



Memorandum

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to **Marina Rush**
Department of Planning and Development
County of Santa Clara

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from Peter Hudson PG, CEG
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Subject Peer Review and Treatment Feasibility Evaluation,
Lehigh Southwest Cement Company Permanente Quarry

Introduction

The Santa Clara County Planning Office (County) requested that Lehigh Southwest Cement Company Permanente Quarry (Lehigh) evaluate three alternative methods for reducing selenium discharges from the East Materials Storage Area (EMSA) at Pond 30. The three alternatives were 1) expansion of Pond 30, 2) trucking water from Pond 30 to the Quarry pit for eventual treatment at Pond 4A, and 3) piping and pumping water to the Quarry pit for eventual treatment at Pond 4A. This memorandum provides ESA's comments on Lehigh's evaluation of the feasibility of these alternative methods. In addition, this memorandum provides ESA's comments on its review of the surface water sampling results for December 2014, and February 2015. The documents submitted to the County by Lehigh and reviewed by ESA were:

- *Supplemental Report on Feasibility of Alternatives to Water Treatment for Discharges from the EMSA prepared by Lehigh, January 22, 2015*
- *Geotechnical Report for the Expansion of Pond 30, prepared by Golder Associates for Lehigh, February 2015*
- *Laboratory Reports for Water Samples of Pond 30 Discharge to Permanente Creek, December 2014, February 2015.*

Overall Conclusion of the Treatment Feasibility Evaluation

It is ESA's opinion that the individual alternatives evaluated are not currently capable of reducing selenium discharge concentrations to Permanente Creek to less than or equal to the Basin Plan Water Quality Objective for total recoverable selenium of 5 micrograms per Liter ($\mu\text{g/L}$). The 5 $\mu\text{g/L}$ limit is the required treatment threshold as per the Conditions of Approval (COA No. 82). However, it is anticipated that, upon completion of the proposed non-limestone cap on the EMSA and WMSA and installation and operation of the permanent treatment facility at Pond 4A, it will be feasible to reduce discharge concentrations of selenium to below the Basin Plan Water Quality Objective. Details of ESA's evaluation of the individual alternatives are presented below.

Expansion of Pond 30

Pond 30 is located at the base of the EMSA and currently has a design capacity of 0.184 acre feet (8,000 cubic feet). Stormwater enters Pond 30 through a series of engineered swales, ditches, and smaller ponds and basins located on the EMSA. When levels in the Pond reach a certain height in the standpipe, the water is then discharged to Permanente Creek. Lehigh proposes to expand Pond 30 to increase its design capacity.

The geotechnical and construction constraints of the Pond 30 expansion were evaluated by Lehigh's engineering consultant, Golder Associates (Golder), and the results of the assessment were presented in its report titled, *Geotechnical Report for the Expansion of Pond 30, February 2015*. Golder's geotechnical assessment evaluated the potential seismic and geologic hazards associated with construction of the Pond 30 expansion and included a slope stability analysis that considered both static and seismic conditions. Golder concluded that from a geotechnical perspective, the proposed location is suitable for the Pond 30 expansion project. Golder's static and seismic slope stability analysis indicated that the pond expansion would not adversely impact the stability of slopes above or below the ponds and the slopes for the pond itself had adequate factors of safety and were within allowable displacement limits. ESA generally concurs with the findings of the Golder's Geotechnical evaluation of the Pond 30 expansion but has the following comment regarding the report:

Comment: On Page 9, Section 4.3 of the Golder Geotechnical Report, the second sentence states that, *"Because the pond will be lined with a geomembrane, the analyses assume that there would be groundwater recharge from the pond and would not raise the water table level or lead to seepage forces on the existing slopes located to the west of the pond.* It is unclear why the analyses assume there would be groundwater recharge from the pond if it is lined with a geomembrane liner to prevent infiltration. ESA expects that this sentence contains a typographical error.

Recommendation for Additional Information

While the geotechnical assessment adequately addresses geologic and seismic stability of the proposed pond expansion, ESA recommends that Lehigh develop a hydrologic assessment to evaluate the efficiency of the pond operation. A hydrologic assessment that analyzes pond fill rate and discharge frequency for a 2-year, 5-year, 10-year, and 25-year storm would provide additional data that could assist in determining the frequency and duration of stormwater discharges from Pond 30 to Permanente Creek. Additionally, Lehigh does not provide details of the Pond 30/Permanent Creek discharge flow and piping configuration. Without that detail, it is difficult to assess how the water is routed from Pond 30 to Permanente Creek (i.e. whether it is via spillway or discharge pipe). An evaluation of the functionality of the expanded Pond 30 would not be complete without this information.

