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July 15, 2013

VIA ELECTRONIC MAIL AND FEDERAL EXPRESS

Ms. Dyan Whyte
Assistant Executive Officer
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, California 94612

Re: *Submittal of Sediment Toxicity Study Plan – June 27, 2013 Amended Water Code section 13267 Order, Order No. R2-2013-1005-A1, Directive 8*

Dear Ms. Whyte:

Enclosed, pursuant to the Regional Water Quality Control Board, San Francisco Bay Region's, ("Regional Water Board") June 27, 2013 amended Water Code section 13267 Order, Order No. R2-2013-1005-A1, ("Order"), Lehigh Southwest Cement Company ("Lehigh") timely encloses the Sediment Toxicity Study Plan in accordance with Directive 8.a. of the Order. If you or your staff have any questions regarding the enclosed Work Plan, or would like to discuss further, please do not hesitate to contact me or Greg Knapp at Lehigh, or Mike Bryan and Ben Giudice of RBI.

Very truly yours,

Nicole E. Granquist

Nicole E. Granquist

Enclosure

Cc: Brian Thompson, Regional Water Quality Control Board, San Francisco Bay Region
Greg Knapp, Director Environmental Region West, Lehigh
Scott Rickman, Regional Counsel, Lehigh Hanson

SEDIMENT TOXICITY STUDY PLAN
PERMANENTE QUARRY AND CEMENT PLANT
LEHIGH SOUTHWEST CEMENT COMPANY

Prepared for:

Regional Water Quality Control Board
San Francisco Bay Region

On Behalf of:

Lehigh Southwest Cement Company

Prepared by:

ROBERTSON - BRYAN, INC.
Solutions for Progress

July 2013

SEDIMENT TOXICITY STUDY PLAN
PERMANENTE QUARRY AND CEMENT PLANT
LEHIGH SOUTHWEST CEMENT COMPANY

Prepared for:

Regional Water Quality Control Board
SAN FRANCISCO BAY REGION
1515 Clay Street, Suite 1400
Oakland, CA 94612

On Behalf of:

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July 2013

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1 INTRODUCTION

1.1 Background

The Lehigh Southwest Cement Company (Lehigh) operates the Permanente Quarry and Cement Plant (Permanente Facility) within the drainage of Permanente Creek in southwestern Santa Clara County, California. The discharge of quarry water and other facility process and storm water is currently regulated by a general National Pollutant Discharge Elimination System (NPDES) permit for discharges from sand and gravel mining operations (San Francisco Bay Regional Water Quality Control Board (Regional Water Board) Order R2-2008-0011; NPDES general permit number CAG982001) and a general NPDES permit for stormwater discharges associated with an industrial activity (State Water Resources Control Board (State Water Board) Order No. 97-03-DWQ). In the near future, the Regional Water Board intends to regulate discharges at the Permanente Facility through a facility-specific individual NPDES permit. Most recently, the Regional Water Board issued an ammended 13267 Investigative Order (Order No. R2-2013-1005-A1) directing Lehigh to compile and submit technical and monitoring reports pertaining to discharge and receiving water quality, including testing of receiving water ponds for bulk sediment toxicity.

1.1.1 Watershed Characteristics

The Permanente Creek watershed is located in the southern San Francisco Bay region. The watershed is relatively small, encompassing approximately 17 square miles. The main channel is about 13 miles long and flows from west to east, then north to San Francisco Bay. The watershed upstream of the Permanente Facility is relatively undeveloped. Downstream of the Permanente Facility, Permanente Creek enters suburban and urban areas of Los Altos and Mountain View. In the Los Altos area, the Permanente Diversion Channel diverts the majority of storm flow to Stevens Creek.

The Permanente Facility is located in the upper portion of the watershed in the southern headwater area, which encompasses approximately 3.9 square miles of steep, upland terrain. In the reach adjacent to the Permanente Facility, the Permanente Creek alignment has been altered and straightened in some areas and portions of the creek are contained within a culvert or open concrete-lined channel. Permanente Creek is typically perennial at the upstream end of the property; however, over the middle section of the site (i.e., south of the quarry pit) the creek flows only intermittently. Downstream of the intermittent reach, discharges from the quarry supplement or provide entirely all Permanente Creek flow, which typically results in a perennial flow regime.

