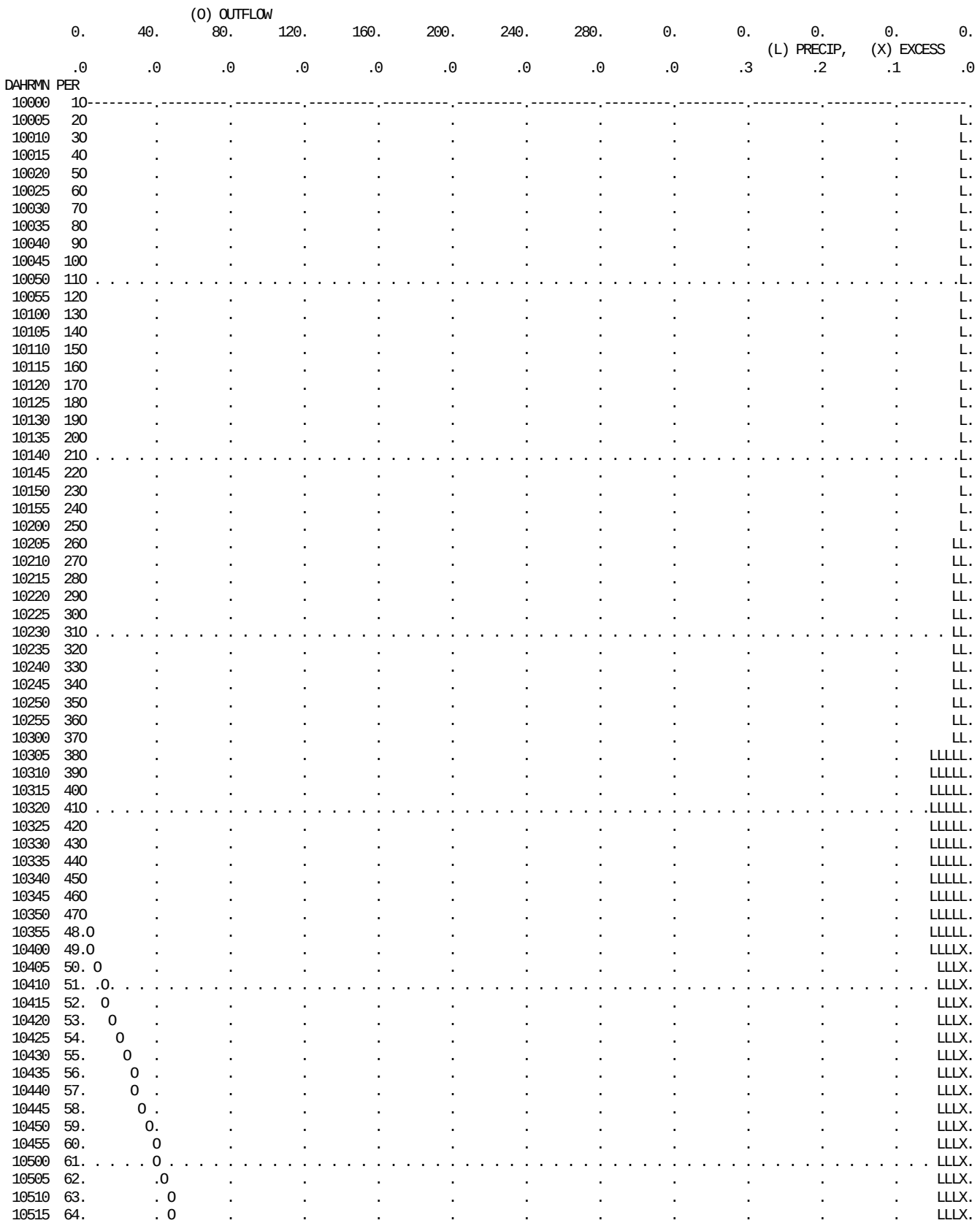
NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1 0	STARTING DATE
ITIME	0000	STARTING TIME
NQ	300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2 0	ENDING DATE
NDTIME	0055	ENDING TIME
ICENT	19	CENTURY MARK

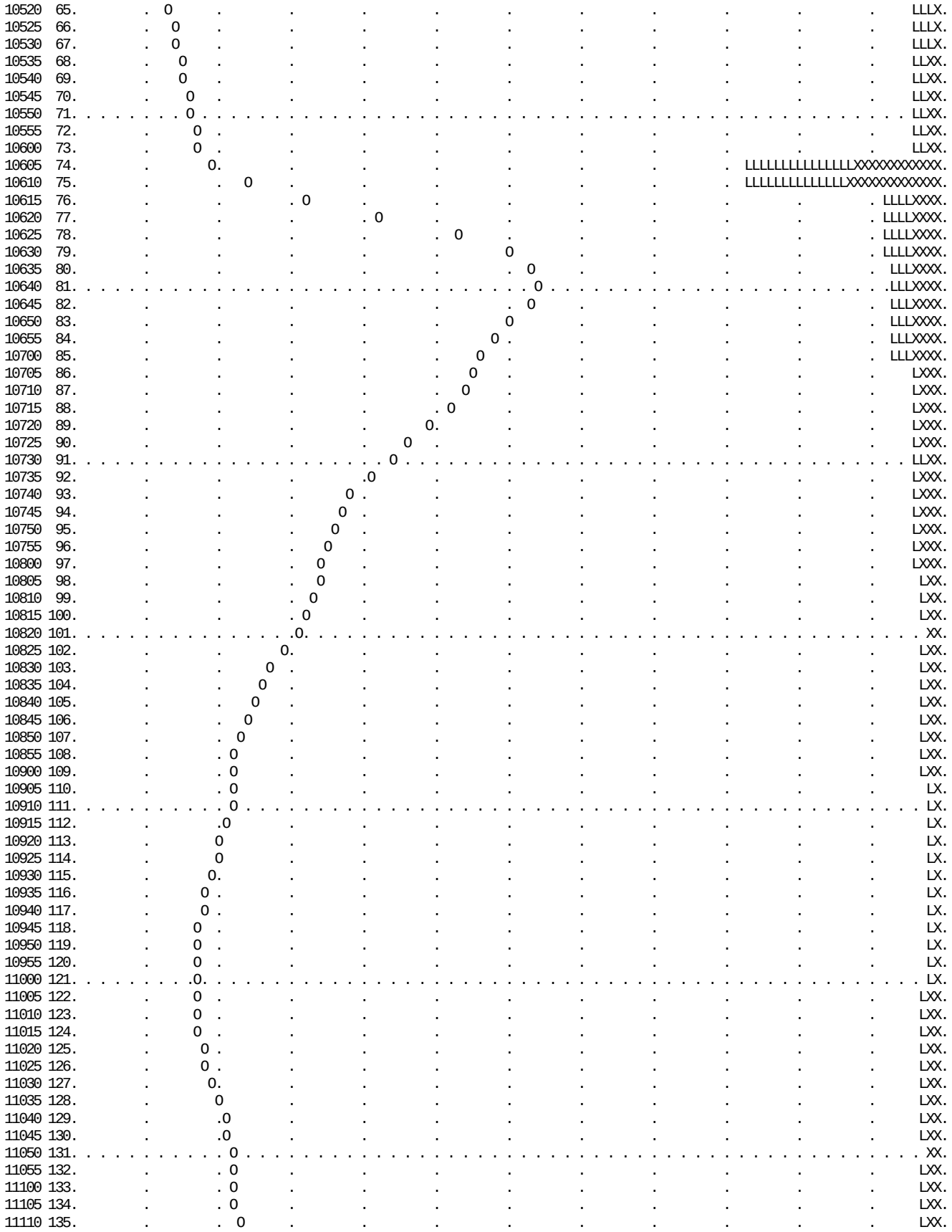
COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

STATION WMSA-NQ





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11450 179.       .     0 .       .       .       .       .       .       .       .       .       .       . LX.
11455 180.       .     0 .       .       .       .       .       .       .       .       .       .       . LX.
11500 181. . . . . . . .0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
11505 182.       .    0  .       .       .       .       .       .       .       .       .       .       . XX.
11510 183.       .    0  .       .       .       .       .       .       .       .       .       .       . XX.
11515 184.       .    0  .       .       .       .       .       .       .       .       .       .       . XX.
11520 185.       .     0 .       .       .       .       .       .       .       .       .       .       . XX.
11525 186.       .     0 .       .       .       .       .       .       .       .       .       .       . XX.
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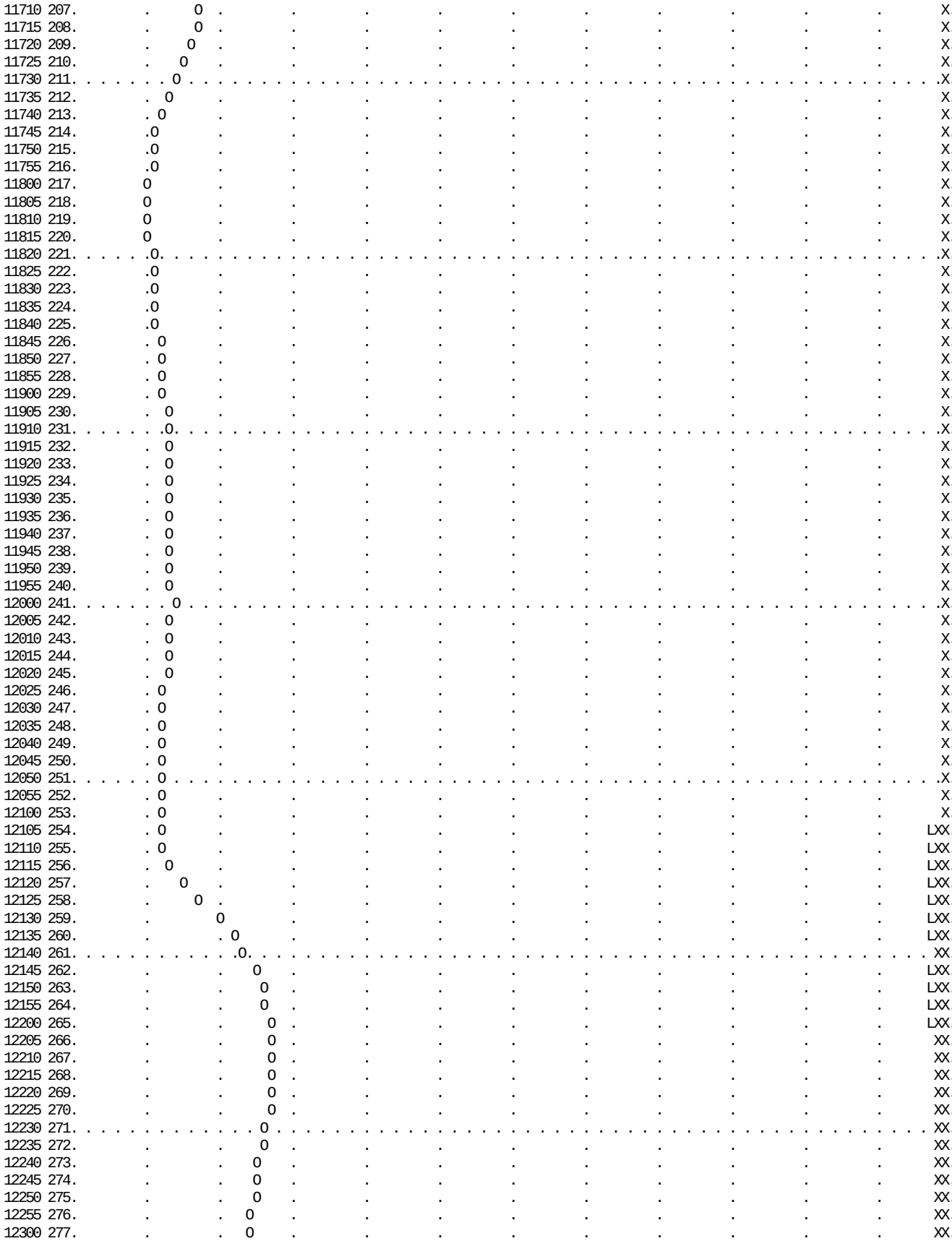


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20010 291.
20015 292.
20020 293.
20025 294.
20030 295.
20035 296.
20040 297.
20045 298.
20050 299.
20055 300.

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	WMSA-NQ	257.	6.67	123.	72.	69.	.63		

*** NORMAL END OF HEC-1 ***

APPENDIX C

DESILTATION BASIN ANALYSES

DESILTATION BASIN SIZING

Proposed Desiltation Basin Sizing using SCVURPPP Method

Region	Hydrology Study Node Number	Drainage Area, ac	Rain Gage Correction Factor	Unit Basin Storage Volume, in	BMP Volume, ac-ft	BMP Volume, cf
NQ+WMSA	2	400.56	2.0	0.01	0.6676	29,081
Rock Plant Reserve	18	54.69	2.0	0.01	0.0912	3,970

Notes:
BMP Volume = Rain Gage Correction Factor x Unit Basin Storage Volume x Drainage Area
Rain gage correction factor = Site M.A.P. / Gage M.A.P. = Site M.A.P. / 13.7 (Site M.A.P. given in Appendix A)
BMP Volume for Surge Pile based on SCVURPPP Method Only Since Footprint is Small and Additional Binder/Mating will be Placed over Area

Proposed Desiltation Basin Sizing using SWRCB Equation

Region	Hydrology Study Node Number	Drainage Area, ac	Q25, cfs	As, sf	Minimum Basin Length, ft	Minimum Basin Width, ft
NQ+WMSA	2	400.56	166.0	32,129	253	127
Rock Plant Reserve	18	54.69	90.0	17,419	187	93

B.1 SCVURPPP Sizing Criteria Worksheets

These worksheets are designed to assist municipal staff and development project proponents in sizing stormwater treatment measures. Figures referenced in the computations can be found at the end of this Appendix B.

Section I. Selecting Sizing Approach Based on Type of Treatment Measure

1. Does the treatment measure operate by detaining a volume of runoff for a certain amount of time for pollutant removal (i.e., is it a volume-based treatment measure)? See Table B-1 for examples.

   _X_ Yes ____ No

If Yes, continue to Section II. Sizing for Volume-Based Treatment Measures.
If No, continue to next question.

2. Does the treatment measure operate based on the flow of runoff through the device (i.e, is it a flow-based treatment measure)? See Table B-1 for examples.

   ___ Yes _X_ No

If Yes, continue to Section III. Sizing for Flow-Based Treatment Measures.

Table B-1. Flow and Volume Based Treatment Measure Sizing Criteria

Type of Treatment Measure	LID?	Hydraulic Sizing Criteria
Bioretention area	Yes	Flow- or volume-based or combination
Flow-through planter box	Yes	Flow- or volume-based or combination
Tree well filter	Yes[1]	Flow-based
Infiltration trench	Yes	Volume-based
Subsurface infiltration system	Yes	Volume-based
Rainwater harvesting and reuse	Yes	Volume-based
Media filter	No	Flow-based
Extended detention basin	No	Volume-based

[1] A tree well filter is considered LID treatment if biotreatment soil is used as the filter media and the unit is sized based on a 5 in/hr surface loading rate.

Section II. Sizing for Volume-Based Treatment Measures, continued

Section II.B — Sizing Volume-Based Treatment Measures based on the Adapted CASQA Stormwater BMP Handbook Approach

The equation that will be used to size the BMP is:

Design Volume = (Rain Gage Correction Factor) × (Unit Basin Storage Volume) × (Drainage Area)

Step 1. Determine the drainage area for the BMP, A = varies acres

See spreadsheet for area tributary to each desiltation basin.

Step 2. Determine percent imperviousness of the drainage area:

a. Estimate the amount of impervious surface (rooftops, hardscape, streets, and sidewalks, etc.) in the area draining to the BMP: 0 acres

b. % impervious area = (amount of impervious area/drainage area for the BMP) × 100
% impervious area = **(Step 2.a/Step 1)** × 100
% impervious area = 0 %

Step 3. Find the mean annual precipitation at the site (MAP_{site}). To do so, estimate where the site is on Figure B-1 and estimate the mean annual precipitation in inches from the rain line (isopleth) nearest to the project site.[6] Interpolate between isopleths if necessary.

MAP_{site} = 28 inches

Step 4. Identify the reference rain gage closest to the project site from Table B-2b and record the MAP_{gage}:

MAP_{gage} = 13.7 inches

Table B-2b: Precipitation Data for Three Reference Gages

Reference Rain Gages	Mean Annual Precipitation (MAP_{gage}) (in)
San Jose Airport	13.9
Palo Alto	13.7 ←
Morgan Hill	19.5

[6] Check with the local municipality to determine if more detailed maps are available for locating the site and estimating MAP.

Section II. Sizing for Volume-Based Treatment Measures, continued

Section II.B —Adapted CASQA Stormwater BMP Handbook Approach (continued)

Step 5 Determine the rain gage correction factor for the precipitation at the site using the information from **Step 3** and **Step 4**.

Correction Factor = MAP_{site} (**Step 3**)/MAP_{gage} (**Step 4**)

Correction Factor = see spreadsheet

Step 6. Identify the representative soil type for the BMP drainage area.

a) Identify from Figure B-1 or from site soils data, the soil type that is representative of the pervious portion of the project shown here in order of increasing infiltration capability:

____ Clay (D) ____ Sandy Clay (D) ____ Clay Loam (D)

__X__ Silt Loam/Loam (B) ____ Not Applicable (100% Impervious) See Figure B-1 in Appendix A.

b) Does the site planning allow for protection of natural areas and associated vegetation and soils so that the soils outside the building footprint are not graded/compacted? Y (Y/N)

If your answer is no, and the soil will be compacted during site preparation and grading, the soil's infiltration ability will be decreased. Modify your answer to a soil with a lower infiltration rate (e.g., Silt Loam to Clay Loam or Clay).

Modified soil type: N/A

Step 7. Determine the average slope for the drainage area for the BMP: >15 %

Step 8. Determine the unit basin storage volume from sizing curves.

a) Slope ≤ 1%

Use the figure at the end of this Appendix entitled "Unit Basin Volume for 80% Capture, 1% Slope" corresponding to the nearest rain gage: Figure B-2, B-3, or B-4 for San Jose, Palo Alto, or Morgan Hill, respectively. Find the percent imperviousness of the drainage area (from **Step 2**) on the x-axis. From there, find the line corresponding to the soil type (from **Step 6**), and obtain the unit basin storage volume on the y-axis.

Unit Basin Storage for 1% slope ($UBS_{1\%}$) = _____(inches)

b) Slope ≥ 15%

Use the figure at the end of this Appendix entitled "Unit Basin Volume for 80% Capture, 15% Slope" corresponding to the nearest rain gage: Figure B-5, B-6, or B-7 for San Jose, Palo Alto, or Morgan Hill, respectively. Find the percent imperviousness of the drainage area (from **Step 2**) on the x-axis. From there, find the line corresponding to the soil type (from **Step 6**), and obtain the unit basin storage volume on the y-axis.