Conclusion Regarding Pond 30 Expansion Alternative

It is ESA's opinion that a larger Pond 30 would reduce the direct discharges of stormwater to Permanente Creek and combined with the non-limestone cover at the EMSA, when completed, would serve to reduce selenium concentrations in water discharged to the creek. Any additional storage volume over what is now available at Pond 30 is an improvement in the drainage system at the EMSA. It is expected that the expanded pond would detain water for a longer period before discharge, would facilitate mixing and dilution of the stormwater runoff, and would better regulate discharge flows to Permanente Creek. However, ESA reiterates that the expanded pond alone cannot be considered a treatment alternative. The pond would be effective in containing additional stormwater and thus reducing the frequency of discharges to Permanente Creek. The expanded pond would not guarantee no discharge to Permanente Creek and can only be considered as a treatment alternative if the program to cover, remove and regrade the limestone-bearing materials continues and the limestone-bearing materials are

successfully removed from the exposure surface of the EMSA. Only then would selenium concentrations in the stormwater continue to diminish and approach the basin Plan Objective of 5µg/L.

Trucking Water to the Quarry Pit

Lehigh determined that trucking water from Pond 30 to the Quarry pit was technically infeasible and a significant safety concern. Lehigh's analysis concluded that the volume of water produced by the 10-year, 24 hour storm and the 100-year 24-hour storm would require 11,000–gallon capacity trucks to be filled every 1 to 6 minutes depending on the storm event. The trucks would then be required to make their way up a controlled one and two-lane quarry road network, which would delay returning trucks. The number of trucks required and the logistics of transporting the required volumes of water through the quarry in inclement weather would also present safety concerns.

While ESA agrees with Lehigh as to the number of trucks required to transport the volume of water accumulated during a 10- and 100-year storm and the overall logistics and anticipated safety concerns, it is ESA's opinion that Lehigh's analysis may be too conservative as it calculates the required volume of water based on very large, somewhat uncommon storm events and assumes the need to altogether avoid discharges to Permanente Creek. The 10-year and 100-year storm events are quite large and infrequent compared to the 2-year and 5-year storms that are more typical for this area during normal winter. The smaller storms would produce less accumulated runoff at Pond 30, resulting in the need for fewer trucks and reducing potential safety concerns. Further, ESA does not feel it is practical for Lehigh to assume that the objective of trucking water should be to altogether eliminate discharges to Permanente Creek. In a large storm event (10-year, 25-year, or 100-year), even in the 2- to 5-year event for that matter, some degree of discharge to Permanente Creek would be unavoidable considering the current size of Pond 30 and the ongoing accumulation during a rain storm. In this case, developing a trucking plan to eliminate discharges to Permanente Creek even during a storm may be setting the bar too high, making the alternative to truck water impractical. Based on safety concerns and operational logistics, it is unreasonable to expect that trucking water would be possible during a storm event, especially a large one. It may be acceptable to design a water trucking plan that *reduces* discharges to the creek (to the extent feasible) but does not attempt to *prevent* any discharge when unavoidable during a storm event.

Recommendation for Additional Information

ESA recommends that Lehigh expand its analysis of the trucking option to examine the volume of water, number of trucks, and logistics required for the smaller, more typical storm events (2- and 5-year, 24-hour) and to assume in that analysis that the objective of the trucking option is to *reduce* to the extent feasible, not necessarily *eliminate*, discharges to Permanente Creek during a small to large storm event. For example, the analysis could assume that water is pumped from Pond 30 before a forecasted storm event to empty the pond and then immediately after the storm event so that discharges to Permanente Creek are kept to a minimum.

Conclusion Regarding Trucking Alternative

Trucking water from Pond 30 to the Quarry pit could reduce the number of times stormwater containing selenium is discharged to Permanente Creek. Although it may be feasible to design such a plan to truck water to the Quarry pit, until the Frontier selenium treatment system at Pond 4A can reliably and consistently treat all Quarry pit discharge water to 5µg/L or below, this alternative would not be capable of reducing the concentrations of selenium below the Basin Plan Objective.

Piping Water to the Quarry Pit

Piping water from Pond 30 at the EMSA to the quarry pit was determined by Lehigh to be infeasible based on the required level of engineering and the time-frame of design and construction. The project would require the construction of 2 miles of pipe and pumping facilities to lift water up to 800 vertical feet. Lehigh concluded that if such a system could successfully be built, it would require specialized engineering consultants and about two years to design and build. Lehigh indicates that the pipeline and pump system would be complete after the non-limestone cover at the EMSA is installed thereby making the water delivery system no longer necessary.