1.1.2 Discharge Operations

Discharges from the Permanente Facility to Permanente Creek consist of quarry discharge (ground and storm water entering the quarry that is pumped out), process water, and storm water associated with industrial activities. The 13267 Investigative Order specifies sediment toxicity testing in three in-stream receiving water ponds. The source and characteristics of water in these ponds is summarized in **Table 1**.

Table 1. Characteristics of Permanente Facility Ponds Subject to Sediment Toxicity Testing Provisions of 13267 Investigative Order.

Pond Name	Type of Water	Period / Frequency of Release
Pond 13	Permanente Creek. During dry season, water is primarily that released from Pond 4A	Daily
Pond 22	Permanente Creek. During dry season, water is primarily a mix of Pond 4A and Pond 9 proportional to their respective release volumes. Pond 22 is sensitive red-legged frog habitat.	Daily
Pond 14	Permanente Creek. During dry season, water is primarily a mix of Pond 4A and Pond 9 proportional to their respective release volumes. Volume of Permanente Creek entering Pond 14 is regulated by an upstream diversion structure that bypasses the majority of flow around Pond 14. Pond 14 is sensitive red-legged frog habitat.	Daily, depending on upstream flow diversion

Pond 4A is located off-stream and adjacent to Permanente Creek. This pond primarily receives drainage water from the quarry pit, but also receives an intermittent and small volume of water from the primary crusher. Pond 9 is similarly located off-stream and adjacent to Permanente Creek. Presently, this pond may receive process and storm water from Pond 11 (now intermittently, if at all) at the cement plant and storm water from the areas immediately adjacent to Pond 9.

Low dams on the channel of Permanente Creek create Ponds 13, 22, and 14. In the case of Pond 14, a diversion structure immediately downstream of Pond 22 diverts the majority of flow around Pond 14 via a bypass channel that is considered the mainstem of Permanente Creek. During the dry season, Permanente Creek immediately upstream of Pond 13 is dry except when Pond 4A (off-stream) is discharging water collected from the quarry pit and primary crusher. As such, during the dry season, Pond 13 water is similar in chemical composition to that of Pond 4A. Typical operations at Pond 4A include daily continuous releases of water. However, in cases of maintenance activities or power outages that affect pumping from the quarry pit, Pond 4A may not release for periods of several days or more.

When inflows are sufficient to cause Pond 9 (off-stream) to release water into Permanente Creek, this released water mixes with water released Pond 13. This combined water ultimately flows to Pond 22 and Pond 14. As such, during the dry season when there is no or very low ambient upstream Permanente Creek flow, Pond 13 shares similar water chemistry to Pond 4A, and Ponds 22 and 14 share a blended water chemistry between Pond 4A and Pond 9.

1.2 Purpose, Objectives, and Intended Use of Sediment Toxicity Study Plan

The 13267 Investigative Order requires sediment toxicity testing at Pond 13, Pond 22, and Pond 14. To facilitate sediment toxicity testing, the Order requires preparation of a sediment toxicity testing study plan (Study Plan), to be submitted to the Regional Water Board by July 15, 2013 for Assistant Executive Officer review and approval. Specifically, the Order states in Provision 8.a:

> "The Discharger shall submit a sediment toxicity assessment study plan, consistent with U.S. EPA freshwater sediment toxicity testing guidance, by **July 15, 2013** for approval by the Assistant Executive Officer. Upon approval, the Discharger shall perform whole-sediment toxicity tests in accordance with the approved plan. The study plan shall identify specific sampling locations within Ponds 13, 14, and 22, a sampling schedule, testing species, test methods, and test end points (growth, survival, and/or reproduction). If possible, representative subsamples shall be collected from depositional areas in the inlet, middle, and outlet segments of each pond, and homogenized into a single sample for analysis. Both short-term and long-term end points shall be utilized for the selected test species. The plan shall also include a clear statement of the study purpose, QA/QC information, sample collection, handling, and test-preparation protocols, use of control and reference sediment samples, and information to be included in reports."