Unit Basin Storage for 15% slope ($UBS_{15\%}$) = _____(inches)

Section II. Sizing for Volume-Based Treatment Measures, continued

Section II.B. —Adapted CASQA Stormwater BMP Handbook Approach (continued)

c) Slope > 1% and < 15%

Find the unit basin volumes for 1% and 15% using the techniques in **Steps 8.a** and **8.b** and interpolate by applying a slope correction factor per the following formula:

$UBS_x = UBS_{1\%} + (UBS_{15\%} - UBS_{1\%}) \times (X\%-1\%) / (15\% -1\%)$
$= (\textbf{Step 8a}) + (\textbf{Step 8b- Step 8a}) \times (X\%-1\%)/(15\%-1\%)$

Where UBS_x = Unit Basin Storage volume for drainage area of intermediate slope, X %

Unit Basin Storage volume (UBS_x) = _____(inches)
(corrected for slope of site)

Step 9. Determine the Adjusted Unit Basin Storage Volume for the site, using the following equation:

Adjusted UBS = Rain Gage Correction Factor × Unit Basin Storage Volume

Adjusted UBS = (**Step 5**) × (**Step 8**)

Adjusted UBS = _____inches

Step 10. Determine the BMP Design Volume, using the following equation:

Design Volume = Adjusted Unit Basin Storage Volume × Drainage Area

Design Volume = (**Step 9**) × (**Step 1**) × 1 foot/12 inch

Design Volume = _____acre-feet × 43,560 square feet/acre = _____cubic feet

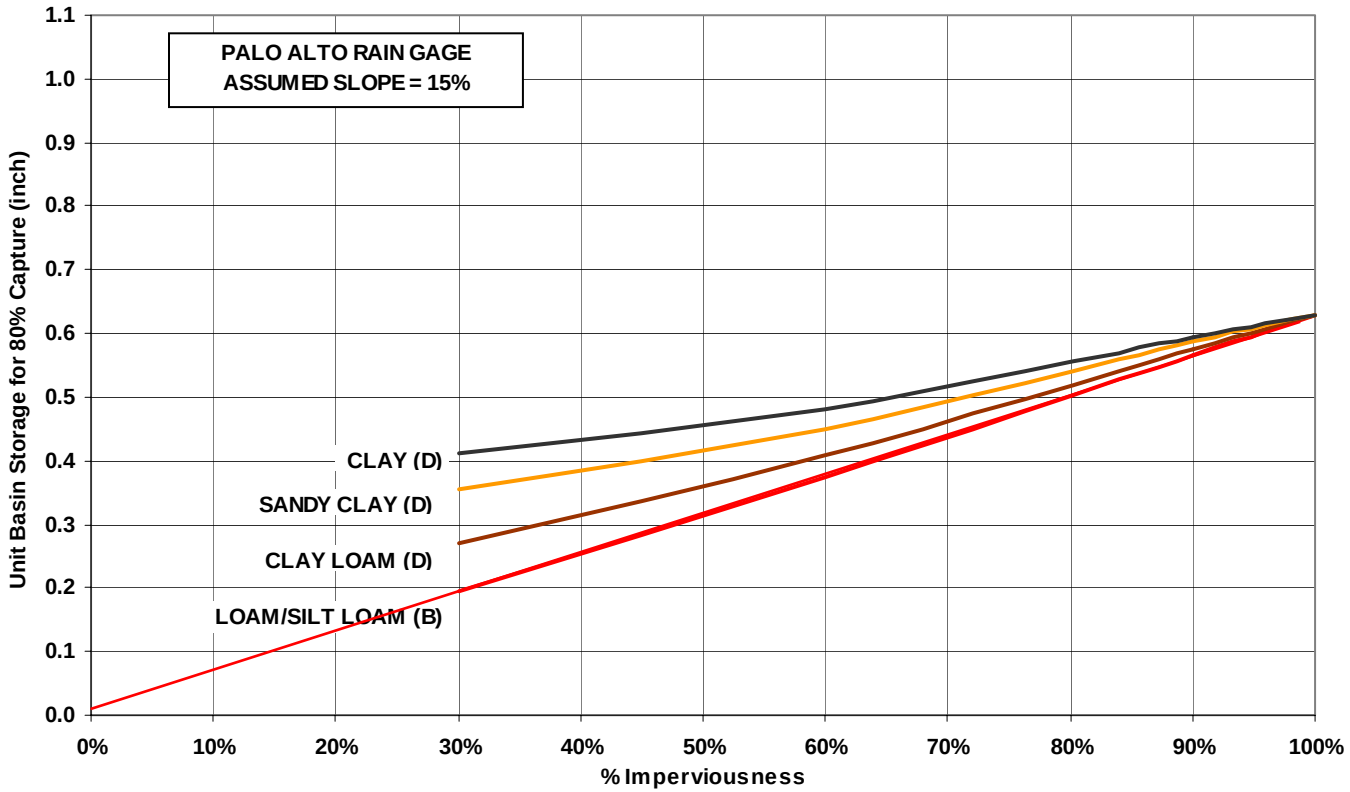
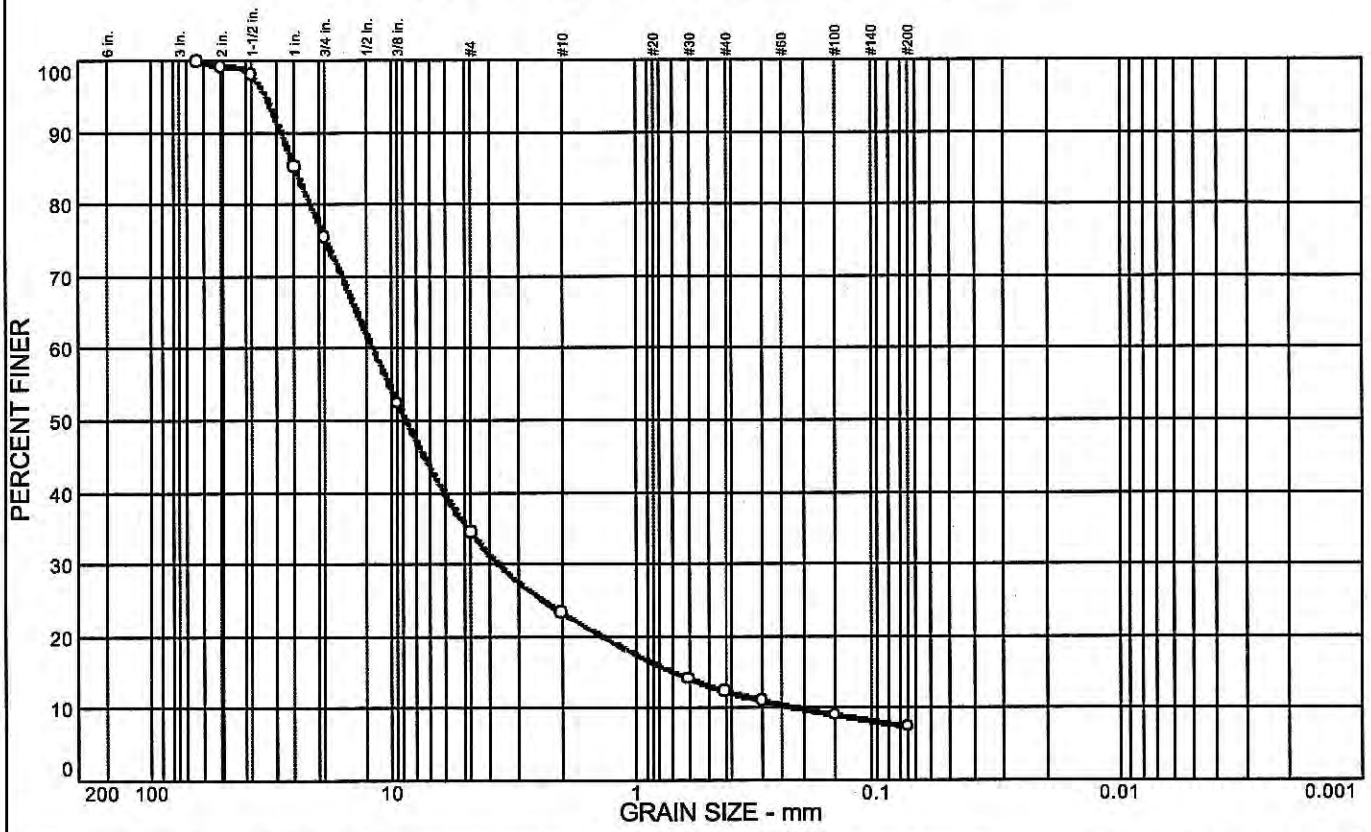


Figure 3-B Unit Basin Volume for 80% Capture - <u>Palo Alto Rain Gage</u>

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
o		65.6	27.0	7.4					

SIEVE inches size	PERCENT FINER o		
2.5	100.0		
2	99.2		
1.5	98.0		
1	85.3		
3/4	75.5		
3/8	52.4		
	GRAIN SIZE		
D_{60}	12.0		
D_{30}	3.65		
D_{10}	0.220		
	COEFFICIENTS		
C_c	5.05		
C_u	54.84		

SIEVE number size	PERCENT FINER o		
#4	34.4		
#10	23.3		
#30	14.1		
#40	12.4		
#50	11.0		
#100	9.0		
#200	7.4		

SOIL DESCRIPTION

o Gray Poorly Graded GRAVEL w/ Silt & Sand

REMARKS:

o

o Source: TC-1

WASTE ROCK - EMSA

COOPER TESTING LABORATORY

Client: Golder Associates

Project: Hanson - 063-7109

Project No.: 287-036

Figure

Worksheet for NQ/WMSA Outlet Pipe

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Normal Depth	4.37	ft
Diameter	4.37	ft
Discharge	257.00	ft³/s

Results

Diameter	4.37	ft
Normal Depth	4.37	ft
Flow Area	14.99	ft²
Wetted Perimeter	13.73	ft
Hydraulic Radius	1.09	ft
Top Width	0.00	ft
Critical Depth	4.22	ft
Percent Full	100.0	%
Critical Slope	0.01752	ft/ft
Velocity	17.14	ft/s
Velocity Head	4.57	ft
Specific Energy	8.94	ft
Froude Number	0.00	
Maximum Discharge	276.46	ft³/s
Discharge Full	257.00	ft³/s
Slope Full	0.02000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Worksheet for Rock Plant Reserve Outlet Pipe

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Normal Depth	3.18	ft
Diameter	3.18	ft
Discharge	110.00	ft³/s

Results

Diameter	3.18	ft
Normal Depth	3.18	ft
Flow Area	7.93	ft²
Wetted Perimeter	9.98	ft
Hydraulic Radius	0.79	ft
Top Width	0.00	ft
Critical Depth	3.05	ft
Percent Full	100.0	%
Critical Slope	0.01740	ft/ft
Velocity	13.87	ft/s
Velocity Head	2.99	ft
Specific Energy	6.17	ft
Froude Number	0.00	
Maximum Discharge	118.33	ft³/s
Discharge Full	110.00	ft³/s
Slope Full	0.02000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Worksheet for NQ/WMSA Riser

Project Description

Solve For	Headwater Elevation

Input Data

Discharge	257.00	ft³/s
Crest Elevation	100.00	ft
Weir Coefficient	2.70	US
Crest Length	14.14	ft

Results

Headwater Elevation	103.57	ft
Headwater Height Above Crest	3.57	ft
Flow Area	50.41	ft²
Velocity	5.10	ft/s
Wetted Perimeter	21.27	ft
Top Width	14.14	ft

Worksheet for Rock Plant Reserve Riser

Project Description

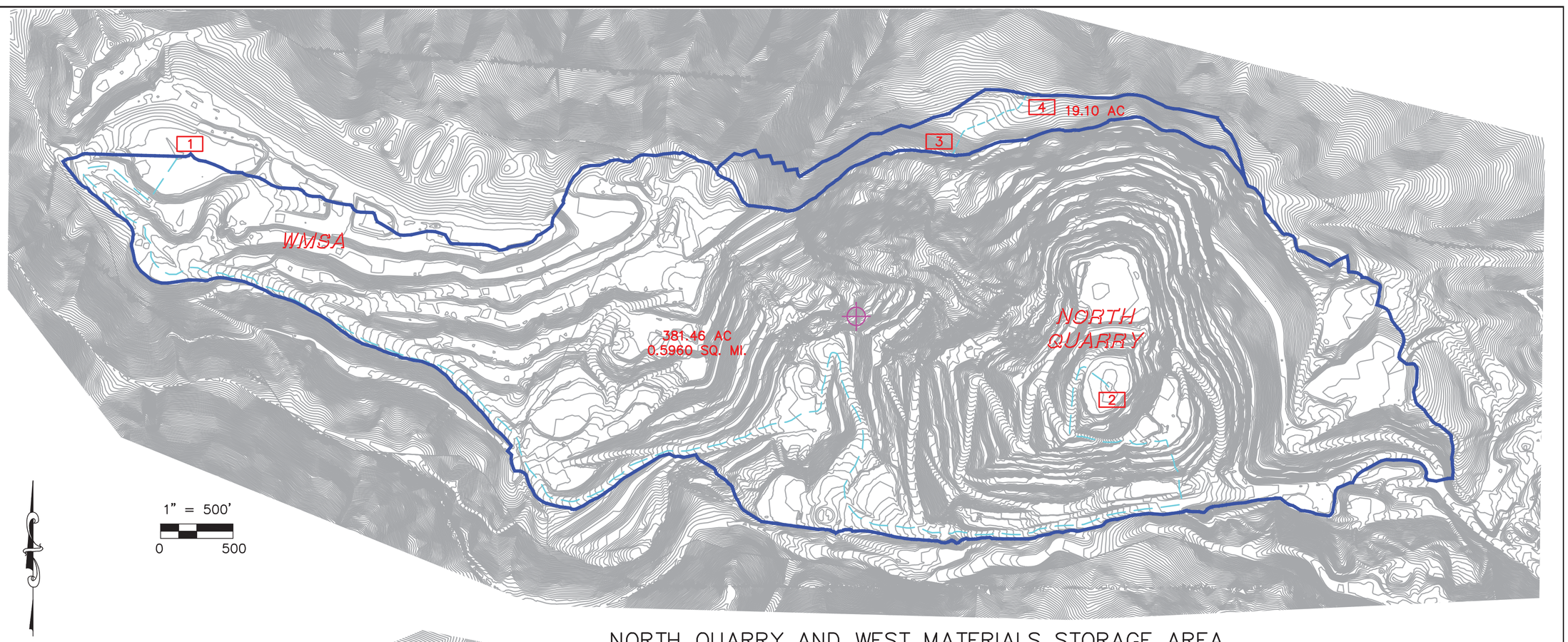
Solve For	Headwater Elevation

Input Data

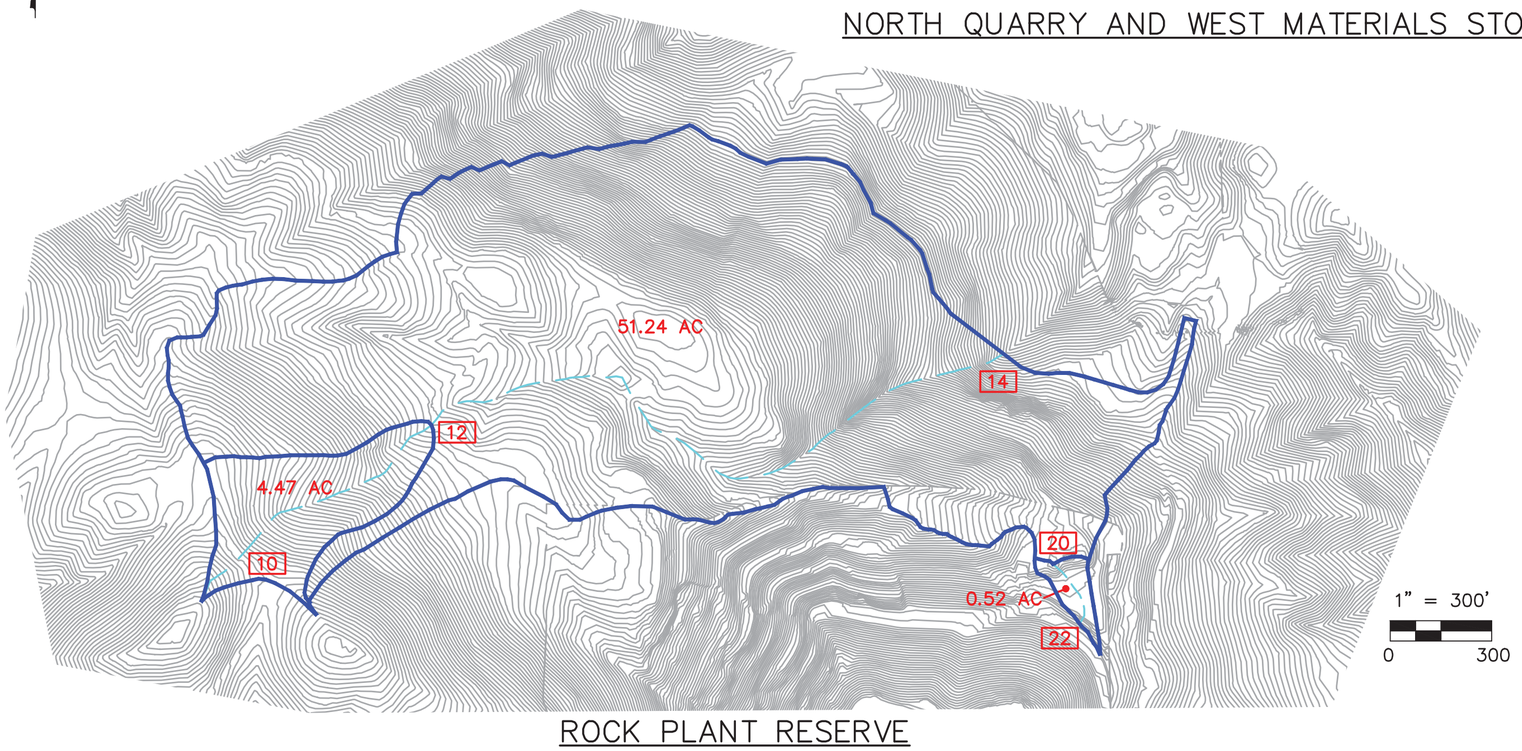
Discharge	110.00	ft³/s
Crest Elevation	100.00	ft
Weir Coefficient	2.70	US
Crest Length	11.00	ft

Results

Headwater Elevation	102.39	ft
Headwater Height Above Crest	2.39	ft
Flow Area	26.33	ft²
Velocity	4.18	ft/s
Wetted Perimeter	15.79	ft
Top Width	11.00	ft



NORTH QUARRY AND WEST MATERIALS STORAGE AREA



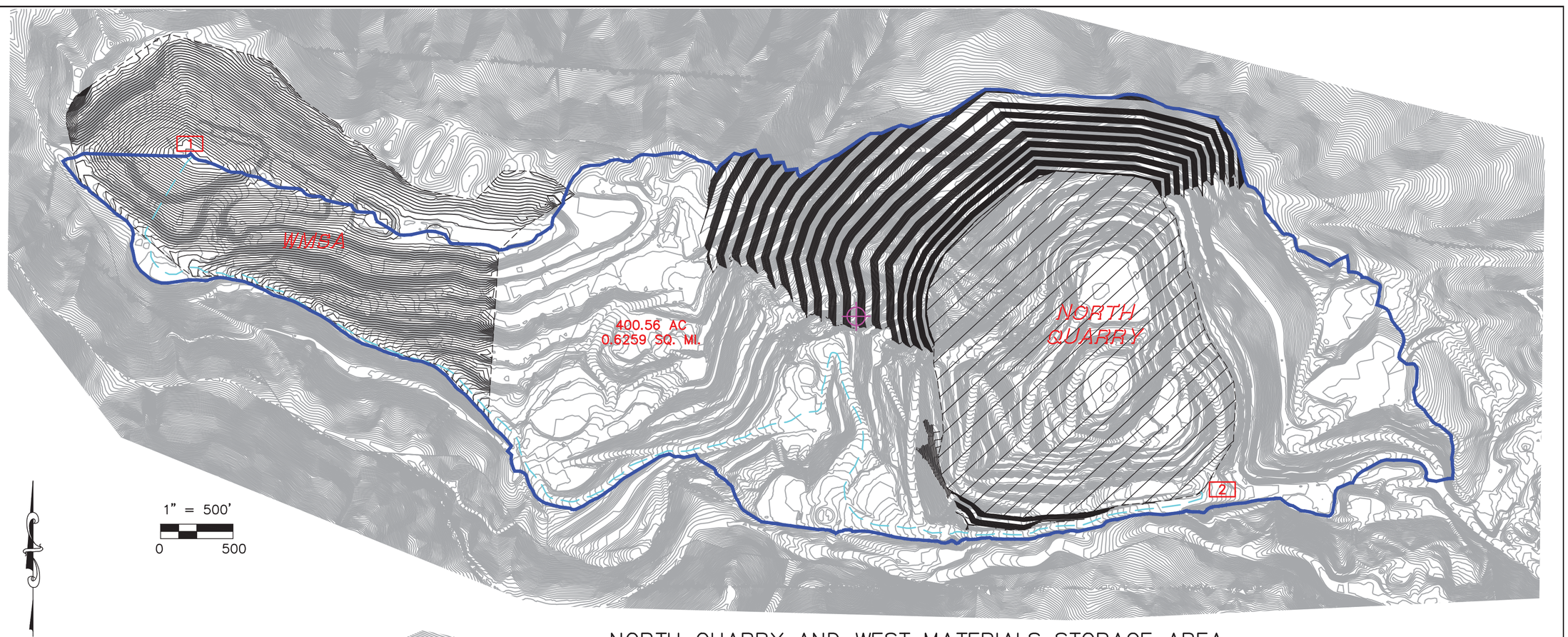
ROCK PLANT RESERVE

LEGEND:

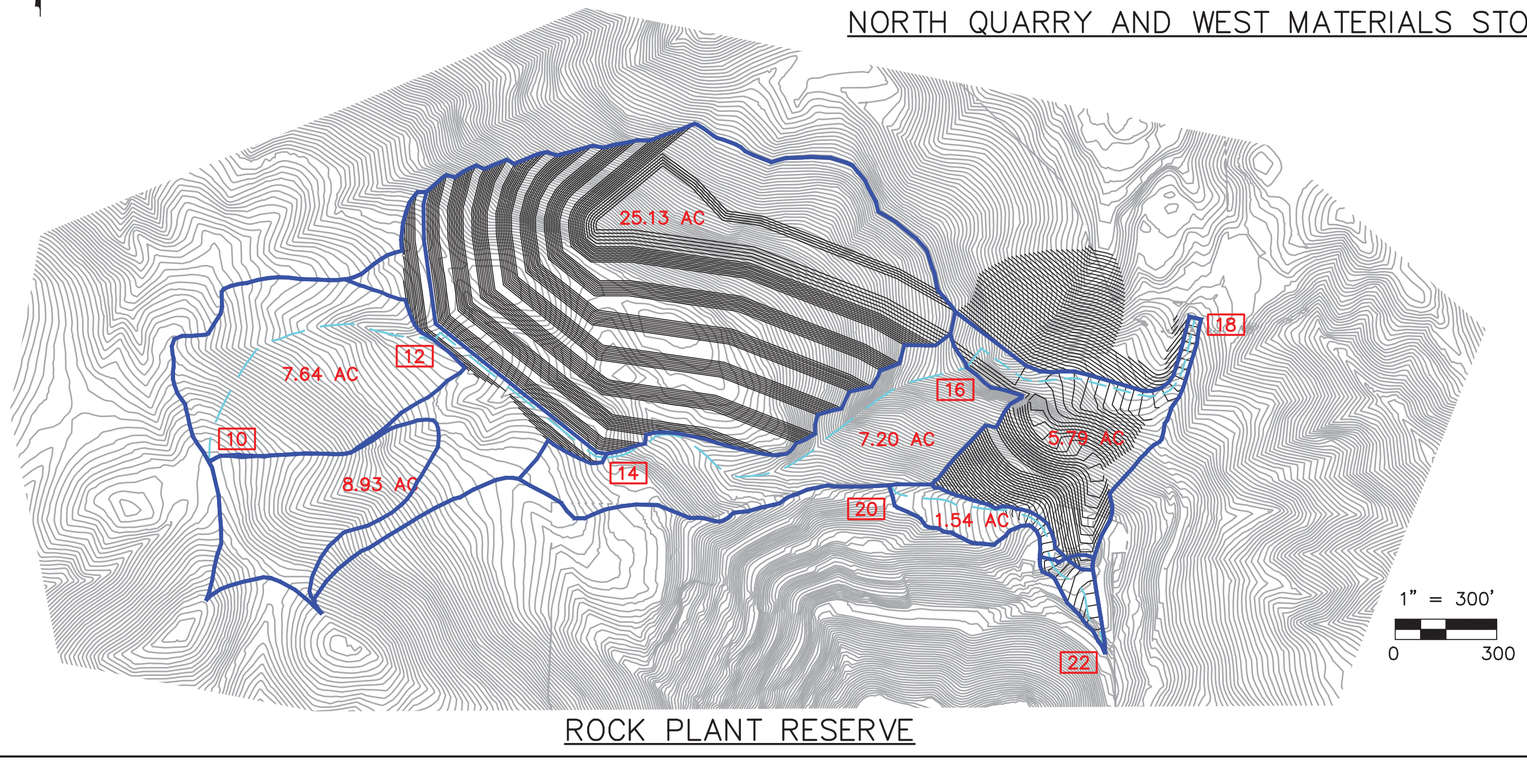
- DRAINAGE BASIN BOUNDARY
- OVERLAND FLOW PATH
- 3.62 AC DRAINAGE BASIN AREA
- 10 HYDROLOGIC ANALYSIS NODE NUMBER
- CENTROID

NOTES:
THE EXISTING AND PROPOSED CONDITION HYDROLOGY AT THE NORTHERLY HALF OF THE WMSA WILL BE SIMILAR, SO ANLAYSES WERE NOT PERFORMED FOR THIS AREA.

EXISTING CONDITION
HYDROLOGIC WORK MAP



NORTH QUARRY AND WEST MATERIALS STORAGE AREA



ROCK PLANT RESERVE

LEGEND:

- DRAINAGE BASIN BOUNDARY
- PROPOSED RECLAMATION CONTOURS
- OVERLAND FLOW PATH
- 3.62 AC DRAINAGE BASIN AREA
- 10 HYDROLOGIC ANALYSIS NODE NUMBER
- CENTROID

NOTES:
THE EXISTING AND PROPOSED CONDITION HYDROLOGY AT THE NORTHERLY HALF OF THE WMSA WILL BE SIMILAR, SO ANLAYSES WERE NOT PERFORMED FOR THIS AREA.

TEMPORARY DESILTATION BASINS WILL BE CONSTRUCTED WITHIN THE RECLAIMED PAD NEAR NODE 2 AND WITHIN THE ROCK PLANT BELOW NODE 18.

PROPOSED CONDITION
HYDROLOGIC WORK MAP

APPENDIX J
BIOLOGICAL RESOURCES

Biological Resources Assessment
Lehigh Permanente Quarry

SANTA CLARA COUNTY, CALIFORNIA

Prepared For:
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Date:
February 2019

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EXECUTIVE SUMMARY

The Permanente Quarry (Quarry) is a surface mining operation for limestone and aggregate materials that has been in operation since the 1930s. Historical and active quarrying areas are surrounded by steep hillsides supporting forests and shrubland.

This purpose of this report is to describe the results of WRA's field investigations, which assessed the 3,510-acre Permanente Property for the (1) presence of special status species; (2) potential to support special status species; and (3) presence of other sensitive biological resources protected by local, state, and federal laws and regulations.

Six special status wildlife species have been observed on the Permanente Property: California Red-legged Frog, San Francisco Dusky-footed Woodrat, White-tailed Kite, Olive-sided Flycatcher, Yellow Warbler, and Grasshopper Sparrow. One species, the Pallid Bat, has a high potential to occur. Three additional special status wildlife species have a moderate potential to occur on the Permanente Property: Western Red Bat, Long-eared Owl and Loggerhead Shrike.

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1.0 INTRODUCTION

In April through September, 2008 and February through May, 2009, WRA, Inc. performed an assessment of biological resources at the Permanente Quarry and certain surrounding lands, in Santa Clara County, California (Figure 1). The purpose of the assessment was to gather information necessary to complete a review of biological resources in support of California Environmental Quality Act (CEQA) review. This review also supplies the information for conservation of rare, threatened or endangered species, sensitive species and wildlife habitat in compliance with California's Surface Mining and Reclamation Act regulations under CCR § 3703 Performance Standards for Wildlife Habitat.

This report describes the results of WRA's field investigations, which assessed the 3,510-acre Permanente Property, for the (1) presence of special status species; (2) potential to support special status species; and (3) presence of other sensitive biological resources protected by local, state, and federal laws and regulations.

Protocol level special status plant surveys and protocol level surveys for California Red-legged Frog were conducted on site, the results of which are presented herein. This assessment is based on information available at the time of the study and on site conditions that were observed during the period in which the Permanente Property were investigated.

1.1 Permanente Property Description

The Permanente Quarry (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 (Figure 1). Elevation ranges from 500 to over 2,000 feet above sea level. The Quarry occupies a portion of an approximately 3,510-acre property owned by Hanson Permanente Cement, Inc. ("Permanente Property"). The Quarry is operated by Lehigh Southwest Cement Company ("Lehigh"). The Quarry currently comprises approximately 614 acres of existing and planned operational areas, which consist of surface mining excavations, overburden stockpiling, crushing and processing facilities, access roads, administrative offices and equipment storage. This includes approximately 19.5 acres of exploratory drilling roads and drill pads south of Permanente Creek. An additional 49.2 acres of predominantly historic mining disturbance is located adjacent to Permanente Creek in an area known as the Permanente Creek Reclamation Area (PCRA). The Quarry also includes other predominantly undisturbed areas, either held in reserve for future mining or which buffer operations from adjacent land uses.

Mining operations take place subject to California's Surface Mining and Reclamation Act (SMARA). SMARA mandates that surface mining operations have an approved reclamation plan that describes how mined lands will be prepared for alternative post-mining uses, and how residual hazards will be addressed. Santa Clara County acts as lead agency under SMARA. The County approved the Quarry's current reclamation plan in 2012.

A cement manufacturing plant lies adjacent to the Quarry on the east. The cement plant also is owned and operated by Lehigh. The cement plant is a separately-permitted industrial use which is not considered part of the Quarry and is not subject to SMARA's requirements. The cement plant was included in the scope of the biological assessment of the Permanente Property.

2.0 REGULATORY BACKGROUND

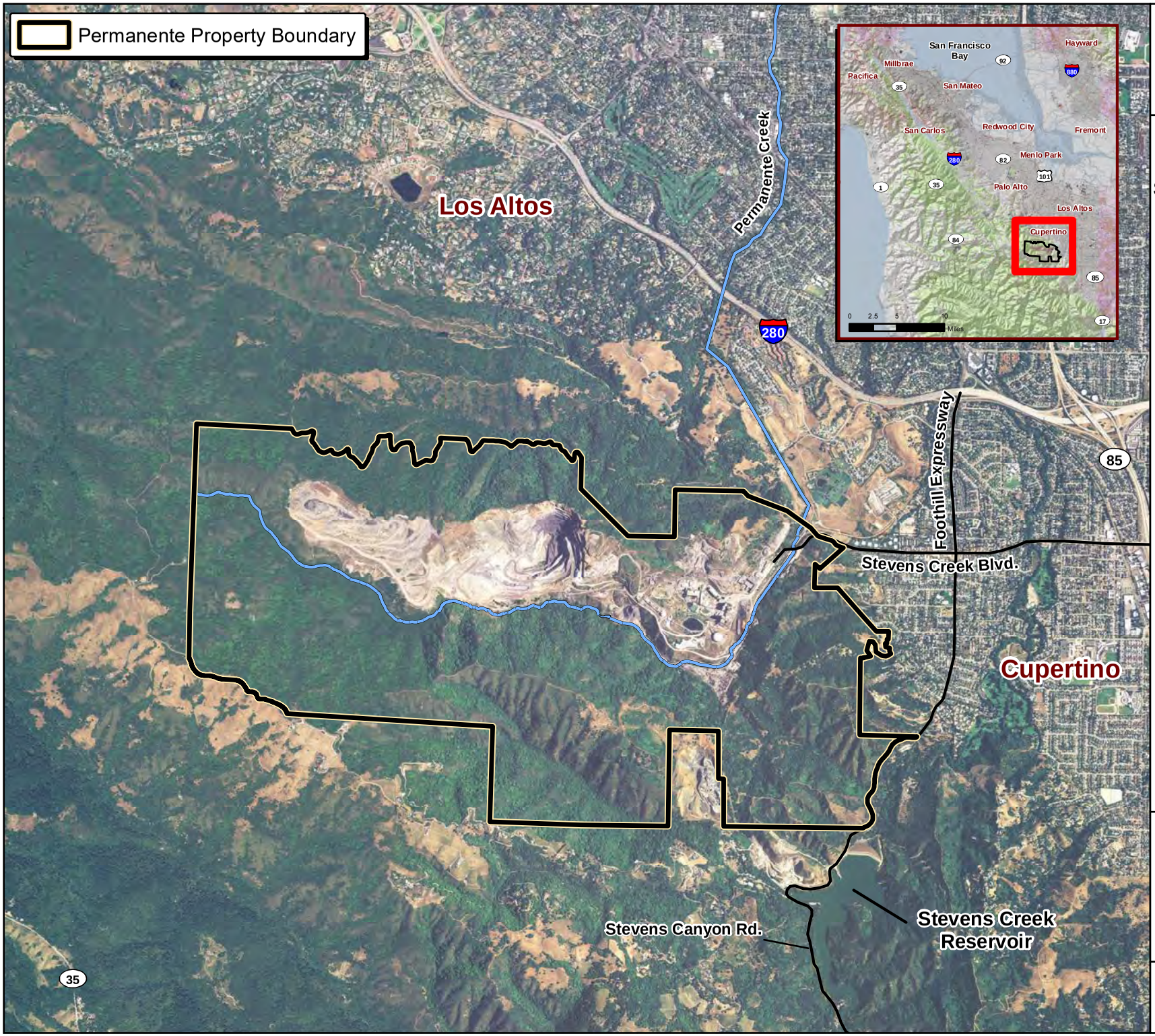
The following sections explain the regulatory context of the biological assessment, including applicable laws and regulations that were applied to the field investigations.

2.1 Sensitive Biological Communities

Sensitive biological communities include habitats that fulfill special functions or have special values, such as wetlands, streams, and riparian habitat. These habitats are protected under federal regulations (such as the Clean Water Act), state regulations (such as the Porter-Cologne Act, the California Department of Fish and Game [CDFG] Streambed Alteration Program, and CEQA), or local ordinances or policies (City or County Tree Ordinances, Special Habitat Management Areas, and General Plan Elements).

Waters of the United States

The U.S. Army Corps of Engineers (Corps) regulates "Waters of the United States" under Section 404 of the Clean Water Act. "Waters of the U.S." are defined broadly as waters susceptible to use in commerce, including interstate waters and wetlands, all other waters (intrastate waterbodies, including wetlands), and their tributaries (33 CFR 328.3). Potential wetland areas, according to the three criteria used to delineate wetlands stated in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987), are identified by the presence of (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. Areas that are inundated for sufficient duration and depth to exclude growth of hydrophytic vegetation are subject to Section 404 jurisdiction as "other waters" and are often characterized by an ordinary high water mark (OHWM). Other waters, for example, generally include lakes, rivers, and streams. The placement of fill material into "Waters of the U.S." (including wetlands) generally requires an individual or nationwide permit from the Corps under Section 404 of the Clean Water Act.



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Lehigh Permanente Quarry
Santa Clara County, CA

Figure 1.

Permanente Property Location Map

N
W E
S

0 0.25 0.5 1
Miles

Date: May 2010
Map By: Michael Rochelle
Image: 2005 NAIP
Filepath: I:\Acad2000\16000\16143\gis\Arcmap\2010 Figures\BRA\Location.mxd

Waters of the State

The term “Waters of the State” (WOS) is defined by the Porter-Cologne Act as “any surface water or groundwater, including saline waters, within the boundaries of the state.” The Regional Water Quality Control Board (RWQCB) protects all waters in its regulatory scope, but has special responsibility for wetlands, riparian areas, and headwaters. These waterbodies have high resource value, are vulnerable to filling, and are not systematically protected by other programs. RWQCB jurisdiction includes “isolated” wetlands and waters that may not be regulated by the Corps under Section 404. “Waters of the State” are regulated by the RWQCB under the State Water Quality Certification Program which regulates discharges of fill and dredged material under Section 401 of the Clean Water Act and the Porter-Cologne Water Quality Control Act. Projects that require a Corps permit, or fall under other federal jurisdiction, and have the potential to impact “Waters of the State,” are required to comply with the terms of the Water Quality Certification determination. If a proposed project does not require a federal permit, but does involve dredge or fill activities that may result in a discharge to “Waters of the State,” the RWQCB has the option to regulate the dredge and fill activities under its state authority in the form of Waste Discharge Requirements.

Streams, Lakes, and Riparian Habitat

Streams and lakes, as habitat for fish and wildlife species, are subject to jurisdiction by CDFG under Sections 1600-1616 of the State Fish and Game Code. Certain alterations to a streambed or lake may require a 1602 Lake and Streambed Alteration Agreement. The term stream, which includes creeks and rivers, is defined in the California Code of Regulations (CCR) as follows: “a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation” (14 CCR 1.72).

Riparian and freshwater habitats are identified as biological communities targeted for conservation in the Resource Conservation Element of the Santa Clara County (SCC) General Plan (County of Santa Clara 1995). Riparian setback distances are described as “flexible” in the SCC General Plan, and generally range up to 150 feet, with the larger setbacks recommended for streams in a natural, undisturbed state. Because Permanente Creek has been historically highly altered, a narrower setback is appropriate. Stream setbacks are approved on a project-by-project basis through discussion with County planners.

Other Sensitive Biological Communities

Other sensitive biological communities not discussed above include habitats that fulfill special functions or have special values. Natural communities considered sensitive are those identified in local or regional plans, policies, regulations, or by the CDFG. CDFG ranks sensitive communities as “threatened” or “very threatened” and keeps records of their occurrences in its Natural Diversity Database. Sensitive plant communities are also identified by CDFG on their *List of California Natural Communities Recognized by the CNDDB*. Impacts to sensitive natural communities identified in local or regional plans, policies, regulations or by the CDFG or USFWS must be considered and evaluated under CEQA (California Code of Regulations: Title 14, Div. 6, Chap. 3, Appendix G).

Specific habitats including bayland habitats, riparian and freshwater habitats, grassland/savanna habitats, and chaparral/mixed woodland/evergreen forest areas are generally identified for conservation in the Resource Conservation Element of the Santa Clara

County General Plan although specific ordinances for their conservation have yet to be developed. Implementation policies that apply to these habitat types include conformance with state and federal laws regarding commercial timber sales and endangered species preservation. The SCC General Plan specifies that conservation of these habitat types is important for the maintenance of wildlife habitat linkages and surface water quality.

Oak Woodlands

Under Public Resources Code section 21083.4 (SB 1334), Santa Clara County shall mitigate for conversion of oak woodlands that will have a significant effect on the environment. The code defines an oak tree as any species of native oak larger than five inches diameter at breast height (DBH).

2.2 Special Status Species

Special status species include those plants and wildlife species that have been formally listed, are proposed as endangered or threatened, or are candidates for such listing under the federal Endangered Species Act (FESA) or California Endangered Species Act (CESA). These acts afford protection to both listed and proposed species. In addition, California Department of Fish and Wildlife (CDFG) Species of Special Concern, which are species that face extirpation in California if current population and habitat trends continue, U.S. Fish and Wildlife Service (USFWS) Birds of Conservation Concern, sensitive species included in USFWS Recovery Plans, and CDFG special status invertebrates are all considered special status species. Although CDFG Species of Special Concern generally have no special legal status, they are given special consideration under the California Environmental Quality Act (CEQA). In addition to regulations for special status species, most birds in the United States, including non-status species, are protected by the Migratory Bird Treaty Act of 1918. Under this legislation, destroying active nests, eggs, and young is illegal. Plant species on California Native Plant Society (CNPS) Lists 1 and 2 are also considered special status plant species. Impacts to these species are considered significant according to CEQA. CNPS List 3 and 4 plants have little or no protection under CEQA, but are included in this analysis for completeness.

Critical Habitat

Critical habitat is a term defined and used in the Federal Endangered Species Act as a specific geographic area that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. The FESA requires federal agencies to consult with the USFWS to conserve listed species on their lands and to ensure that any activities or projects they fund, authorize, or carry out will not jeopardize the survival of a threatened or endangered species. In consultation for those species with critical habitat, federal agencies must also ensure that their activities or projects do not adversely modify critical habitat to the point that it will no longer aid in the species' recovery. In many cases, this level of protection is similar to that already provided to species by the FESA "jeopardy standard."

Santa Clara Valley Habitat Plan

The Santa Clara Valley Habitat Plan was completed in August 2012. Although the Permanente Property lies outside the limits of the Habitat Plan, species covered in this plan are also considered in this assessment as they are regionally important for conservation.