Lehigh dismisses as infeasible the alternative of piping water from Pond 30 to the Quarry Pit based on the time required to design and build the piping and pumping system. While ESA concurs that the design and build of such a system would require considerable time and effort, it is ESA's opinion that the alternative should not be dismissed altogether and considered infeasible just based on timing because, if needed, the design and build schedule could always be compressed. Having a system in place to transport water from Pond 30 to treatment at the Quarry pit may be a necessary alternative if the complete EMSA reclamation (non-limestone cover + vegetation) requires additional time until it can successfully and consistently reduce selenium concentrations in discharges to Permanente Creek.

Recommendation for Additional Information

ESA recommends that Lehigh explore a shorter design and build schedule for the pipeline option.

Conclusion Regarding Quarry Pit Piping Alternative

Similar to the trucking alternative described above, piping water from Pond 30 to the Quarry pit could reduce selenium-bearing stormwater discharges to Permanente Creek. Although it is feasible to design a system to pipe the water from Pond 30 to the Quarry pit for purposes of eventual treatment, until the Frontier treatment system at Pond 4A can reliably and consistently treat water from the Quarry pit to 5µg/L or below, this alternative would not be capable of reducing the concentrations of selenium below the Basin Plan Objective.

Stormwater Sampling Results – December 2014

Lehigh collected stormwater samples from Pond 30 on December 2, December 12, and December 22. These samples were obtained following storm events that caused Pond 30 to discharge to Permanente Creek. According to Santa Clara County Water District ALERT gauge 1454 (Maryknoll Fields), approximately 1.6 inches of rain fell in the vicinity of the EMSA on December 2, 2014. This was the third significant rain event for the season following smaller events in October and November; the previous significant events occurred on November 29 (0.47 inches), and November 30 (0.63 inches). The concentration of total recoverable selenium in the December 2 water sample was 26 µg/L [or equivalently or parts per billion (ppb)]. The second stormwater sample collected by Lehigh from the Pond 30 discharge was on December 12, 2014, which followed a small rain event on December 11 that amounted to 0.6 inches of rain. The cumulative rainfall amount recorded between December 2 and December 12 was about 3.5 inches. The total recoverable selenium concentration detected in the December 12 water sample was 65 µg/L. The third stormwater sample obtained from the Pond 30/Permanente Creek discharge was on December 22 and the total recoverable selenium concentration was 81 µg/L. The December 22 sample was collected 5 days after a significant rain event on December 16 and 17 that amounted to approximately 5.7 inches of rain over a period of about 24 hours. The cumulative rainfall amount recorded in the vicinity of the quarry between December 2 and December 22 was about 11.3 inches of rain.

Stormwater Sampling Results – February 2015

Following a precipitation-free month of January the Santa Clara County Water District ALERT gauge 1454 (Maryknoll Fields) recorded rainfall during a storm event that began midday February 6 and ended February 9 at around midnight. The peak of the storm was on February 6 at about 4 o'clock in the afternoon. The event resulted in about 4 inches of rain in the vicinity of the Permanente Quarry site. Lehigh collected samples on February 7 at about 10 o'clock in the morning from the Pond 30 discharge to Permanente Creek. Total recoverable selenium was detected in the water sample at 31 µg/L, well above the 5µg/L Basin Plan Objective.

Recommendation for Additional Information

ESA must reiterate the importance for Lehigh to prepare water sampling reports for each sampling event at Pond 30. Preparing sampling reports is a standard practice in the industry and is necessary to fully analyze the laboratory data report. Receiving just the water quality laboratory report is not adequate under any monitoring program. Reports should, at a minimum, provide details of the sampling event such as sample location, field conditions, water temperature, turbidity, rationale for requested analyses, time since last storm, sample control, table of cumulative results, and laboratory data reports.

Conclusion Regarding Water Sampling Results

The rainfall data recorded in the vicinity of the EMSA and the detected concentrations of total recoverable selenium indicate that during the period of significant rainfall in December 2014, selenium concentrations increased considerably at the Pond 30 discharge to Permanente Creek. Given the grading activity (rough grading and installation of non-limestone cover) on the EMSA in December of 2014 and the amount of rainfall over a relatively short period of time in this area, it is reasonable to expect the stormwater runoff to contain elevated level of selenium. The sample results from February 2015 represent the first significant rainfall event following the December storms and although the February selenium concentrations were lower, they were still elevated above the 5 µg/L threshold. It is also reasonable to infer from the December 2014 and February 2015 water sample data that stormwater Best Management Practices (BMPs) on the EMSA, that are required under the Final Conditions of Approval (COA Nos. 78 and 79) for the Reclamation Plan Amendment (RPA), were either not in place, not functioning properly and/or were not designed to adequately manage the precipitation intensity and magnitude of stormwater flows that occurred during the December and February storm events. ESA understands that Lehigh is currently investigating the cause of the elevated selenium levels in the Pond 30 samples collected in December.