This Study Plan has been prepared to meet the July 15, 2013 deadline and the specific content requirements of provision 8.a specified in the 13267 Investigative Order. In discussion of the need for sediment toxicity testing, the 13267 Investigative Order specifically identifies the need to develop information pertaining to the quality of "potential historic sediment deposits" that may reside in Ponds 13, 14, and 22 (Finding 27 of Order). The requirements for sediment toxicity testing specified in Provision 8 of the Order provide further guidance on the scope of information to be gathered, namely toxicity testing of accumulated sediments. Therefore, the objective of this Study Plan is to present an approach for testing and reporting of whole-sediment toxicity in Ponds 13, 14, and 22. Future sampling and testing for whole-sediment toxicity will follow the approach detailed in this Study Plan upon its approval by the Assistant Executive Officer of the Regional Water Board.

2 WHOLE-SEDIMENT TOXICITY STUDY PLAN

2.1 Bioassay Test Methods

2.1.1 Test Organism

Whole-sediment toxicity testing will be conducted with *Hyalella azteca* (*H. azteca*), a freshwater epibenthic arthropod widely distributed throughout northern California and expected to inhabit Permanente Creek. *H. azteca* is a common and reliable bioassay test species that is used regularly for whole-sediment toxicity testing. Moreover, *H. azteca* are tolerant to a wide-range of grain sizes and sediment substrates, thus reducing the potential for substrate interference (USEPA 2000). Although efforts will be taken to sample from depositional areas, such a tolerance is important insomuch that pond sediments will likely present a range of substrates across their longitudinal transect.

The nature of the Permanente Facility and its quarry operations is such that the principal contaminants of concern are metals. *H. azteca* is known to be sensitive to metals, and thus represents a suitable test organism for whole-sediment toxicity testing in Ponds 13, 14, and 22. Alternative freshwater test species, namely *Chironomus tentans*, is comparatively less sensitive to metals (USEPA 2000). Therefore, *H. azteca* is the most suitable of the two organisms for testing purposes. It is not expected that testing with both organisms would yield any additional information on potential sediment toxicity in the ponds, based on the existing literature summarized in USEPA 2000 regarding their relative sensitivities to the constituents of concern.

2.1.2 Test Method

Whole-sediment toxicity testing will follow the standard protocols contained in *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants in Freshwater Invertebrates* (EPA 600/R-99/064). The specific test method to be used with collected sediments is *Hyalella azteca 10-day survival and growth test for sediments* (Method 100.1), with laboratory control water used as the overlying test water, and test results compared to a laboratory control sediment.

In this method *H. azteca* are exposed to whole-sediment for a period of 10 days, after which the endpoints of survival and growth are evaluated. Daily counted survival provides a short-term endpoint, whereas growth at the end of the test provides a long-term endpoint. Composited sediment is placed in test chambers at the 100% concentration (i.e., field sediments are not diluted). A standard volume of laboratory control water is added to the test chamber. This overlying water is renewed on a daily basis. Tests are run at a controlled temperature (23°C) and controlled period of illumination. Organisms are fed daily. Results from field sediments are evaluated through statistical comparison with results from a simultaneously tested laboratory control sediment. The laboratory control sediment is a composite of clean reference sediments of known performance history maintained by the bioassay laboratory. A site-specific reference sediment will not be used because no site-specific reference site with a known performance history has been designated, and no similarly depositional areas exist in the area that do not receive discharge water from the quarry.

Per the study objectives and requirements of Provision 8.a of the 13267 Investigative Order, toxicity testing will be performed on whole-sediment. Whole-sediment toxicity testing represents the aggregate toxic response from exposure to the sediment as a whole, as opposed to a simulated elutriate or extracted pore water. As such, any observed toxicity represents the aggregate effect of all toxicants present in the sample sediment. Chemical analysis of the sediment sample is not necessary to determine whether sediment toxicity is occurring. However, sediment may affect the aggregate properties of the overlying water which could interfere with test results. Thus, alkalinity, hardness, ammonia and pH are measured at the start and the end of the test, and dissolved oxygen (DO) and temperature are measured on a daily basis. Test replicates are aerated if DO drops below 2.5 mg/L; mortality or reduced growth due to depleted DO is considered a test interference and not indicative of chemical toxicity.