2.3 Other Regulatory Issues

Sudden Oak Death

The United States Department of Agriculture restricts the interstate movement of certain regulated and restricted articles from quarantined areas in California to prevent the spread of *Phytophthora ramorum*, the organism that causes Sudden Oak Death (SOD) (7 CFR Part 301). Within California, transport of regulated and restricted articles from quarantined counties is regulated by the California Department of Food and Agriculture (CCR3700). Fourteen California counties including Alameda, Contra Costa, Humboldt, Lake, Marin, Mendocino, Monterey, Napa, San Francisco, Santa Clara, Santa Cruz, San Mateo, Solano and Sonoma Counties are included in the quarantine. Regulated articles include nursery stock and soil and may only be moved interstate from a quarantined area if accompanied by a certificate. Restricted articles include bark chips, firewood, forest stock, or mulch from certain vegetation. Restricted articles may only be moved interstate from a quarantined area by the U.S. Department of Agriculture for experimental or scientific purposes.

3.0 METHODS

Between May 2008 and October 2009, the Permanente Property was traversed on foot to determine (1) biological communities present within the Permanente Property, (2) if existing conditions provided suitable habitat for any special status plant or wildlife species, and (3) if sensitive habitats are present. For those areas that were inaccessible due to extreme terrain or dense vegetation, inspection was conducted using aerial photographs and referencing to areas observed on foot.

3.1 Biological Communities

Prior to the site visit, the Soil Survey of the Santa Clara Area, California [U.S. Department of Agriculture (USDA) 1941], the US Fish and Wildlife Service (USFWS) National Wetland Inventory, U.S. Geologic Survey (USGS) topographic maps and USDA aerial photos were examined to determine if any unique soil types, vegetative features, and/or aquatic features that could support sensitive plant communities were present on the Permanente Property. Biological communities present on the Permanente Property were classified based on existing plant community descriptions described in the *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986). However, in some cases it is necessary to identify variants of community types or to describe non-vegetated areas that are not described in the literature. Figure 3 shows the general location and extent of the biological communities observed on the Permanente Property. See Appendix C for representative site photographs of the observed plant communities.

3.2 Sensitive Biological Communities and Aquatic Features

Biological communities identified on the Permanente Property were evaluated to determine if they are considered sensitive or non-sensitive as defined by the CEQA and other applicable laws and regulations.

3.2.1 Wetlands and Waters

Wetland areas were identified as areas dominated by plant species with a wetland indicator status[1] of OBL, FACW, or FAC as given on the U.S. Fish and Wildlife Service List of Plant Species that Occur in Wetlands (Reed 1988). Evidence of wetland hydrology can include direct evidence (primary indicators), such as visible inundation or saturation, surface sediment deposits, algal mats and drift lines or indirect indicators (secondary indicators), such as oxidized root channels. Some indicators of wetland soils include dark colored soils, soils with a sulfidic odor, and soils that contain redoximorphic features as defined by the Corps Manual and Field Indicators of Hydric Soils in the United States (NRCS 2002).

Areas that are inundated for sufficient duration and depth to exclude growth of hydrophytic vegetation, such as lakes and ponds, or convey water, such as streams, are also subject to Section 404 jurisdiction.

[1] OBL = Obligate, always found in wetlands (> 99% frequency of occurrence); FACW = Facultative wetland, usually found in wetlands (67-99% frequency of occurrence); FAC = Facultative, equal occurrence in wetland or non-wetlands (34-66% frequency of occurrence).

Areas delineated as “Other Waters of the U.S.” are characterized by an ordinary high water (OHW) mark, defined as:

> *...that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impresses on the bank, shelving, changes in the characteristics of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.”*
>
> Federal Register Vol. 51, No. 219,
> Part 328.3 (e). November 13, 1986

“Other waters” are identified in the field by the presence of a defined river or stream bed, a bank, and evidence of the flow of water, or by the absence of emergent vegetation in ponds or lakes. Corps jurisdiction of waters in non-tidal areas extends to the ordinary high water (OHW) mark. “Other waters” that were found on the Permanente Property were mapped and are described in the Results section of this report; however, some may be exempt from regulation under the Clean Water Act. “Waters of the State” may include additional aquatic areas not meeting federal definitions. Where this occurred, they were mapped as “Waters of the State”. “Waters of the U.S.” and “Waters of the State” were either mapped using sub-meter accuracy GPS units, or were mapped based on USGS topographic maps and aerial photograph interpretation; stream widths were noted from field observations. Between March 2008 and August 2009, WRA conducted a routine wetland delineation on the Permanente Property and prepared two reports fully describing the methods and results of the study (WRA 2008, 2010). The first of the two reports (WRA 2008) was verified in a letter dated March 02, 2009 (Corps file no. 2008-00356S); the second (WRA 2010a) was submitted to the Corps for verification on February 3, 2010.

3.2.2 Riparian Habitat

An inspection was conducted to determine if the banks of drainages, streams and other aquatic features on the Permanente Property support hydrophytic or stream-dependent woody plant species (riparian species). Streams supporting riparian vegetation were noted and the area of the riparian habitat was estimated and mapped using ArcGIS software.

3.2.3 Other Sensitive Biological Communities

The Permanente Property was evaluated for the presence of other sensitive biological communities recognized by the California Department of Fish and Game (CDFG) or other local or regional ordinances. All biological communities on the Permanente Property were mapped and are described in Section 4.1 below.

3.3 Special Status Species

3.3.1 Literature Review

Potential occurrence of special status species on the Permanente Property was evaluated by first determining which special status species occur in the vicinity of the Permanente Property through a literature and database search. Database searches for known occurrences of special status species focused on the Cupertino 7.5 minute USGS quadrangle and the eight surrounding USGS quadrangles. The following sources were reviewed to determine which

special status plant and wildlife species have been documented to occur in the vicinity of the Permanente Property:

- California Natural Diversity Database records (CNDDB) (CDFG July 2009a)
- USFWS quadrangle species lists (USFWS July 2009)
- CNPS Electronic Inventory records (CNPS July 2009)
- CDFG publication "California's Wildlife, Volumes I-III" (Zeiner et al. 1990)
- CDFG publication "Amphibians and Reptile Species of Special Concern in California" (Jennings 1994)
- A Field Guide to Western Reptiles and Amphibians (Stebbins, R.C. 2003)
- CDFG CalFish ArcIMS Fish Distribution Mapping Tool and Fish Passage Assessment Database (CDFG September 2009b)
- National Oceanic and Atmospheric Administration NMFS Distribution Maps for California Salmonid Species (1999)

3.3.2 Site Assessment

A site visit was made to the Permanente Property to search for suitable habitats for species identified in the literature review as occurring in the vicinity. The potential for each special status species to occur on the Permanente Property was then evaluated according to the following criteria:

1) No Potential. Habitat on and adjacent to the site is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).

2) Unlikely. Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.

3) Moderate Potential. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.

4) High Potential. All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.

5) Present. Species is observed on the site or has been recorded (i.e. CNDDB, other reports) on the site recently.

The site assessment is intended to identify the presence or absence of suitable habitat for each special status species known to occur in the vicinity in order to determine its potential to occur on the Permanente Property. The site visit does not constitute a protocol-level survey and is not

intended to determine the actual presence or absence of a species; however, if a special status species is observed during the site visit, its presence will be recorded and discussed. Appendix A presents the evaluation of potential for occurrence of each special status plant and wildlife species known to occur in the vicinity of the Permanente Property with their habitat requirements, potential for occurrence, and rationale for the classification based on criteria listed above.

Rare plant surveys

Based upon a review of the resources and databases given in Section 3.3.1, 81 plant species which have been given special protection status under state and federal species legislation occur in the vicinity of the Permanente Property. These species, their likelihood of occurrence on the Permanente Property, and the results of the protocol level rare plant surveys are presented in Appendix A.

Based on a reconnaissance level site visit and review of the literature, 32 of the 81 listed species were determined to have the potential to occur on the Permanente Property due to their habitat requirements, known distribution, and the habitats provided on the Permanente Property. Protocol level rare plant surveys were then performed to verify the presence or absence of these thirty two species. Forty-nine (49) of the 81 listed species were determined to have no potential to occur on site based on the lack of specific habitat requirements of the species on the Permanente Property such as coastal salt marsh or particular soil types.

Protocol level surveys were conducted in May and July, 2008 by WRA botanists who have experience with the rare plant species that could occur in the area. The surveys followed the protocol for plant surveys described by Nelson (1987). This protocol complies with recommended resource agency guidelines (CNPS 2001, CDFG 2000, USFWS 1996). In small portions of the Permanente Property, terrain, density of poison oak, or other safety issues proved to be significant obstacles to effectively surveying according to these methods. In these cases, all attempts were made to view the area from alternative locations.

All plants observed during the surveys were identified using The Jepson Manual (Hickman 1993), to the taxonomic level necessary to determine rarity.

Special Status Wildlife Species

Based upon a review of the resources and databases given in Section 3.3.1, 46 wildlife species which have been given special protection status under state and federal species legislation occur in the vicinity of the Permanente Property. These species, their likelihood of occurrence on the Permanente Property, and the results of the field surveys are presented in Appendix A.

Based on a reconnaissance level site visit and review of the literature, 10 of the 46 listed species were determined to have the potential to occur on the Permanente Property due to their habitat requirements, known distribution, and the habitats provided on the Permanente Property. A site assessment for wildlife species involved the identification of habitat types and quality within Permanente Property as it pertains to special status species. This included actively traversing the Permanente Property to identify important habitat features like small mammal burrows, tree cavities and snags, existing nest structures, rock outcroppings, and water features. Additional breeding bird surveys conducted during the breeding bird window (February 1 – August 31) were used to supplement the reconnaissance level site visit assessment of present habitat and present species, by documenting the type of avian species

demonstrating nesting and breeding activity. Additional habitat features such as woodrat stick nests were encountered and noted during these surveys. Collaboration with botanical staff was also used to identify wildlife habitat and unique features identified during protocol level rare plant surveys.

3.4 Aquatic Surveys

WRA biologists conducted aquatic biota surveys within Permanente and Monte Bello Creeks in 2009. The surveys included fish sampling, amphibian surveys, and macroinvertebrate sampling. Fish sampling by net of approximately 100 foot reaches included various habitat features (i.e. pool, riffle, run). Sampling efforts took place in February and May in both watersheds to sample fish across varying flow conditions.

A tandem double observer nocturnal visual encounter survey (VES) methodology was used to survey for amphibians within suitable aquatic habitats within the Study Area. Nocturnal VES surveys were conducted from February through May 2009. Surveys began one hour after sunset and concluded at least one hour before sunrise.

In April 2009, WRA biologists collected 18 benthic macroinvertebrate samples (BMI) at six sites (four sites along Permanente Creek and two sites along Monte Bello Creek) in accordance with the California Stream Bioassessment Procedure (CSBP 2003) for non-point source assessments. The CSBP is a regional adaptation of the national U.S. Environmental Protection Agency's (EPA) Rapid Bioassessment Protocols for wadeable streams (Barbour et al. 1999), authored by the California Department of Fish and Game.

All BMI samples remained under the custody of WRA and were processed by WRA biologists.

Organisms were removed from the sample and placed in a petri dish for identification under a stereomicroscope. BMIs were then identified to a standard taxonomic level, typically family level for arthropods and order or class for non-arthropods using standard taxonomic keys (McCafferty 1999, Merritt and Cummins 1996, Voshell 2002).

In addition to aquatic biota surveys, water temperature data was collected at various sampling stations along Permanente Creek. Water temperature is an important consideration for some species, especially fish, who cannot tolerate warm water temperatures. Rainbow Trout are coldwater species, and have a relatively low tolerance for elevated water temperatures. Exposure to elevated water temperatures may lead to reduced health and fitness, reduced growth rates, increased susceptibility to predation and disease, and depending on life-stage and duration of the exposure, may cause direct mortality.

4.0 RESULTS

The Permanente Property is generally characterized by undeveloped hillsides to the south, and to the north, an operating limestone quarry with associated facilities. The quarry is surrounded on all sides by steeply sloping rugged terrain dominated by a mosaic of various open and impenetrable chaparral and scrub communities, open woodlands, and dense forests. The majority of the area is drained by Permanente Creek which runs west to east through the Permanente Property. Two smaller watersheds are present in the southern portion of the Permanente Property. The Permanente Property is bordered by open space lands to the north and west, Monte Bello Ridge and Stevens Creek Quarry to the south, and Stevens Creek Reservoir to the southeast and residential developments to the east.

The following sections present the results of the biological resources assessment for special status species, sensitive plant communities and aquatic features on the Permanente Property.

4.1 Biological Communities

Table 1 summarizes the area of each biological community type or other habitat observed on the Permanente Property. Biological communities were further classified based on specific vegetation alliances observed within each community. Twenty (20) distinct biological communities are located on the Permanente Property. Non-sensitive biological communities include: 1) ruderal herbaceous grassland, 2) mixed scrub, 3) northern mixed chaparral, 4) chamise chaparral, 5) oak chaparral, 6) poison oak scrub, 7) non-native annual grassland, 8) California bay forest, 9) California buckeye woodland, 10) rock outcrop, 11) revegetated areas, 12) active quarry, 13) disturbed areas, and 14) settling ponds and operational water features. Sensitive biological communities include: 15) wetland, 16) willow riparian forest and scrub, 17) sycamore alluvial woodland, 18) white alder riparian forest, 19) oak woodland, and 20) streams and ponds. The general locations and extent of these communities is shown in Figures 3(a) through 3(d). Table 2 shows the extent of the biological communities within the property.

4.1.1 Non-Sensitive Biological Communities

Ruderal herbaceous grassland - Ruderal herbaceous grassland is not described by Holland (1986) but includes habitats previously disturbed and/or reclaimed which have been inactive long enough to recruit a plant community dominated by herbaceous weeds and non-native grasses. Species typical of this plant community in California include brome grasses (*Bromus* spp.), wild oats (*Avena* spp.), Italian thistle (*Carduus pycnocephalus*), wild mustard (*Brassica* sp.), and filaree (*Erodium* sp.). This community is widespread throughout California.

Ruderal herbaceous grassland on the Permanente Property primarily occurs on slopes between quarry roads, or in areas adjacent to quarry activities. Species typical of this biological community on the Permanente Property include Italian thistle, field mustard (*Brassica rapa*), lupine (*Lupinus* sp.), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), yellow star thistle (*Centaurea solstitialis*), oleander (*Nerium oleander*), and slender wild oats (*Avena barbata*). Wildlife observed in this plant community on the Permanente Property include Dark-eyed Junco (*Junco hyemalis*), Ring-necked Snake (*Diadophis punctatus*), and California Towhee (*Pipilo crissalis*).

Mixed scrub - Mixed scrub includes shrub-dominated communities dominated by coyote brush (*Baccharis pilularis*), California sagebrush (*Artemisia californica*), and California buckwheat (*Eriogonum fasciculatum*) partially described as Diablan Sage Scrub by Holland (1986). This

community occurs on shallow rocky soils, typically on hot southern exposures of the coast range from Oregon to Central California in areas out of the range of coastal fog incursion.

Mixed scrub was mapped in the eastern portion of the Permanente Property on southern exposures. Additionally, small patches of this community type were mapped throughout the Permanente Property where coyote brush or California buckwheat is the dominant shrub type.

Mixed scrub on the Permanente Property is characterized as dense to moderately open stands to 1.5 meters tall dominated by coyote brush, California sagebrush, and/or California buckwheat with little to no understory vegetation. Associated species include sticky monkey flower (*Mimulus auranticaus*), poison oak (*Toxicodendron diversilobum*), deerweed (*Lotus scoparius*), black sage (*Salvia mellifera*), golden yarrow (*Eriophyllum confertiflora*), and California cudweed (*Gnaphalium californica*). On the Permanente Property, this community type intergrades with chaparrals and oak woodlands. Wildlife observed in this community type on the Permanente Property include Hermit Thrush (*Catharus guttatus*), Northern Pacific Rattlesnake (*Crotalus viridis oreganus*), and Wrentit (*Chamaea fasciata*).

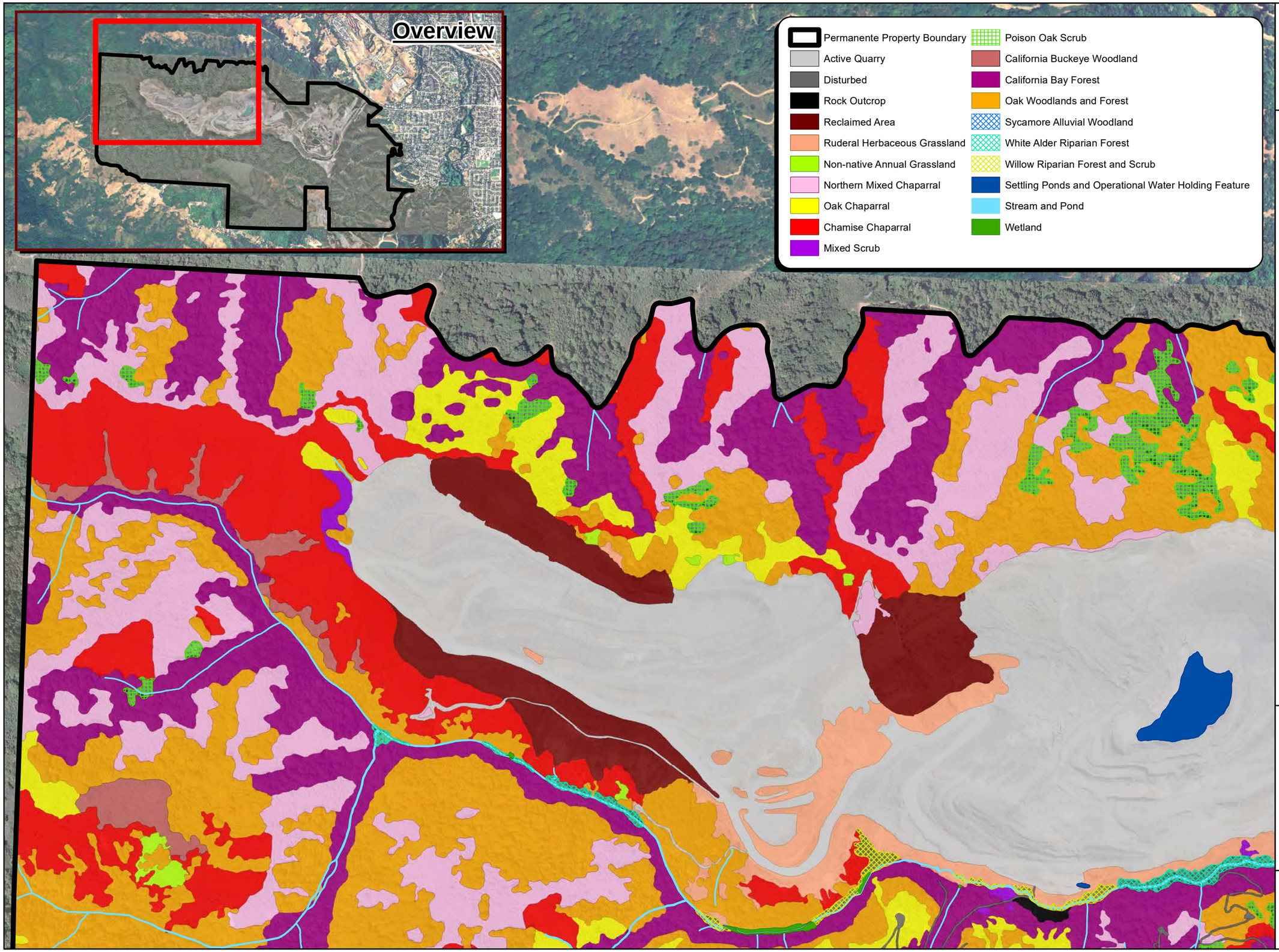
Northern mixed chaparral - Northern mixed chaparral is a community of broadleaved sclerophyll shrubs two to four meters tall forming dense often impenetrable stands dominated by chamise (*Adenostoma fasciculatum*), scrub oak (*Quercus berberidifolia*), various manzanitas (*Arctostaphylos* spp.), and various members of the genus *Ceanothus* (Holland 1986). This community type occurs on dry, rocky, steep, typically south-facing slopes with thin to little soil. It usually occurs below 3,000 feet elevation in Northern California. It is widely distributed throughout the mountain ranges of California.