2.2 Sample Collection, Handling, and Frequency

Sediment samples from Ponds 13 and 22 will be collected by hand scoop. Due to the constraints placed on sampling by the presence of red-legged frogs, samples from Pond 14 will be collected by a ponar dredge or hand scoop (if shallow enough to do so from the boat) from an inflatable raft. Conditions at Pond 22 (i.e., clear, shallow, and wadeable) are such that sampling with a scoop will be possible with limited possibility for red-legged frog disturbance.

To the extent possible given field conditions, representative sediment samples from depositional areas will be collected from the inlet, middle, and outlet segments of each pond. Specific locations in the ponds at the inlet, middle, and outlet segments will be determined at the time of sampling depending on site access and site conditions, and for Ponds 14 and 22, depending

additionally on the necessity of avoiding sensitive red-legged frog habitat. Samples will be placed into individual sampling jars, and transported under ice and in the dark to the bioassay laboratory. For each trio of pond sediment samples, equal volume subsamples will be homogenized into a single sample at the laboratory. Testing will utilize each pond sediment homogenate.

The proposed sampling schedule is provided in **Table 2**. As specified in the 13267 Investigative Order, sediment sampling at Pond 13 is to occur for a single year, once in the dry season and once in the wet season. Wet season sediment sampling at Pond 13 occurred on March 25, 2013, and, with a single exception, followed the protocols and approach outlined in this Study Plan. The exception was that sediment was collected from depositional areas at the inlet and outlet segments of Pond 13, as opposed to the inlet, middle, and outlet segments. This difference in sampling methodology is not considered substantial, and thus future sampling is scheduled for only the dry season.

Table 2. Schedule of Sediment Sampling for 2013.

Pond	Sampling Month	Comment
13	September	Dry season sample. Wet season sample previously collected on March 25, 2013
14 and 22	September	Dry season sample. Due to constrained sampling window associated with red-legged frogs, a second sample will be collected if 0.25 inches of rainfall are recorded at Permanente Facility after September sampling but prior to October 31, 2013

Sampling at Ponds 22 and 14 are constrained by the presence of red-legged frogs and the need to minimize their disturbance during the breeding season. Based on consultation with the California Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service, sampling will occur in September 2013. A second sample will be collected in October 2013 if the Permanente Facility receives rainfall of more than 0.25 inches between the sample in September and October 31, 2013. All sediment sampling in Ponds 14 and 22 will be supervised by a U.S. Fish and Wildlife Service approved biologist, trained in identification of all red-legged frog life stages and sensitive habitats.

2.3 Quality Assurance and Quality Control

Minimum quality assurance and quality control procedures and metrics will be met as specified in EPA Method 100.1 (USEPA 2000). Minimum test acceptability criteria include:

- test temperature at 23 °C, with daily mean variation of ≤1°C and instantaneous maximum variation of ≤3°C,
- control survival of ≥80%, and
- measurable control organism growth.

In addition, a concurrent reference toxicant test will be run for each batch of sediment bioassays. If DO concentrations drop below 2.5 mg/L, aeration will be employed. Change in test alkalinity,

hardness, or ammonia concentrations of greater than 50% will result in qualified test results. Whole-sediment toxicity tests will be started as soon as possible, but not later than 2 weeks after collection. Samples will be stored in the dark at ≤4°C.

2.4 Reporting

Consistent with the 13267 Investigative Order, sediment toxicity testing results will be reported within 30 days after the end of the quarter in which the sampling was conducted (i.e., for samples collected in September, results would be reported no later than October 30th). At a minimum, the report will include:

- sample collection date,
- test initiation date,
- organism source and age,
- end point values for both control and field samples (i.e., mean percent survival and mean dry weight gain),
- statistical endpoint expressed in TU (TU = 100/NOEC)[1], and
- reference toxicant test NOEC, LOEC, and EC50 values.

Methods of statistical analysis will be provided in the form of a Comprehensive Environmental Toxicity Information System (CETIS) report output.

3 REFERENCES

USEPA (United States Environmental Protection Agency). 2000. Methods for Measuring the Toxicity of Sediment-associated Contaminants with Freshwater Invertebrates, Second Edition. EPA 600/R-99/064. March 2000.

[1] Because only undiluted sediment will be evaluated, the possible TU values are 1 (no statistical difference between field sediment and control) and >1 TU (a statistical difference between field sediment and control is present)