On the Permanente Property, northern mixed chaparral was mapped in various locations on east and south-facing slopes. Northern mixed chaparral on the Permanente Property forms dense impenetrable stands two to three meters tall with high species diversity in the shrub strata. It intergrades with oak woodlands and oak chaparrals on deeper soils, and chamise chaparral on southern exposures. Species typical of this community type on the Permanente Property include chamise, scrub oak, Eastwood's Manzanita (*Arctostaphylos glandulosa* ssp. *glandulosa*), jimbrush (*Ceanothus oliganthus* var. *sorediatus*), buckbrush (*Ceanothus cuneatus*), birch-leaf mountain mahogany (*Cercocarpus betuloides*), poison oak, yerba santa (*Eriodictyon californicum*), white pitcher sage (*Lepechinia calycina*), coffeeberry (*Rhamnus californicus*), and redberry (*Rhamnus crocea*). There is little to no understory, but where present include Indian warrior (*Pedicularis densiflorus*), Pacific sanicle (*Sanicula crassicaulis*), coyote mint (*Monardella villosa* ssp. *villosa*), and Indian paintbrush (*Castilleja affinis*). Wildlife observed in this community type on the Permanente Property includes Brush Rabbit (*Sylvilagus bachmani*), California Thrasher (*Toxostoma redivivum*) and California Quail (*Callipepla californica*).

Chamise chaparral - Chamise chaparral is a one to three meter-tall chaparral community dominated by chamise with associated species contributing little to overall cover and mature stands containing very little herbaceous understory (Holland 1986). Associated species typically include Manzanita species, scrub oak, buckbrush, birch-leaf mountain mahogany, yerba santa, sage (*Salvia* sp.), and California buckwheat. It has a general distribution similar to northern mixed chaparral, but is more abundant in southern California.

Table 1. Biological Communities within the Permanente Property Boundary

Biological Community	**Acres**
Active Quarry	568.6
Buckeye Woodland	15.6
California Bay Forest	438.1
Chamise Chaparral	464.8
Disturbed	71.0
Mixed Scrub	67.9
Non-native Annual Grassland	48.5
Northern Mixed Chaparral	358.2
Oak Chaparral	225.8
Oak Woodlands and Forests	920.0
Operational Water Holding Feature	10.8
Poison Oak Scrub	109.4
Reclaimed Area	72.5
Rock Outcrop	0.9
Ruderal Herbaceous Grassland	103.0
Sediment Ponds	1.3
Streams and Ponds	8.8
Sycamore Riparian	6.2
Wetland	2.4
White Alder Riparian Forest	15.0
Willow Riparian Forest and Scrub	4.3
Total	**3,510**



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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry
Santa Clara County, CA

Figure 2a.

Biological Communities within the Permanente Property Boundary

N
W E
S

0 350 700 1,400
Feet

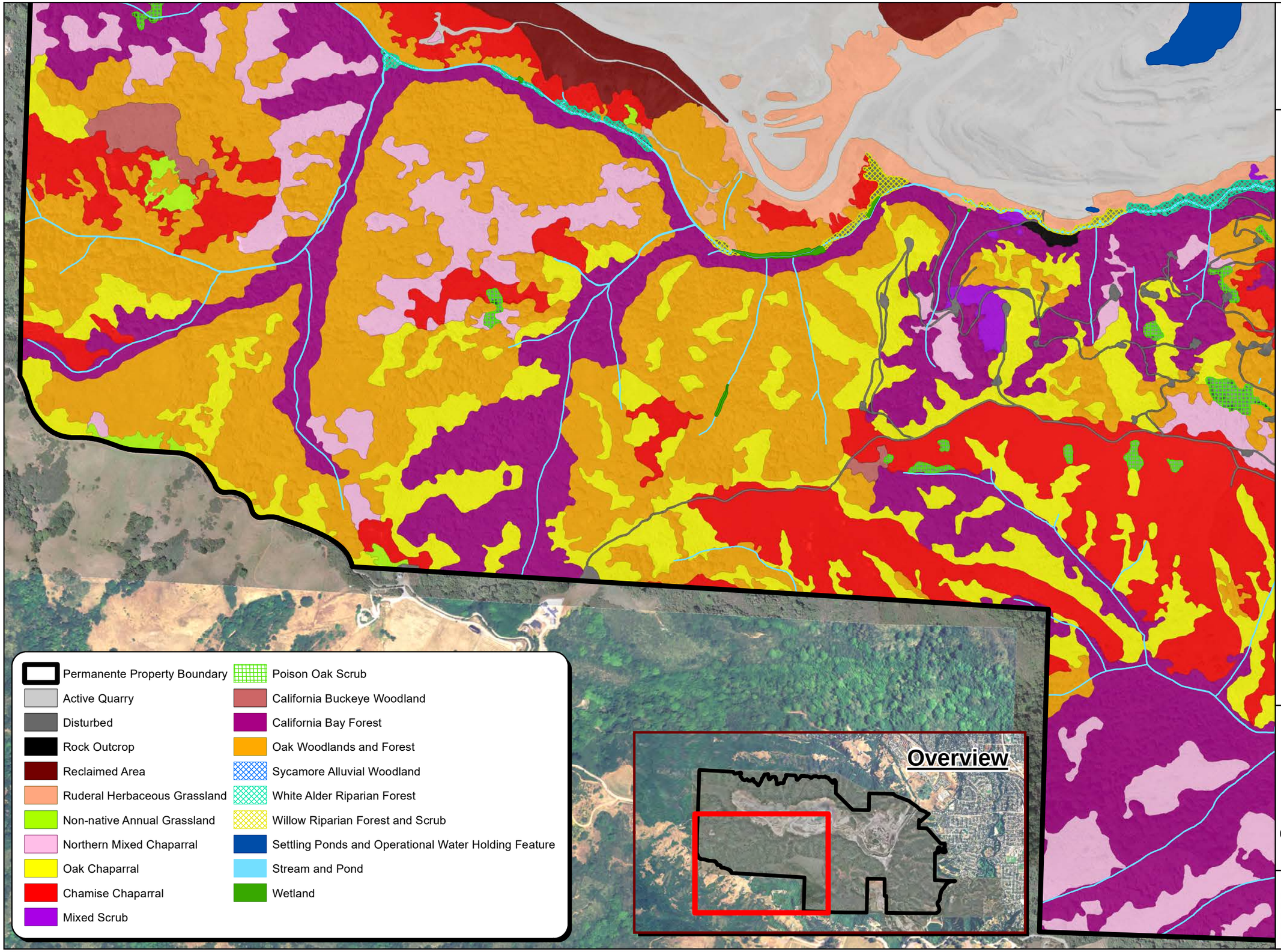
Date: May 2010
Map By: Michael Rochelle
Image: April 2007
Filepath: I:\Acad2000\16000\16143\gis\Arcmap\BRA\2010 Report\BioCommunities_A.mxd

wra
ENVIRONMENTAL CONSULTANTS

Lehigh Permanente
Quarry
Santa Clara County, CA

Figure 2b.

Biological Communities
within the Permanente
Property Boundary



N
W E
S

0 350 700 1,400
Feet

Date: May 2010
Map By: Michael Rochelle
Image: April 2007
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BRA\2010 Report\BioCommunties_B.mxd

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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry
Santa Clara County, CA

Figure 2c.

Biological Communities within the Permanente Property Boundary

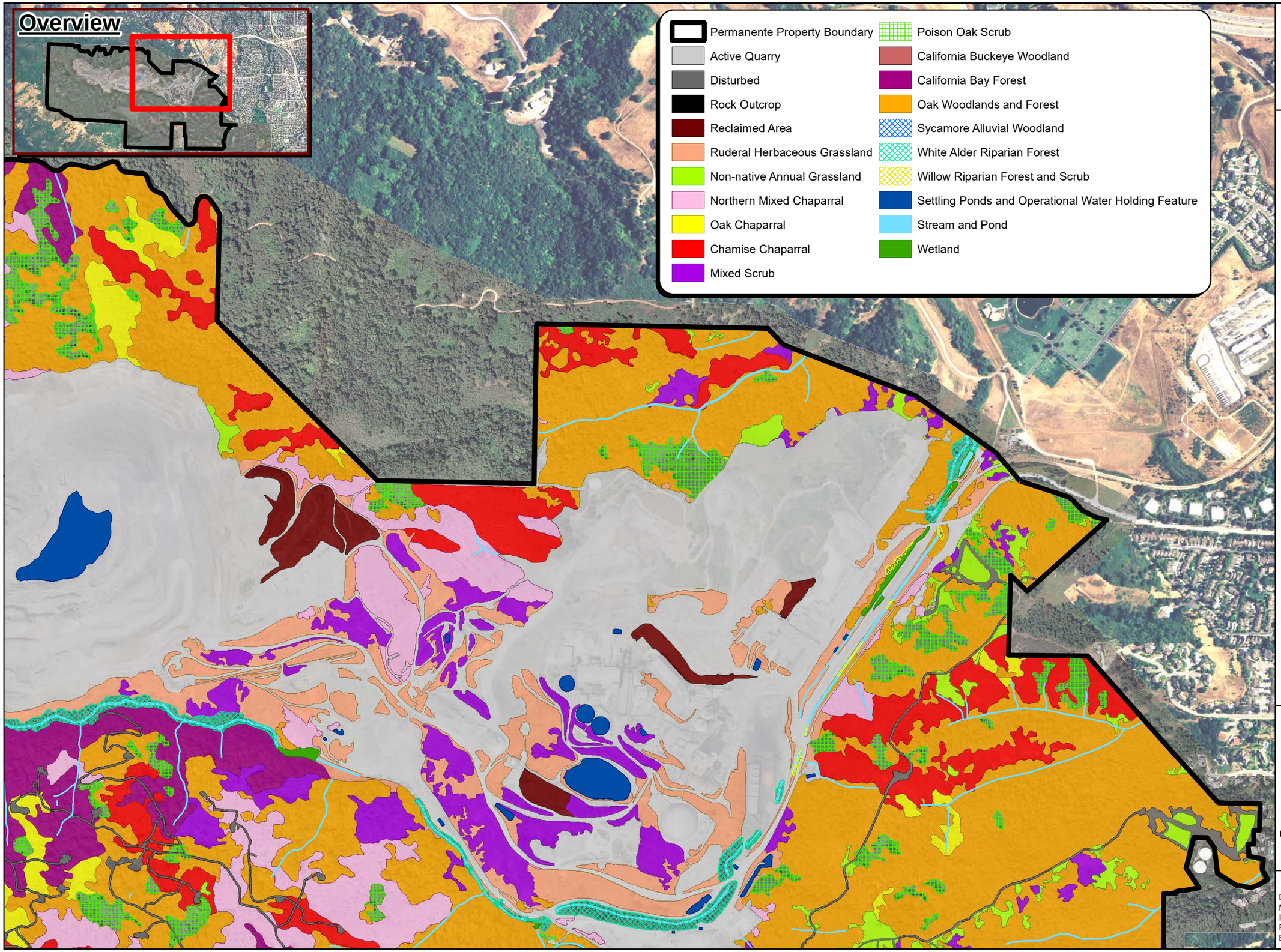
Permanente Property Boundary
Active Quarry
Disturbed
Rock Outcrop
Reclaimed Area
Ruderal Herbaceous Grassland
Non-native Annual Grassland
Northern Mixed Chaparral
Oak Chaparral
Chamise Chaparral
Mixed Scrub
Poison Oak Scrub
California Buckeye Woodland
California Bay Forest
Oak Woodlands and Forest
Sycamore Alluvial Woodland
White Alder Riparian Forest
Willow Riparian Forest and Scrub
Settling Ponds and Operational Water Holding Feature
Stream and Pond
Wetland

Overview

N
W E
S

0 350 700 1,400
Feet

Date: May 2010
Map By: Michael Rochelle
Image: April 2007
Filepath: I:\Acad2000\16000\16143\gis\Arcmap\BRA\2010 Report\BioCommunities_C.mxd



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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry
Santa Clara County, CA

Figure 2d.

Biological Communities within the Permanente Property Boundary

N
W E
S

0 350 700 1,400
Feet

Date: May 2010
Map By: Michael Rochelle
Image: April 2007
Filepath: I:\Acad2000\16000\16143\gis\Arcmap\BRA\2010 Report\BioCommunities_D.mxd

Chamise chaparral on the Permanente Property dominates southern exposures with shallow soils. Chamise chaparral on the Permanente Property ranges from 0.5 to three meters tall forming impenetrable stands with no herbaceous understory. It intergrades with northern mixed chaparral on eastern exposures, and abruptly borders oak woodland and oak chaparral at ridgelines. Occasional associates include scrub oak, toyon (*Heteromeles arbutifolia*), and madrone (*Arbutus menziesii*). Wildlife observed in this community type on the Permanente Property includes Spotted Towhee (*Pipilo maculatus*), Bewick's Wren (*Thryomanes bewickii*), and Anna's Hummingbird (*Calypte anna*).

Oak chaparral - Oak chaparral includes plant communities described in Holland (1986) as scrub oak chaparral and undescribed plant communities dominated by canyon live oak (*Quercus chrysolepis*) under four meters tall. Oak chaparral is a dense, evergreen chaparral dominated by oak shrubs (*Quercus berberidifolia*, *Q. chrysolepis*, and *Q. agrifolia*) with considerable cover of birch-leaf mountain mahogany and accumulated leaf litter in the understory. It ranges from Tehama County to Baja California in the western Sierra Nevada and Coast Ranges.

On the Permanente Property, oak chaparral was mapped on various north and east-facing slopes where conditions are slightly more mesic than other slopes. It intergrades with northern mixed chaparral on northern exposures, chamise chaparral on eastern exposures, and oak woodlands on flatter north-facing slopes. Species typical of this community on the Permanente Property include scrub oak, bush interior live oak (*Quercus wislizeni* var. *frutescens*), coffeeberry, madrone, chaparral pipestem (*Clematis lasiantha*), poison oak, and birch-leaf mountain mahogany. Wildlife observed in this community type on the Permanente Property include Hutton's Vireo (*Vireo huttoni*), Blue-gray Gnatcatcher (*Polioptila caerulea*), and Fox Sparrow (*Passerella iliaca*).

Poison oak scrub - Briefly described in Holland (1986), poison oak scrub is a shrub-dominated community maintained by frequent fires or other disturbance and completely dominated by poison oak. Poison oak scrub on the Permanente Property contains extremely dense, monotypic stands of poison oak to two meters tall. There are no other species associated with this community type. Wildlife observed in this community type on the Permanente Property includes Ruby-crowned Kinglet (*Regulus calendula*), Wrentit, and San Francisco Dusky-footed Woodrat (*Neotoma fuscipes annectens*).

Non-native annual grassland - Non-native annual grassland is described in Holland (1986) as a dense to sparse cover of annual grasses and herbs 0.2 to 0.5 meters high. Characteristic species include wild oats, soft chess (*Bromus hordeaceus*), filaree (*Erodium botrys*, *E. cicutarium*), Italian ryegrass (*Lolium multiflorum*), small fescue (*Vulpia microstachys*), and various native and non-native herbs and wildlfowers. This community type is distributed throughout the valleys and foothills of most of California below 3,000 feet.

Non-native annual grassland was mapped on the Permanente Property in various landscape positions. Non-native annual grassland intergrades with chaparrals and oak woodlands on slopes and ridgelines. Species typical of this community type on the Permanente Property include wild oats, ripgut brome (*Bromus diandrus*), soft chess, Italian ryegrass, filaree, small fescue, California poppy (*Eschscholzia californica*), bird vetch (*Vicia cracca*), and birdfoot trefoil (*Lotus corniculatus*). Wildlife observed in this plant community on the Permanente Property include Western Meadowlark (*Sturnella neglecta*), Bobcat (*Lynx rufus*), and Violet-green Swallow (*Tachycineta thalassina*).

California bay forest - California bay forest is described in Holland (1986) as similar to a mixed evergreen forest but typically consisting entirely of California bay to 30 meters tall. It usually occurs on moist, north-facing slopes and intergrades with redwood forests in moister canyons and mixed chaparral on drier, rockier slopes. This community type is usually very dense and supports little or no understory. Characteristic species include jimbrush, dogwood (*Cornus* sp.), blackberries (*Rubus* sp.), and snowberry. It is distributed along the Coast Ranges from the Oregon border to northern San Luis Obispo County below 3,000 feet, with patchy occurrences of stands usually limited to a few acres.

On the Permanente Property, this community type occurs on north-facing slopes and in the protected valley bottoms. This community type on the Permanente Property consists of dense, monotypic stands of California bay with little to no understory. Reproduction is primarily vegetative with many stems arising from a single root system. Wildlife observed in this plant community include Steller's Jay (*Cyanocitta stelleri*), Chestnut-backed Chickadee (*Poecile rufescens*), and Mule Deer (*Odocoileus hemionus*).

California buckeye woodland - California buckeye woodland is not described in Holland (1986), but includes areas of open woodland dominated by California buckeye. California buckeye woodlands on the Permanente Property usually contain moderate cover of California buckeye with associated elderberry (*Sambucus mexicana*) and coast live oak. The understory is dominated by native grasses and herbs such as California melic grass (*Melica californica*), small-flowered needlegrass (*Nassella lepida*), California buttercup (*Ranunculus californicus*), and pacific sanicle as well as non-native grasses such as Italian ryegrass, soft chess, and ripgut brome. Wildlife observed in this plant community on the Permanente Property include Chestnut-backed Chickadee, American Robin (*Turdus migratorius*), and Red-breasted Sapsucker (*Sphyrapicus ruber*).

Rock outcrop - Rock outcrop includes areas that host little to no soil or plant cover. On the Permanente Property, they are primarily vertical exposures of various rock types amidst chaparral communities on all aspects. Many small rock outcrops are scattered throughout the Permanente Property, but were primarily too small to map in this effort. The largest rock outcrop on the Permanente Property is on the southern side of Permanente Creek in the center of the Permanente Property. This rock outcrop supports sparse coverage of bigleaf maple (*Acer macrophyllum*) saplings and pacific stonecrop (*Sedum spathulifolium*).

Reclaimed areas - Reclaimed areas are defined here as historically disturbed slopes that have been reclaimed by grading to a final contour, planted with native grass species, and/or planted at a low to moderate density with native shrubs and trees including coyote brush, chamise, and oaks from locally collected cuttings and acorns. Irrigation has been applied to some of the more recent, large-scale revegetated areas to encourage the establishment of planted trees and shrubs, and protective cages have been installed around most container plantings to reduce damage from deer browsing. Generally, these areas are dominated by grass species including wild oats, brome grasses, small fescue, and Italian rye-grass with some establishment of yellow star thistle throughout the open areas. Wildlife observed in this plant community on the Permanente Property include Grasshopper Sparrow (*Ammodramus savannarum*), Bewick's Wren, and Spotted Towhee.

Active quarry - Areas identified on the Permanente Property as active quarry have been disturbed by quarry activities and in some locations host a very small number of weedy and/or native plant species including yellow star thistle, coyote brush, chamise, wild oats, sweet fennel

(*Foeniculum vulgare*), and field mustard. Generally, plant cover in these areas is very sparse due to the lack of topsoil. This community offers little habitat for plants or animals.

Disturbed areas - Areas identified on the Permanente Property as disturbed have been disturbed by non-quarry activities such as plowing for fuel breaks and construction and maintenance of dirt roads and clearing of hiking trails. Disturbed areas generally have highly compacted soils and provide little habitat for plants or animals.

Settling ponds and operational water features - Settling ponds for quarry runoff and operational water ponds were identified on the Permanente Property as shown in Figures 3a-d.

4.1.2 Sensitive Biological Communities and Aquatic Features

The sensitive biological communities observed on the Permanente Property are shown in Figures 4(a-d) and described below.

Wetland - Wetlands mapped on the Permanente Property include two types of wetland: wetland seeps and freshwater emergent wetlands. Wetland seeps are not described in Holland (1986) but are characterized by a dominance of perennial herbs and ferns that are adapted to wetland conditions. On the Permanente Property, wetland seeps occur along slopes where freshwater lenses intersect the soil surface, or along intermittent spring-fed streams. Wetland seeps on the Permanente Property are dominated by California elk clover (*Aralia californica*), wild ginger (*Asarum caudatum*), giant chain fern (*Woodwardia finbriata*), maiden hair fern (*Adiantum jordanii*), and five-fingered fern (*Adiantum aleuticum*). Wildlife observed in this plant community on the Permanente Property include Stellar's Jay, Bewick's Wren, and California Newt (*Taricha torosa*).

Emergent freshwater wetland occurs in quiet sites permanently flooded with freshwater (Holland 1986). This community is dominated by perennial emergent monocots to five meters tall. Characteristic species of this community type include sedges (*Carex* sp.), bulrush (*Scirpus* sp.), cattails (*Typha* sp.), and spike rush (*Eleocharis* sp.). This community type occurs along the California coast and in coastal valleys near river mouths and around the margins of lakes and springs.

Emergent freshwater wetland on the Permanente Property includes areas adjacent to Permanente Creek which are permanently flooded and host a plant community dominated by perennial emergent grasses and herbs. Four constructed sedimentation basins (Ponds 13, 14, 21 and 22) were mapped as freshwater marshes due to the recruitment of this plant community in the accumulated sediments between maintenance cycles. Species typical of this community type on the Permanente Property include cattail, watercress (*Rorippa nasturtium* ssp. *aquaticum*), field horsetail (*Equisetum arvense*), stinging nettle (*Urtica dioica*), and short spike hedge nettle (*Stachys pycnantha*). Wildlife observed in this plant community on the Permanente Property include Song Sparrow (*Melospiza melodia*), Pacific Tree Frog (*Pseudacris regilla*), and Red-winged Blackbird (*Agelaius phoeniceus*).

Willow riparian forest and scrub - Willow riparian forest and scrub is not described in Holland (1986), but is characterized as a riparian community dominated by various willow species (*Salix* spp.). Species typical of this community type include arroyo willow (*Salix lasiolepis*), red willow (*S. laevigata*), and black willow *(S. gooddingii*). The overstory ranges from dense to open, and heights range from one to six meters. Associated understory species include short spike hedge nettle, stinging nettle, poison oak, California blackberry (*Rubus ursinus*), and western creek dogwood (*Cornus sericea* ssp. *occidentalis*). It occurs along flat areas adjacent to Permanente

Creek and wet tributaries. Wildlife observed in this plant community on the Permanente Property include Lincoln's Sparrow (*Melospiza lincolnii*), Wilson's Warbler (*Wilsonia pusilla*), and Great Blue Heron (*Ardea herodias*).

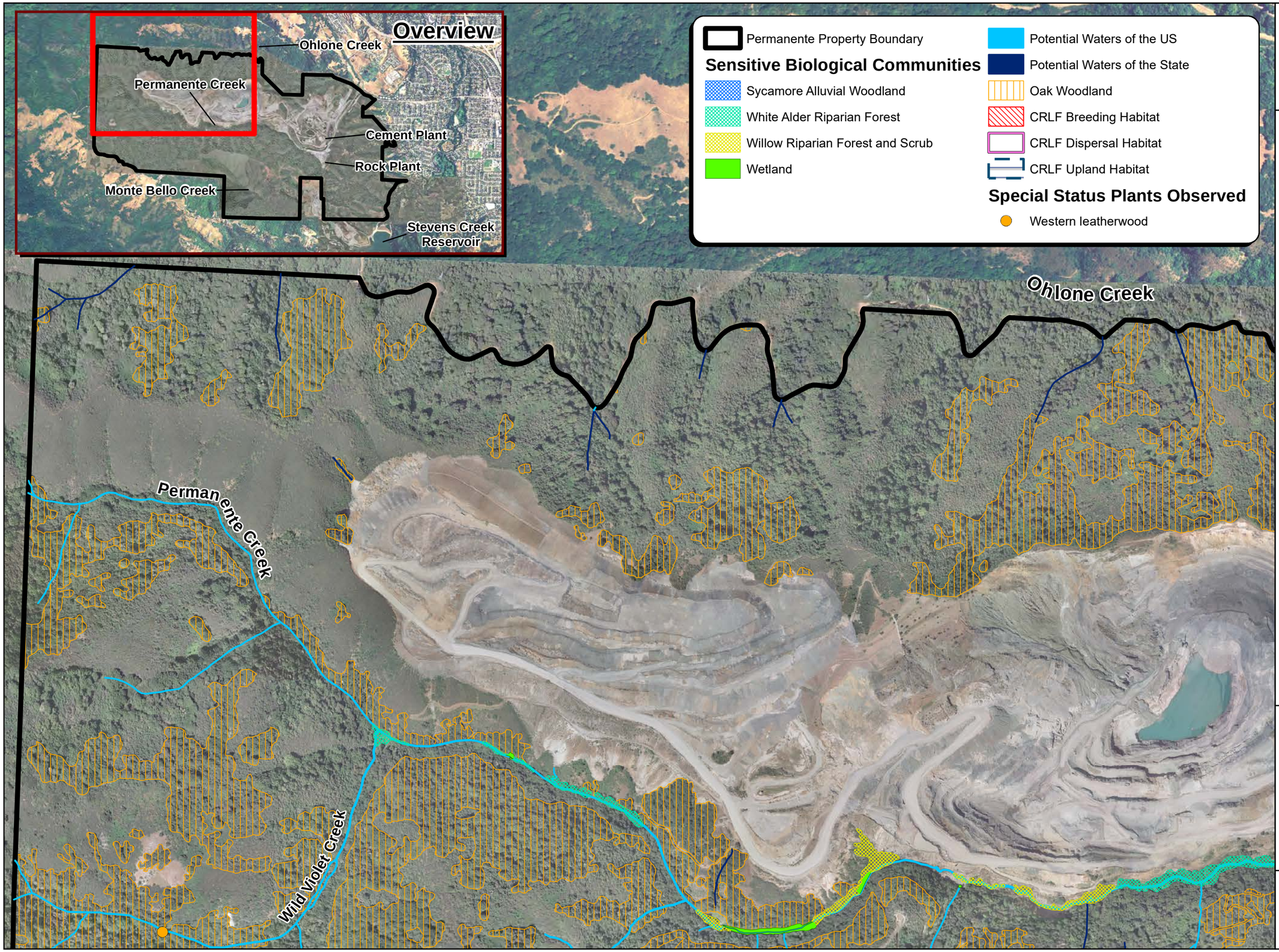
Sycamore alluvial woodland - Sycamore alluvial woodland is described in Holland (1986) as a moderately closed broadleaf riparian forest dominated by sycamore (*Platanus racemosa*) and cottonwood (*Populus fremontii*). Associated species include bigleaf maple (*Acer macrophyllum*), California buckeye, coast live oak, and various willow species. This community type usually occurs on floodplains of sub-perennial streams throughout the coast ranges of California.

Sycamore alluvial woodland was mapped in the far eastern portion of the Permanente Property along one unnamed tributary to Stevens Creek. This community has a moderately open canopy dominated by sycamore with occasional cottonwood, valley oak (*Quercus lobata*), and coast live oak. Understory species include California blackberry, poison oak, and annual grasses. Wildlife observed in this plant community on the Permanente Property include Hairy Woodpecker (*Picoides villosus*), Pacific Slope Flycatcher (*Empidonax difficilis*), and Brown Creeper (*Certhia americana*).

White alder riparian forest - White alder riparian forest is described in Holland (1986) as a medium-tall broadleaf deciduous streamside forest dominated by white alder (*Alnus rhombifolia*) typical of perennial streams in incised canyons below 6,000 feet. Stands in the coast ranges have abundant willows, poison oak, California wild rose (*Rosa californica*), and snowberry in the understory. Associated species include bigleaf maple, western creek dogwood, and Oregon ash (*Fraxinus latifolia*). White alder riparian forest is best formed along rapidly flowing, bedrock-constrained, steep sided canyons, so the riparian corridor is typically narrow.

White alder riparian forest was mapped on the Permanente Property along portions of Permanente Creek. This community type on the Permanente Property is dominated by white alder with abundant bigleaf maple, western creek dogwood, willows, poison oak, and snowberry. Wildlife observed in this plant community on the Permanente Property include Nuttall's Woodpecker (*Picoides nuttallii*), Black Phoebe (*Sayornis nigricans*), and Pacific Slope Flycatcher.

Oak woodland – Several oak woodland community types are described in more detail in Holland (1986), but were lumped in this vegetation mapping effort due to the lack of dominance of one oak species in most of the woodlands encountered on the Permanente Property. Permanente Property's oak woodlands are described as Blue Oak Woodland and Coast Live Oak Woodland in Holland (1986) but also contain oak woodland communities dominated by canyon live oak, and mixed oak woodlands. Species characteristic of these oak woodland types include blue oak (*Quercus douglasii*), coast live oak, canyon live oak, California buckeye, grey pine (*Pinus sabiniana*), California bay, elderberry, toyon, madrone, coffeeberry, poison oak, gooseberries (*Ribes* spp.), and manzanitas. These oak woodland types are distributed throughout California typically in protected valleys and north-facing slopes, intergrading with chaparrals on drier sites and mixed evergreen forests on moister sites.



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Santa Clara County, CA

Figure 3a.

Sensitive Biological Communities and Special Status Species Observed

N
W E
S

0 350 700 1,400
Feet

Date: May 2010
Map By: Michael Rochelle
Image: 2005 NAIP
Filepath: I:\Acad2000\16000\16143\gis\Arcmap\BRA\2010 Report\SpecialStatus_A.mxd

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Lehigh Permanente Quarry
Santa Clara County, CA

Figure 3b.

Sensitive Biological Communities and Special Status Species Observed

Permanente Creek

Wild Violet Creek

Monte Bello Creek

Permanente Property Boundary

Sensitive Biological Communities

- Sycamore Alluvial Woodland
- White Alder Riparian Forest
- Willow Riparian Forest and Scrub
- Wetland
- Potential Waters of the US
- Potential Waters of the State
- Oak Woodland
- CRLF Breeding Habitat
- CRLF Dispersal Habitat
- CRLF Upland Habitat

Special Status Plants Observed

- Western leatherwood

Overview

Ohlone Creek
Permanente Creek
Cement Plant
Rock Plant
Monte Bello Creek
Stevens Creek Reservoir

N
W E
S

0 350 700 1,400 Feet

Date: May 2010
Map By: Michael Rochelle
Image: April 2007
Filepath: I:\Acad2000\16000\16143\gis\Arcmap\BRA\2010 Report\SpecialStatus_B.mxd

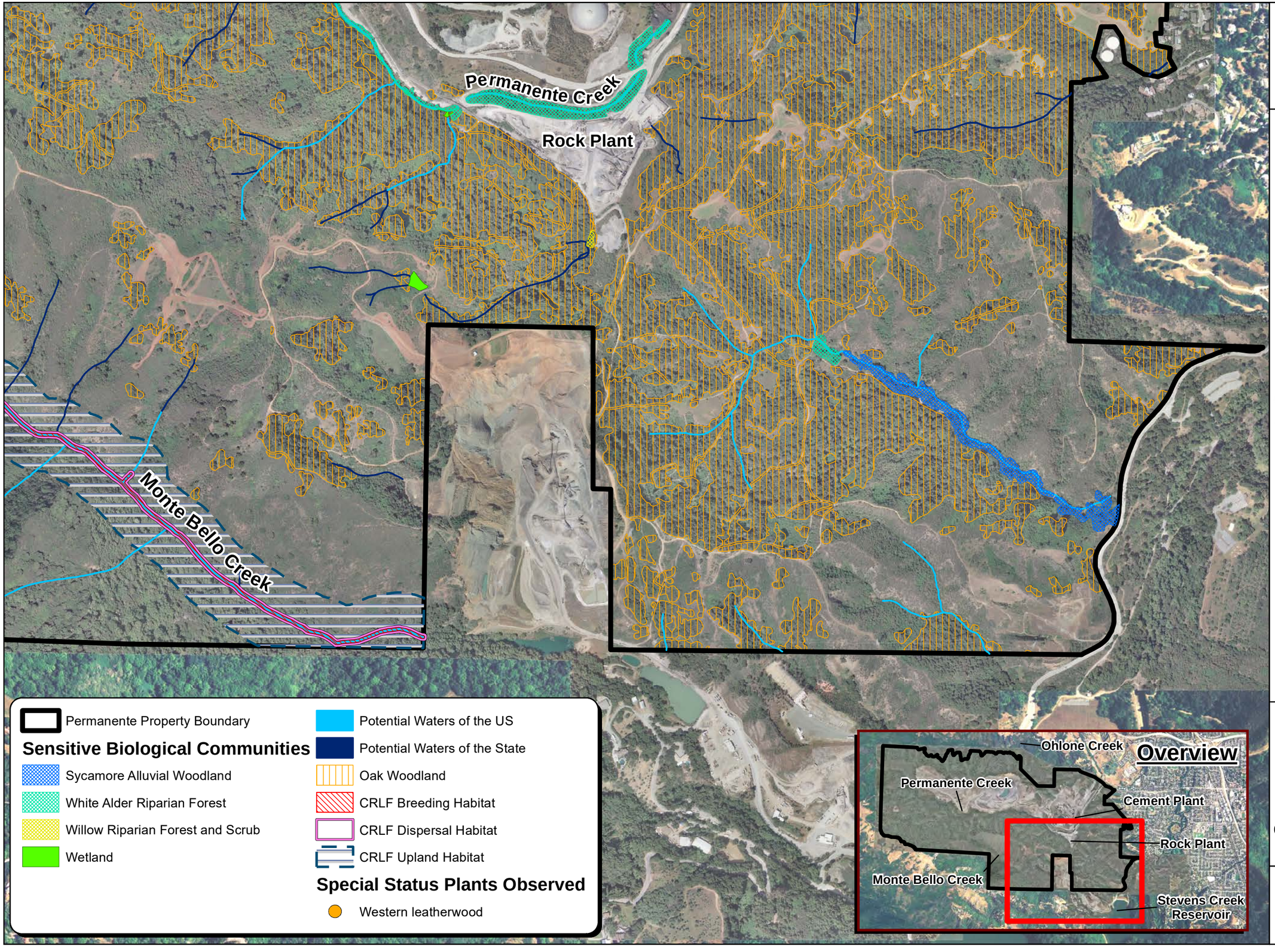

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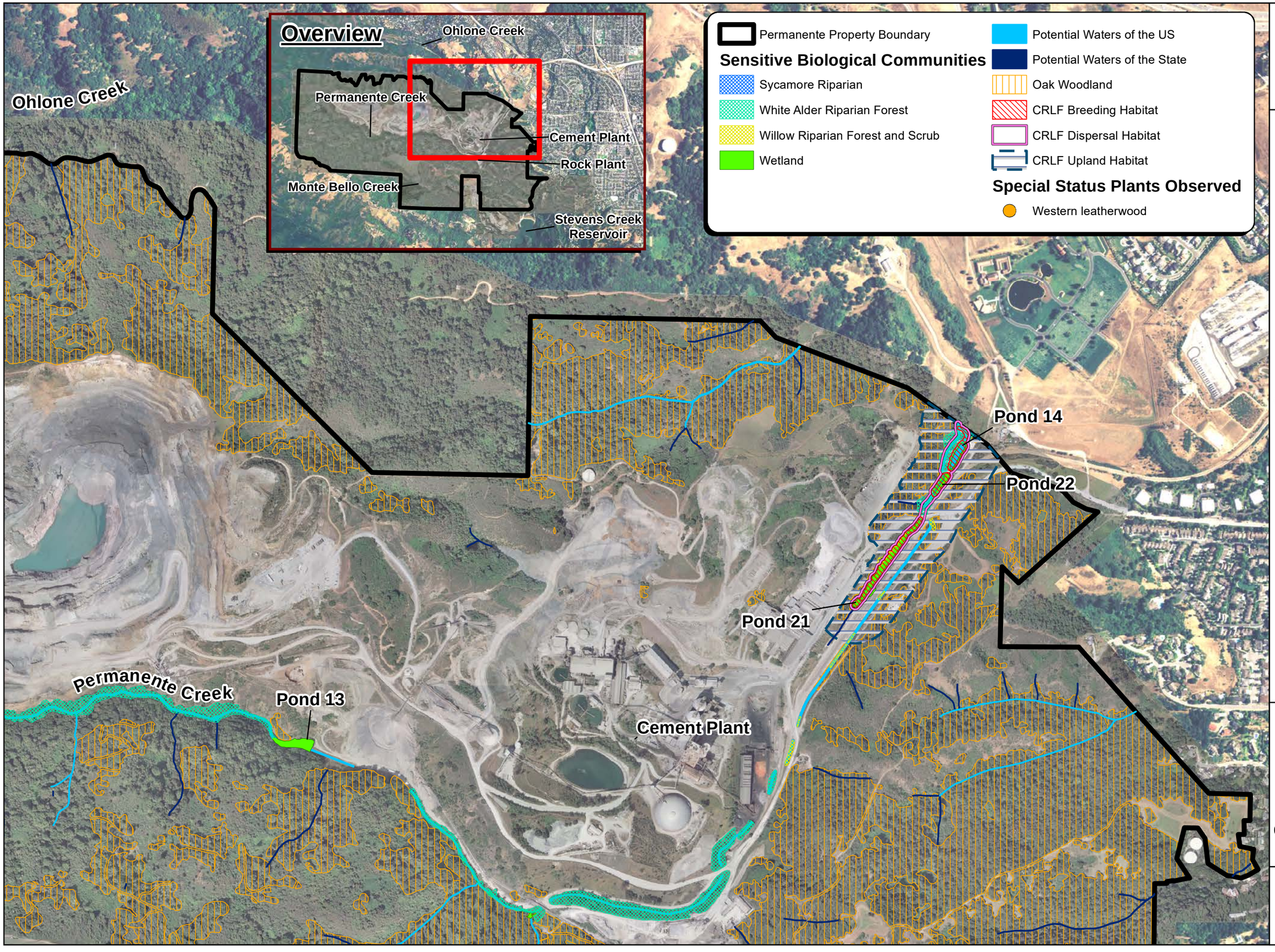
Figure 3c.

Sensitive Biological Communities and Special Status Species Observed

N
W E
S

0 350 700 1,400 Feet

Date: May 2010
Map By: Michael Rochelle
Image: April 2007
Filepath: I:\Acad2000\16000\16143\gis\Arcmap\BRA\2010 Report\SpecialStatus_C.mxd



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Lehigh Permanente Quarry
Santa Clara County, CA

Figure 3d.

Sensitive Biological Communities and Special Status Species Observed

Date: May 2010
Map By: Michael Rochelle
Image: April 2007
Filepath: I:\Acad2000\16000\16143\gis\Arcmap\BRA\2010 Report\SpecialStatus_D.mxd

Oak woodlands were mapped on the Permanente Property primarily along north-facing slopes and in valley bottoms. Oak woodlands on the Permanente Property are predominantly characterized as coast live oak and blue oak woodlands. A few small pockets of oak woodland dominated by interior live oak (northern portion of the Permanente Property) are also present. Oak woodlands on the Permanente Property have dense and diverse overstories containing madrone, tanbark oak (*Lithocarpus densiflorus*), and California bay with occasional grey pine, and Douglas-fir (*Pseudotsuga menziesii*). Species characteristic of the understory include poison oak, coffeeberry, ocean spray (*Holodiscus discolor*), elderberry, toyon, and gooseberries. Wildlife observed in this plant community on the Permanente Property includes Cooper's Hawk (*Accipiter cooperii*), Oak Titmouse (*Baeolophus inornatus*), and California Deer Mouse (*Peromyscus californicus*).

Streams and ponds - Streams and ephemeral drainages were mapped on the Permanente Property. The most significant of these is Permanente Creek which is a perennial stream that flows across the Permanente Property from its headwaters in the west to the northeastern boundary of the site. Portions of the creek only convey surface water for a few weeks during annual peak rains. Tributaries to Permanente Creek as well as tributaries to Ohlone Creek to the north and to Monte Bello Creek to the south of the Permanente Property were mapped and are described in detail in a jurisdictional determination report submitted to the U.S. Army Corps of Engineers in January 2010 (WRA 2010a).

Permanente Creek

The headwaters of Permanente Creek originate to the west of the Permanente Property. It is fed through a series of seeps and intermittent tributaries, in addition to surface runoff. Permanente Creek trends generally west to east, roughly through the center of the property before turning north and flowing for approximately nine miles before emptying into San Francisco Bay. In general, the western-most third of Permanente Creek in the Permanente Property follows a natural course. The central third of the creek has been subjected to historical disturbance, including fill, realignment and road crossings, associated with early mining activities. The eastern third of the creek, after flowing into settling Pond 13, flows through numerous culverts, channelized segments and impoundments before exiting at the north east corner of the Permanente Property. These portions of the Permanente Property have been historically managed and/or diverted as part of the quarry operations, which have been ongoing since the late 1930s based on aerial and historic site photographs. A delineation of Permanente Creek was verified by the U.S. Army Corps of Engineers (WRA 2008). Additionally a detailed analysis of the hydrology of Permanente and Monte Bello Creeks was performed by Golder Associates (2010).

Permanente Creek is heavily managed downstream of the Permanente Property where it runs through residential and commercial areas and is generally channelized until reaching Mountain View Slough and south San Francisco Bay. In Los Altos, just north of Mira Monte and Portland Avenues, there is a low flow diversion dam that spills water into Permanente Creek only during very high flow events effectively severing the creek downstream of this dam from receiving flows from upstream. The dam spills from the top through narrow slits from about five to six foot in height. Below this dam Permanente Creek is overgrown with vegetation. The dam is located along the western portion of an 8,000 foot long concrete diversion channel. The Permanente Diversion was designed to divert the majority of storm runoff from the upper Permanente watershed into Stevens Creek. The diversion structure diverts almost all flow to Stevens Creek (SCVWD 2002).

Generally, tributaries that drain into Permanente Creek are extremely flashy in nature and rarely convey surface flow except during high flow events. The slope to the south of Permanente Creek is densely vegetated and the soils are dominated by various loams which are highly permeable. Since surface water is not largely available (both in time and space) within these tributaries, they do not serve as aquatic habitat to organisms.

Monte Bello Creek

Monte Bello Creek originates from a combination of seeps and intermittent tributaries to the south of the Permanente Property on the north side of Monte Bello ridge and drains an area of approximately 950 acres in size. The Main Stem, also referred to as the "South Fork", flows northeast until it meets the "North Fork" which originates on the Permanente Property. From the confluence, the Main Stem is perennial and trends southeast until it leaves the Permanente Property and drains into a series of large, in-stream, detention basins on the neighboring property. The creek drains into Stevens Creek Reservoir before emptying into Stevens Creek which trends north along Highway 85 and out to San Francisco Bay through Mountain View.

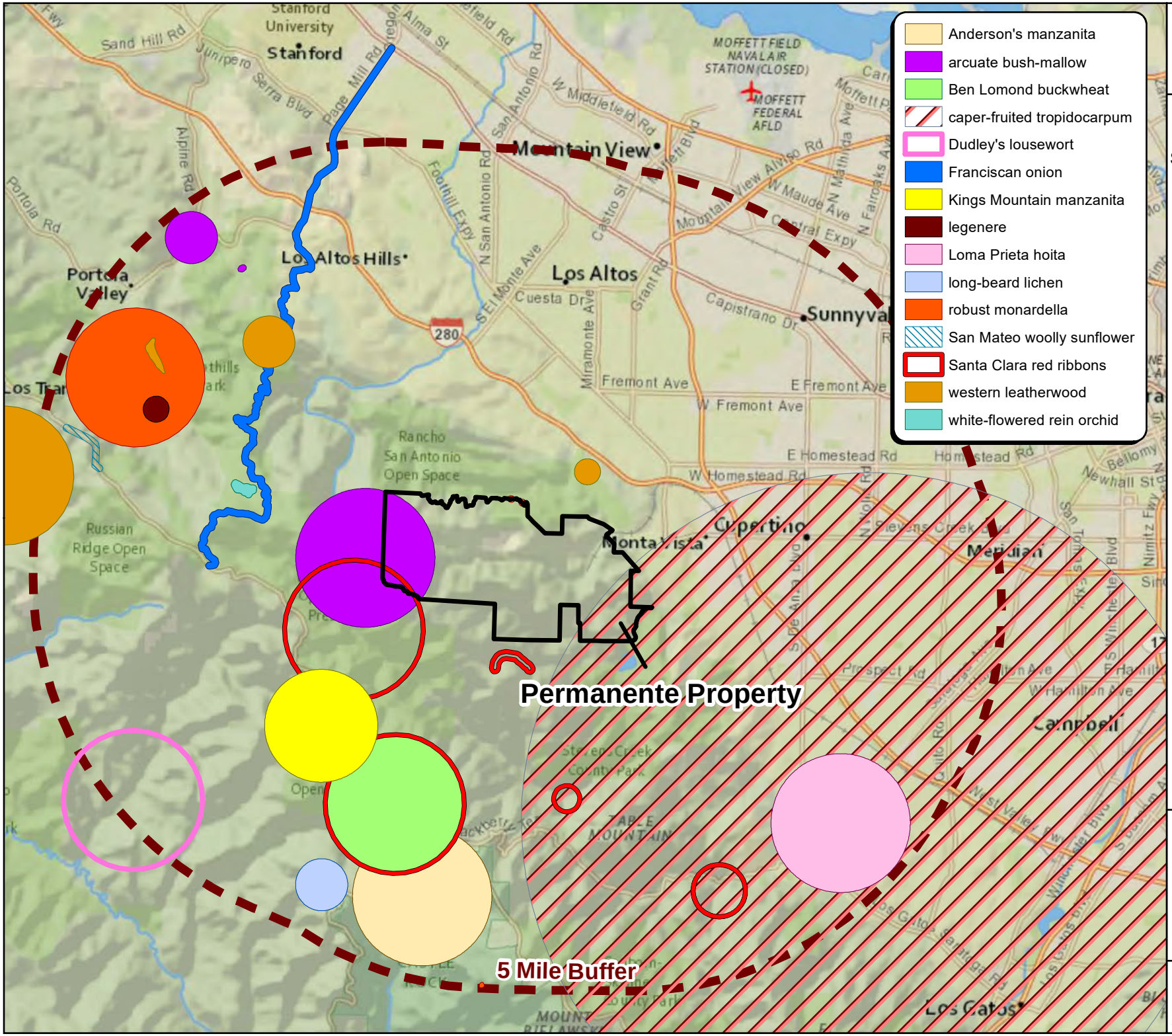
Tributaries to Monte Bello Creek within the Permanente Property range from ephemeral to intermittent. They do not display an OHW mark, nor do they support riparian vegetation. Calcareous limestone is also common in the tributaries to Monte Bello Creek, although no pools were observed which hold water long enough to support fish or breeding amphibians.

Unnamed tributary to Stevens Creek

One unnamed stream and its tributaries were mapped in the southeastern corner of the Permanente Property. This stream is a tributary to Stevens Creek, with their confluence on the eastern side of Stevens Canyon Boulevard off of the Permanente property. Almost the entire watershed for this stream is located on the Permanente Property. This stream is intermittent, with flow absent as early as May in 2008, although an OHW mark was observed throughout much of its length. No wetland seeps were observed in this watershed. The primary source of flow is runoff from adjacent slopes. The main stem of this stream is a low gradient, unconfined channel which supports a significant overstory of willow scrub and riparian sycamore woodland.

Ohlone Creek tributaries

Ohlone Creek is a tributary to Permanente Creek, although their confluence is north of the Permanente Property. The main stem of Ohlone Creek is located in Rancho San Antonio County Park (Mid-Peninsula Open Space District), but a portion of its watershed and several tributaries are located in the northern portion of the Permanente Property. Tributaries to Ohlone Creek observed on the Permanente Property are ephemeral and do not display an OHW mark. Additionally, they do not support an assemblage of plant species adapted to wetland conditions. The forest overstory in the vicinity of these tributaries is California bay forest and is not considered riparian in nature due to its abundance on ridgelines.



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Santa Clara County, CA

Figure 4.

Special Status Plant Occurrences within Five Miles of the Permanente Property Boundary

(*Based on CNDDB 2010 Data*)

Date: May 2010
Map By: Michael Rochelle
Filepath: I:\Acad2000\16000\16143\gis\Arcmap\2010 Reports\BRA\CNDDB_Plants.mxd

4.2 Special Status Species

4.2.1 Plants

California Natural Diversity Database records (Figure 5) indicate that three special status plant species have been recorded on the Permanente Property although two of these occurrences are unlikely to apply to the Permanente Property due to uncertainties in mapping and identification. Caper-fruited tropidocarpum (*Tropidocarpum capparideum*) is reported in the southeastern corner of the Permanente Property, but the record presented is an approximately five-mile radius around a reported collection from 1907, which may have been misidentified (CNDDB 2009). Arcuate bushmallow (*Malacothamnus arcuatus*) is reported in the southwestern portion of the Permanente Property near Black Mountain, but the occurrence is an approximately one-mile radius around an uncertain location report from 1926 (CNDDB 2009). Robust coyote mint (*Monardella villosa* ssp. *globosa*) has been recorded on-site as recently as 2006 (CNDDB 2009), but field investigations by WRA biologists in the exact locations of these occurrences did not confirm the presence of this rare subspecies. In the vicinity of the reported occurrence, several populations of a common subspecies of coyote mint (*Monardella villosa* ssp. *villosa*) were observed. It is the professional opinion of the authors of this report that these three reported species are not present on the Permanente Property.

One early season and one late season protocol rare plant field survey was conducted on May 13-15 and July 10, 11, and 17, 2008. The surveys corresponded to peak blooming periods for observing and accurately identifying twenty five of the thirty two rare plant species with potential to occur on the Permanente Property and vicinity. The remaining species are identifiable outside their blooming period (one tree, five perennial shrubs, one lichen, and one moss).

A list of plant species observed during the surveys is provided in Appendix B. Two listed species were observed on site; Western leatherwood (*Dirca occidentalis*) and Northern California black walnut (*Juglans hindsii*), although only Western leatherwood is afforded protection under CEQA. After further investigation, it was determined that this observation was invalid due to misidentification of the plants, as described below. These species are described in detail below and their occurrence on the Permanente Property is shown in Figure 5.

Western leatherwood (*Dirca occidentalis*). CNPS List 1B. Western leatherwood is a deciduous shrub in the Mezereum family (Thylemaceae) that blooms from January through March and is endemic to California, specifically the San Francisco Bay Area. It primarily occurs on moist slopes in all types of forest- or shrub- dominated communities at elevations of 50 to 395 meters. One small population (< five individuals) was identified on the streambanks of a tributary to Permanente Creek in the far western portion of the Permanente Property.

After further investigation, it was determined that this observation of Western leatherwood was misidentified. During the initial identification of this species no flowering material was available. Subsequent investigation determined that the individual was oso berry (*Oemleria cerasiformis*), a perennial deciduous shrub that occurs on shaded, forested slopes. Oso berry is not a rare species.

Northern California black walnut (*Juglans hindsii*). CNPS List 1B. Northern California black walnut is a deciduous tree in the walnut family (Juglandaceae) that occurs in riparian forest and riparian woodland from 0 to 440 meters in elevation. The species is historically known from Alameda, Butte, Contra Costa, Lake, Napa, Sacramento, Solano, Sonoma, and Yolo counties; however, it can be difficult to determine which stands are native. Only native stands garner protected status. The species blooms from April to May.

Northern California black walnut was observed in the southern portion of the Permanente Property near the remnants of historic homesites, and in drainages near these sites which serve as distribution corridors for this species. Other tree species observed near these sites include fruit trees (*Prunus* spp.), European olive (*Olea europa*), oleander (*Nerium oleander*), and English walnut (*Juglans regia*). Due to the long history of human disturbance near the observed populations and the strong evidence of horticultural tree plantings, it is the professional opinion of the authors that these populations do not constitute a native population but were in fact cultivated by prior human inhabitants in the last fifty to one hundred years; therefore these trees are not afforded protection under CEQA.

CNPS List 4 species. In addition to these two listed species described above, two CNPS List 4 species were observed during rare plant surveys. List 4 species are afforded no protection under CEQA, however they are identified as potentially limited in distribution, and may become listed species in the future. Santa Catalina Island buckwheat (*Eriogonum giganteum* ssp. *giganteum*) has a native distribution restricted only to Santa Catalina Island. A small population of this species was identified in a revegetated area near the cement plant. It has a history of horticultural plantings outside its native range (Hickman 1993) thus was presumably planted within the active quarry in an area previously revegetated for erosion control. Santa Clara red ribbons (*Clarkia concinna* ssp. *automixa*) was observed in several openings in chaparral on thin soils on rock outcrops in the southern portion of the Permanente Property. Observation data for these species may be requested from WRA.

4.2.2 Wildlife

Forty-six special status wildlife species have been recorded in the vicinity of the Permanente Property. These species and their likelihood of occurrence are presented in Appendix A. Figure 6 shows CNDDB documented special status wildlife occurrences within five miles of the Permanente Property. Of these, six species have been documented to occur on the Permanente Property: California Red-legged Frog (*Rana aurora draytonii*), San Francisco Dusky-footed Woodrat, White-tailed Kite (*Elanus leucurus*), Olive-sided Flycatcher (*Contopus cooperi*), Yellow Warbler (*Dendroica petechia*), and Grasshopper Sparrow (*Ammodramus savannarum*). There is a documented California Tiger Salamander (*Ambystoma californiense*) occurrence on the Permanente Property, however the validity of this occurrence is questioned (Jennings pers. comm.) due to the age of the reported occurrence (from 1893) and likely misidentification. One species, the Pallid Bat (*Antrozous pallidus*), has a high potential to occur. Three additional species have a moderate potential to occur on the Permanente Property: Western Red Bat (*Lasiurus blossevillii*), Long-eared Owl (*Asio otus*) and Loggerhead Shrike (*Lanius ludovicianus*).

The Permanente Property is not included in the coverage area for the Santa Clara Valley Habitat Plan, but is located within five miles of the northwestern portion of the Habitat Plan coverage. The potential for wildlife species covered by the Habitat Plan to occur on the Permanente Property, but not otherwise addressed in this report, is addressed in Appendix A. Special status wildlife species that are present or have a high or moderate potential to occur on the Permanente Property are discussed below.

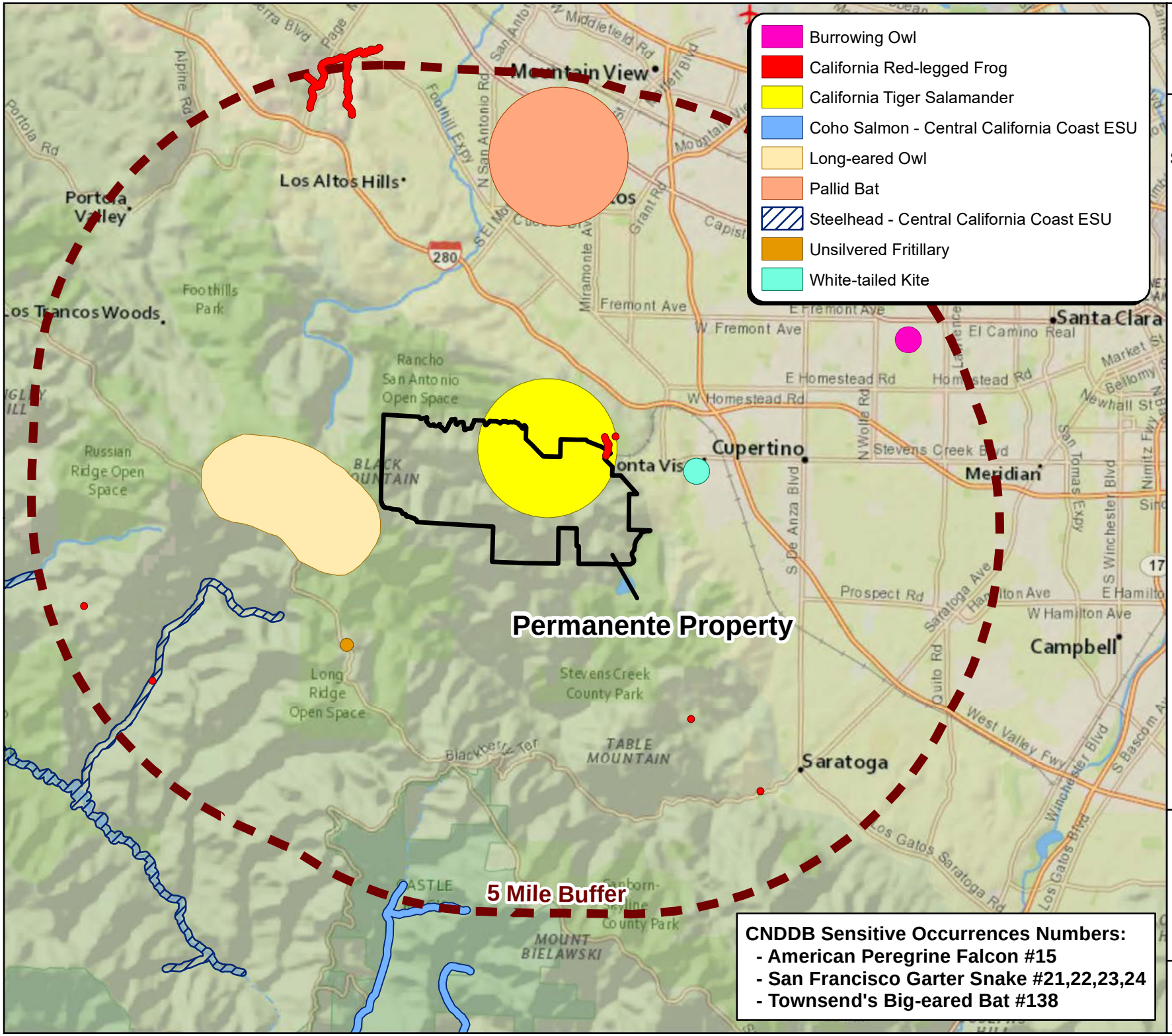

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Figure 5.

Special Status Wildlife Occurrences within Five Miles of the Permanente Property Boundary

(*Based on CNDDB 2010 Data*)

Date: May 2010
Map By: Michael Rochelle
Filepath: I:\Acad2000\16000\16143\gis\Arcmap\2010 Reports\BRA\CNDDB_Animals.mxd

Species present on the Permanente Property

California Red-legged Frog (*Rana aurora draytonii*), Federally Threatened, CDFG Species of Special Concern. The California Red-legged Frog (CRLF) is a medium-sized frog with reddish-colored legs. The species is generally restricted to riparian and lacustrine habitats in California and northern Baja California. In response to a significant decrease in the historic range of the CRLF, the USFWS listed the subspecies as Threatened in 1996. CRLF prefer deep, quiet pools in creeks, rivers, or lakes below 1,500 meters in elevation. Habitat requirements include fresh emergent or dense riparian vegetation, especially willows adjacent to shorelines. Red-legged Frogs can survive in seasonal bodies of water that are dry for short periods if a permanent water body or dense vegetation stands are nearby; rodent burrows and grasslands provide upland aestivation habitat.

The USFWS (2008) has defined the four primary constituent elements essential to the conservation of the CRLF and are described below. Aquatic breeding habitat which are standing bodies of fresh water including natural and manmade ponds, slow-moving streams or pools within streams, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a minimum of 20 weeks in all but the driest of years. Non-breeding aquatic habitats are freshwater and wetted riparian habitats that may not hold water long enough for the subspecies to hatch and complete its aquatic life cycle but that do provide for shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult CRLF. Upland habitats are areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat up to a distance of 300 feet in most cases and comprised of vegetation such as grasslands, woodlands, wetland, or riparian species that provides shelter, forage, and predator avoidance. Dispersal habitat includes upland or riparian dispersal habitat between occupied locations within a minimum of one mile (1.6 km) of each other and that allows for movement between such sites. Dispersal habitat includes various natural habitats and altered habitats such as agricultural fields, which do not contain barriers (e.g., heavily traveled roads without bridges or culverts) to dispersal.

Numerous surveys have been conducted for CRLF on the Permanente Property. CRLF were first discovered on the Permanente Property in September 1997 by Radian International while conducting a CRLF site assessment and field survey (Radian International 1997). These detections were made in a pool located north of Pond 14 between the Pond 14 diversion channel and the channel that drains Pond 14. Since the 1997 survey, the creek channel appears to have undermined this and two other ponds and breached these ponds such that they no longer hold water.

Hagar Environmental Science conducted a fish relocation effort from Ponds 13 and 22 in August of 2000 in preparation of sediment removal from these ponds. The effort was completed in compliance with the issued CDFG permits. During electrofishing surveys, a “few frogs (including one transforming tadpole) were captured”. According to the report, Hagar Environmental (2000), these were “believed to be juvenile foothill yellow-legged frogs” (*Rana boylii*), but were “not positively identified”. It is believed that these were actually CRLF occupying and breeding in Pond 22, as the pond was not at the time, nor is it now, suitable Foothill Yellow-legged Frog (FYLF) habitat. Additionally no FYLF have been detected within the Permanente Creek Watershed (CNDDB 2009).

Dr. Mark Jennings conducted protocol surveys for CRLF on the Permanente Property in 2006 (Jennings 2006b), 2007 (Jennings 2007), biological monitoring for CRLF in October and November 2006 (Jennings 2006a), December 2007 (Jennings 2008b), October 2008 (Jennings

2008c) and August and November 2009 (Jennings 2009a and 2009b). Surveys also were conducted by Dr. Jennings on the night of July 30, 2008 (Jennings 2008a) following current USFWS guidelines. The above-noted studies focused on all existing sedimentation basins and Permanente Creek. Additionally, Dr. Jennings has conducted a CRLF habitat assessment (Jennings 2010) within areas immediately surrounding the proposed reclamation area (Appendix D).

Incidental observations within the Permanente Creek Watershed by WRA biologists are consistent with past studies conducted by Dr. Jennings. In 2009, CRLF adults were frequently seen and vocalizing male CRLFs were detected in February and April in Pond 14. Additionally, a total of 11 CRLF egg masses were observed in Pond 14 in February 2009. CRLF adults have also been detected in Pond 14, although no evidence of breeding was observed here. The stream channel below Pond 14 also contains two deep pools where CRLF adults and larvae have been detected. It is not likely that CRLF are utilizing these pools as aquatic breeding habitat due to seasonally high water velocities. The larvae likely are washed down from Pond 14 and the adults are utilizing this section of Permanente Creek as non-breeding aquatic habitat.

Within the Monte Bello Creek Watershed, WRA biologists incidentally detected a sub-adult CRLF in the uplands adjacent to Monte Bello Creek on May 7, 2009. This individual was observed approximately 0.5 miles upstream from the southeast Property Boundary where Monte Bello Creek leaves the Permanente Property. The Main Stem and South Fork of Monte Bello Creek provide marginal aquatic breeding habitat based on the lack of deep, slack-water pools, but in some years, moderately deep pools may provide suitable conditions to allow for successful CRLF breeding. The creek also serves as non-breeding aquatic habitat and the surrounding uplands provide dispersal and foraging habitat for CRLF (Jennings 2010 – Appendix D).

The results of these surveys show that CRLF consistently occupy limited areas of lower Permanente Creek, and appear to be present in Monte Bello Creek. The protocol surveys conducted in 2007 concluded that CRLF were present in Ponds 14, 21, and 22. No CRLF were found in any other sedimentation basin on the Permanente Property. Most recently, CRLF were observed to successfully breed in Ponds 14 and 21. Upstream of the occupied ponds, aquatic breeding habitat is generally not present on the Permanente Property because of lack of deep slack-water pools and lack of upland habitat within the active quarry. CRLF are unlikely to occur in the active quarry or in heavily disturbed portions of the Permanente Property due to lack of cover, exposure to predation and frequent vehicle traffic. Accordingly, upland and dispersal habitat, two primary constituent habitat elements for CRLF, is limited to undisturbed hillside slopes and revegetated areas within 300 feet of occupied portions of Permanente and Monte Bello Creeks and the occupied sedimentation ponds. Permanente Creek may serve as a movement corridor between Pond 21 and downstream breeding locations off site.

Although CRLF occupy a small portion of Permanente Creek in the northeastern most portion of the Permanente Property as well as Monte Bello Creek in the southern most portion of the Permanente Property, CRLF are not likely to disperse between the two occupied locations. The landscape between these two occupied locations is dominated by heavily trafficked roads, paved industrial areas, and unvegetated arid slopes. The ephemeral nature of the intervening creeks and ponds, long distance (1.75 miles) and steep terrain precludes movement between Permanente and Monte Bello Creek drainages (Jennings 2010). Additionally, a history of CRLF surveys on the Permanente Property has failed to detect CRLF occupying the creeks and ponds between these two systems.

San Francisco Dusky-footed Woodrat (*Neotoma fuscipes annectens*), CDFG Species of Special Concern. This subspecies of Dusky-footed Woodrat occurs in the Coast Ranges between San Francisco Bay and the Salinas River (Matocq 2003). It prefers brushy riparian habitats, coast live oak woodland, and dense scrub communities. Prominent stick houses provide evidence of its presence.

On the Permanente Property, San Francisco Dusky-footed Woodrat is locally abundant in densely wooded forests and woodland, and in scrub and shrub habitat. This species' large stick houses are commonly found in nearly every terrestrial/upland biological community on the Permanente Property except chamise chaparral and grasslands.

White-tailed Kite (*Elanus leucurus*), California Fully Protected Species. Kites occur in low elevation grassland, agricultural, wetland, oak woodland, and savannah habitats. Riparian zones adjacent to open areas are also used. Vegetative structure and prey availability seem to be more important than specific associations with plant species or vegetative communities. lightly grazed or ungrazed fields generally support large prey populations and are often preferred to other habitats. Kites primarily feed on small mammals, although, birds, reptiles, amphibians, and insects are also taken. Nest trees range from single isolated trees to trees within large contiguous forests. Preferred nest trees are extremely variable, ranging from small shrubs (less than 10 feet tall), to large trees (greater than 150 feet. tall) (Dunk 1995). White-tailed Kites are regularly observed foraging on the Permanente Property. Although this species has not been documented to nest here, high quality foraging and nesting habitat is present on the Permanente Property.

Olive-sided flycatcher (*Contopus cooperi)*, CDFG Species of Special Concern, USFWS Bird of Conservation Concern. Olive-sided Flycatcher is typically associated with coniferous forest openings, forest edges near natural openings or human-made openings, or open to semi-open forest stands (Altman and Sallabanks 2000). This species frequently occurs along wooded shores of streams, lakes, rivers, ponds, bogs, and muskegs, where natural edge habitat occurs and standing dead trees often are present (Altman and Sallabanks 2000). This species' frequent presence near water may be due to higher insect abundance in these areas.

A female Olive-sided Flycatcher was observed on the Permanente Property on April 22, 2008. This individual may have been a migrant. While this species prefers montane coniferous forest, records of breeding Olive-sided Flycatcher are present at lower elevations near Santa Clara, and Berkeley (Altman and Sallabanks 2000). There are no other documented occurrences of this species within five miles of the Permanente Property in CNDDB (CNDDB 2009).

Yellow Warbler (*Dendroica petechia*), CDFG Species of Special Concern. Yellow Warbler breeds most commonly in wet, deciduous thickets, especially those dominated by willows, and in disturbed and early successional habitats (Lowther et al. 1999). This species is found between 100 to 2,700 meters elevation in California and at higher elevations along watercourses with riparian growth (Lowther et al. 1999). Yellow warbler populations have declined due to brood parasitism by brown-headed cowbirds (*Molothrus ater*) and habitat destruction. This species' diet is primarily comprised of insects supplemented with berries.

Yellow Warbler has been regularly observed on the Permanente Property during migration and breeding season. This species has been frequently observed foraging within scrub oak dominated habitats near ridge lines. On the Permanente Property, suitable breeding habitat is present within the riparian corridors along Permanente Creek, Monte Bello Creek and their major tributaries. This species may breed within the Permanente Property.

Grasshopper Sparrow (*Ammodramus savannarum*), California Species of Special Concern. This species generally prefers moderately open grasslands and prairies with patchy bare ground. They select different components of vegetation, depending on grassland ecosystem. This sparrow typically avoids grasslands with extensive shrub cover, although some level of shrub cover is important for birds in western regions (Vickery 1996).

Grasshopper Sparrows are ground nesting birds. The nest cup is domed with overhanging grasses and contains a side entrance. Eggs are usually laid in early to mid June and hatch 12 days later. Males and females provide care to the young and second broods are common. This species feed primarily on insects (Vickery 1996).

On the Permanente Property, Grasshopper Sparrows have been observed consistently within sparsely vegetated areas within active quarry areas. Suitable foraging and breeding habitat for this species is abundant within portions of the Permanente Property where shrub, grasslands and bare ground create a habitat mosaic.

Species with a high or moderate potential to occur on the Permanente Property

Pallid Bat (*Antrozous pallidus*), CDFG Species of Special Concern, WBWG High Priority. The Pallid Bat is found in a variety of low elevation habitats throughout California. It selects a variety of day roosts including rock outcrops, mines, caves, hollow trees, buildings, and bridges. Night roosts are usually found under bridges, but also in caves, mines, and buildings. Pallid Bats are sensitive to roost disturbance. Unlike most bats, Pallids primarily feed on large ground-dwelling arthropods and prey are typically taken on the ground (Zeiner, et al. 1990). Hollow trees in the oak woodland provide potential roost habitat for this species; therefore, there is a moderate potential for occurrence for this bat.

The Permanente Property supports several rock outcrops which contain suitable cavities capable of supporting roosting Pallid Bats. Pallid Bats may, however, roost within the walls of the North Quarry if suitable cracks and crevices are present. Large abandoned buildings and other structures on the Permanente Property provide suitable bat roosting habitat. A former aluminum plant building at the north east corner of the Permanente Property is known to support an unidentified bat roost where an outflight was observed at dusk by WRA biologists. The nearest documented occurrence of the Pallid Bat is 5.0 miles north of the Permanente Property (CNDDB 2009). There is a high potential for this species to roost on the Permanente Property.

Western Red Bat (*Lasiurus blossevillii*), WBWG High Priority. This species is considered highly migratory, and broadly distributed, reaching from southern Canada, through much of the western United States. They are typically solitary, roosting primarily in the foliage of trees or shrubs. Day roosts are commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas possibly an association with riparian habitat (particularly willows, cottonwoods, and sycamores).

Suitable habitat for Western Red Bat may be present in the sycamore alluvial woodlands, white alder riparian forest and willow riparian forest on the Permanente Property. There are no known occurrences within 5.0 miles of the Permanente Property (CNDDB 2009). There is a moderate potential for this species to occur on the Permanente Property.

Long-eared Owl (*Asio otus*), CDFG Species of Special Concern. Nesting Long-eared Owls range from coastal lowlands to interior deserts and seem to prefer riparian groves, planted woodlots, and belts of live oaks paralleling streams (Shuford 1993). This owl generally

frequents dense, riparian and live oak thickets paralleling stream courses, and nearby woodland and forest habitats (Zeiner et al. 1990). Long-eared Owls nest almost exclusively in old stick nests of crows, magpies, ravens, hawks, or herons.

The Permanente Property supports suitable foraging and breeding habitat for this bat species along woodland edges. Typical nesting habitat is present in mature riparian vegetation along on-site portions of Permanente Creek, Monte Bello Creek and associated tributaries. Some portions of otherwise suitable habitat along Permanente Creek, in the vicinity of the active quarry, may be unsuitable due to disturbance associated with quarry activities. A breeding pair of Long-eared Owls was recently documented to occur 1.3 miles west of the Permanente Property (CNDDB 2009). This species has a moderate potential to occur on the Permanente Property.

Loggerhead Shrike (*Lanius ludovicianus*), CDFG Species of Special Concern, USFWS Bird of Conservation Concern. Loggerhead Shrike is a common resident and winter visitor in lowlands and foothills throughout California. It prefers open habitats with scattered trees, shrubs, posts, fences, utility lines or other perches. Nests are usually built on a stable branch in a densely-foliaged shrub or small tree and are usually well-concealed. The highest densities occur in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian pinyon-juniper, juniper, and desert riparian habitats. While this species eats mostly arthropods, they also take amphibians, small to medium-sized reptiles, small mammals and birds, and are also known to scavenge on carrion (Ziener et al. 1990).

Loggerhead Shrike has not been observed on the Permanente Property by WRA biologists, however, suitable nesting and foraging habitat is present. There are no documented occurrences of Loggerhead Shrike within 5 miles of the Permanente Property (CNDDB 2009). This species has a moderate potential to occur on the Permanente Property.

Federally and State Listed Species Unlikely to occur within the Permanente Property Boundary

The following species are not likely to occur on the property; however, they are discussed herein for completeness of the analysis. The reasons for a determination that they are not present are provided below. For the purposes of completeness, federal and or state listed species that are unlikely to be present are discussed below:

California Tiger Salamander (*Ambystoma californiense*; CTS) Central Valley Distinct Population Segment (DPS) was listed as Federally Threatened August 4, 2004 (69 FR 47212-47248) and the California Fish and Game Commission approved CTS for listing as State Threatened on March 3, 2010.

CTS require two primary habitat components: aquatic breeding sites and upland terrestrial aestivation or refuge sites. This species inhabits valley and foothill grasslands and the grassy understory of open woodlands, usually within one mile of water (Jennings and Hayes 1994). Adult CTS spend most of their time underground in upland subterranean refugia. Underground retreats usually consist of ground-squirrel burrows but can also be under logs and piles of lumber (Holland et al. 1990). CTS primarily use California ground squirrel burrows as upland refuge sites (Loredo et al. 1996, Trenham 2001).

Within the Permanente Property, a historic occurrence of CTS is documented from Permanente Creek[2], however, there are no seasonal waters capable of supporting CTS breeding. Permanente Creek, which is the original documented location of the specimen discussed above, is now channelized, and inhabited by several native and non-native fish species. This species is unlikely to occur on the Permanente Property.

Central California coast Steelhead (*Oncorhynchus mykiss*) DPS was federally listed as threatened in August 1997 (62 Fed Reg. 43937). Steelhead are sea-run (anadromous) Rainbow Trout. In California, Steelhead only run in the winter due to unsuitable summer stream conditions (low flows). Steelhead spawn in cool, clear, well-oxygenated streams with suitable gravel beds and flow velocity. Unlike salmon, which die after spawning, some Steelhead return to their natal streams several times to spawn.

Historically, Permanente Creek reportedly supported Steelhead (Santa Clara County 2010, Garza and Pearse 2008). The closest known extant Steelhead locale to Permanente Creek is Stevens Creek, just over one mile east of Permanente Creek. One of the largest obstacles to Steelhead reproduction is the placement of natural or man-made (anthropogenic) barriers in Steelhead spawning streams. Barriers within a stream course may limit or completely block access of mature inmigrating Steelhead from accessing suitable spawning habitat. In some cases barriers may also prevent outmigrating smolts from reaching the ocean. Partial or complete barriers include waterfalls, debris jams, excessive velocities, high temperatures, high turbidity, and dams (Barnhart 1986).

Because of dams and other barriers to fish passage downstream of the Permanente property, there is no potential for Steelhead to occur in Permanente Creek on the Permanente Property. In Los Altos, just north of Mira Monte and Portland avenues, there is a low flow diversion dam that spills water into Permanente Creek only during very high flow events. The dam spills from the top through narrow slits from about five to six feet in height. No plunge pool is present on the downstream side of the diversion dam; therefore it serves as an impassable barrier for in-migrating Steelhead. WRA did not assess any additional barriers that may be present downstream of the diversion dam.

The dam is located along the western portion of an 8,000-foot concrete diversion channel. The Permanente Diversion was designed to divert the majority of storm runoff from the Permanente Creek Watershed into Stevens Creek. The dam structure is currently not functioning properly and diverts almost all flow into Stevens Creek (SCVWD 2002), which has a documented Steelhead run. A Coastal Conservancy Report (2004) concluded that a similar, 3,900-foot concrete channel along Mission Creek in Santa Barbara County acts as a total barrier to Steelhead because during low flows, upstream Steelhead migration is not possible due to the water depth throughout the channel being less than the required 7 inches. When flows increase and the water depth in the channel is greater than 7 inches, increased flow velocities are

[2] Dr. Mark Jennings, an expert on rare amphibians, concluded in a report dated October, 2008 that: “The California Tiger Salamander is thought to be present on the Permanente Property because a specimen alleged to be this species, collected in 1893 in the Permanente Creek drainage system, is listed in the CNDDB. However, this is a museum specimen at the California Academy of Sciences that was destroyed during the 1906 San Francisco earthquake and fire. It was not uncommon during the late 19th century for specimens to be misidentified, especially if it was a juvenile or larval individual. Furthermore, the Permanente Property is currently too disturbed to support California Tiger Salamanders, and would preclude any successful breeding in these habitats by California Tiger Salamanders" (HBG, Inc. 2008).

sustained throughout the long channel with no velocity breaks. Upstream Steelhead passage is prevented due to exhaustion as fish attempt to migrate up the long channel.

Since resident Rainbow Trout are known to occur in Permanente Creek and there are no known barriers to downstream migration for trout, some Rainbow Trout may outmigrate to the ocean. Due to the barriers discussed above, it is not possible for these individuals to return to upper Permanente Creek to spawn and likely become part of the Stevens Creek Steelhead population.

Fish surveys confirmed the absence of Steelhead in Permanente Creek from the Permanente Property boundary downstream to the diversion channel. Liedy (1984) sampled six Permanente Creek sites downstream of the Permanente Property between Charleston Road and Interstate 280 in August 1981 and found no Steelhead. Liedy (2002) also sampled two sites in April 1996, one reach downstream of Highway 101 and one reach upstream of Interstate 280 and found no Steelhead. Since surveys have shown that Steelhead are not present in Permanente Creek between the diversion channel and the Permanente Property, and the diversion channel is a complete barrier to upstream Steelhead migration, Steelhead are unable to access this reach and are therefore unlikely to occur on the Permanente Property.

4.3 Aquatic Surveys

WRA conducted an analysis of the aquatic habitats of Permanente Creek and Monte Bello Creek on the Quarry Property. Some of these results are summarized in the sections that follow. The results of the entire study can be found in Appendix E, Permanente Aquatic Technical Report (WRA 2010b).

4.3.1 Aquatic Wildlife Sampling

The results of the aquatic surveys along Permanente Creek are presented for the "upper" and "lower" reaches of the creek that correspond approximately to stations MS-1 and MS-2, respectively, in Golder's hydrology report (2010). The upper reach is within a largely natural portion of the Creek, while the lower reach is below the active quarry area and starts near the Rock Plant. These results describe existing conditions as observed in 2009.

Survey results for fish sampling identified three species, resident non-anadromous Rainbow Trout (*Oncorhynchus mykiss*), Sacramento Sucker (*Catostomus occidentalis*), and Western Mosquito Fish (*Gambusia affinis*) within the Permanente Property. Within the upper reaches of Permanente Creek, Rainbow Trout was the only species observed, with fry, juvenile, and adult life stages for this species recorded. Within the lower reach, Rainbow Trout, Sacramento Sucker, and Western Mosquito Fish were observed. For this reach, juvenile and adult Rainbow Trout and Western Mosquito Fish, and adult Sacramento Sucker were observed.

Survey results for amphibians identified nine species within the Permanente Property, including the California Red-legged Frog. Within the upper reaches of Permanente Creek, five amphibian species were observed, including California Giant Salamander (*Dicamptodon ensatus*), California Newt (*Taricha torosa*), Rough-skinned Newt (*Taricha granulosa*), Ensatina Salamander (*Ensatina eschscholtzii*) and Pacific Tree [=Chorus] Frog (*Hyla [=Pseudacris] regilla*). Within the lower reach of Permanente Creek, six aquatic species, the Rough-skinned Newt adult, California Red-legged Frog, the Pacific Tree [=Chorus] Frog, California Newt, Ensatina Salamander, and Western [=Boreal] Toad (*Bufo [=Anaxyrus] boreas*). California Red-legged Frog egg mass, juvenile and adult life stages have been observed within the lower reach.

Survey results for BMI found similar conditions between upper and lower reaches of Permanente Creek. The physical habitat quality score ranked as very high (a score greater than 160) for both reaches. For species richness, which accounts for the diversity of BMI taxa, the upper reach documented 26 species and 24 species were in the lower reach. Additionally, composition which reflects the number of individuals in a taxon compared to the total number of individuals sampled was similar between the two sampled reaches.

4.3.2 Bioassay Sample

A bioassay was conducted for water samples collected within the Permanente Property in February and April, 2009. For each sample date, water samples were collected from the upper and lower reaches of Permanente Creek. Aquatic Testing Laboratory in Ventura, California performed a Fathead Minnow 96-hour Percent Survival Bioassay (EPA-821-R-03-012) analysis on the collected samples. For all samples there was 100 percent survival of Fathead Minnows (*Pimephales promelas*) subject to the 96-hour test.

The combined results of the field surveys for fish, amphibians, and BMI indicate very similar composition of species and diversity between upper and lower reaches of Permanente Creek. This indicates that water pumped out of the North Quarry does not have a detrimental effect on the aquatic life in the creek. Additionally, the Fathead Minnow acute toxicity test indicates that water from both upper and lower Permanente Creek is not acutely toxic to this species.

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