ATTACHMENT A

Feasibility of Water Treatment for Discharges From The Permanente Quarry Containing Selenium

This report provides information on the feasibility of constructing a water treatment system at the Permanente Quarry with respect to the Quarry Pit, West Materials Storage Area, and East Materials Storage Area. Lehigh Southwest Cement Company ("Lehigh") is submitting this information at the request of the Planning Department and in connection with the Planning Commission's review of the Quarry pursuant to Condition 82 of the County's June 26, 2012 Reclamation Plan Approval.

Background

The Permanente Quarry is a limestone and aggregate mining operation in the unincorporated foothills of western Santa Clara County, approximately two miles west of the City of Cupertino. The Quarry occupies a portion of a 3,510-acre property owned by Hanson Permanente Cement, Inc., and is operated by Lehigh Southwest Cement Company (collectively, "Lehigh"). Mining operations commenced at the Quarry in 1903.

The Quarry includes approximately 614 acres of existing and future operational areas. These areas consist of mining excavations, overburden stockpiling, crushing and processing facilities, exploration areas, access roads, administrative offices and equipment storage. The Quarry also contains undisturbed areas that are either held in reserve for future mining, or which buffer Lehigh's mining operations from adjacent land uses. Permanente Creek is a seasonal stream that runs through the Quarry in a northeasterly direction before emptying into the San Francisco Bay. Most runoff from Quarry operations enters Permanente Creek.

Lehigh excavates limestone and other rock types from the Quarry, which are processed into cement and aggregate products. Limestone is extracted from a single excavation area, the Quarry pit, which has elevations ranging from 750 to 1,750 feet above mean sea level (amsl). The pit also produces other rock types (including greenstone, metabasalts, and graywacke) that are not suitable for producing cement or aggregates, known as "overburden." Overburden is placed in permanent storage in the West Materials Storage Area ("WMSA"), which is located immediately west of the pit, or the East Materials Storage Area ("EMSA") which is located farther to the east.

Mining operations are subject to California's Surface Mining and Reclamation Act ("SMARA") and the County's surface mining ordinance. Both SMARA and County ordinances state that mining operations must have an approved reclamation plan which describes how mined lands will be prepared for post-mining use. The County serves as lead agency under SMARA. In March 1985, the County first approved a Reclamation Plan for the Quarry. In June 2012, the County approved an amended Reclamation Plan, as described in more detail below.

Reclamation Strategy for Selenium

Selenium is a naturally-occurring metal. It is an important nutrient for mammals and other species, but can have toxic effects if ingested at high doses. At the Quarry, selenium is contained within the limestone that is quarried to produce cement and aggregate. When limestone is quarried, selenium can become exposed to atmospheric levels of oxygen (compared to the low levels of oxygen in groundwater). This causes the selenium to become oxidized to a soluble selenite form (Se 6+) that may become dissolved in the storm runoff.

Selenium concentrations in Permanente Creek have been recorded at levels above the applicable water-quality standards. The San Francisco Bay Regional Water Quality Control Board has established chronic and acute limits of 5 and 20 parts per billion (µg/L), respectively. Dissolved selenium concentrations in the creek have been found between 13 µg/L and 81 µg/L. These conditions have not had an apparent effect on fish or benthic organisms in the creek, based on biological studies and laboratory testing using fathead minnows (*Pimephales Promelas*). (WRA, 2010.)

Selenium was studied in detail in connection with the 2012 Reclamation Plan amendment. The proposed amendment contained detailed information on selenium in surface water, groundwater and quarried rock. This included the results of surface water and groundwater (i.e., monitoring well) testing in and around Permanente Creek. It also included the results of field and laboratory testing to determine the amount of selenium in the various rock types at the Quarry, the leachable percentage of selenium in rock, and the capacity of the rock to release selenium when exposed to oxygen and water.

The proposed Reclamation Plan amendment also included reclamation strategies to reduce or eliminate selenium in the Quarry's discharges. For decades, regulatory agencies have focused on preventing stormwater pollution by eliminating contact between runoff and source materials. This "source control" approach, which prevents pollutants from mobilizing into water in the first place, is generally favored over water treatment facilities. This approach is the fundamental Reclamation Plan strategy for closure of most areas in the Quarry, including the EMSA.

The reclamation strategy for the Quarry pit was backfilling, to a minimum elevation of 990 feet amsl, using onsite material from the WMSA. The final backfilled surface would be covered with a layer of non-limestone material and a vegetation growth layer, to isolate runoff from any limestone in the backfill. In addition, organic matter (i.e., green waste) would be mixed in the backfill material to create anaerobic, non-oxygenated conditions that prevent the generation of selenium. Using these techniques, the Reclamation Plan amendment projected that selenium concentrations in pit discharges would fall to between 2-4 µg/L, which meets the applicable water-quality standards.

The reclamation approach to the EMSA and WMSA emphasized the concept of source control to minimize the exposure of limestone rock to oxygen and water. The Reclamation Plan amendment proposed to cover both the EMSA and WMSA at the time of final reclamation with a

layer of non-limestone material, followed by a second layer of revegetation growth media. This would isolate stormwater runoff in the EMSA and WMSA from any limestone rock within the overburden. The cover-and-isolation strategy would function to prevent a release or entrainment of selenium in runoff. The amended Reclamation Plan projected that these reclamation actions would reduce the concentrations of selenium in EMSA and WMSA runoff to levels which meet the current water-quality standards.

2012 Feasibility Study

The Planning Department reviewed the proposed Reclamation Plan amendment with assistance from independent, third-party consultants. The consultants agreed that the reclamation strategies in the amendment were sound, and would effectively reduce selenium in the Quarry's discharges to concentrations meeting the applicable water-quality standards. These conclusions were stated in a draft environmental impact report ("DEIR") in December 2011. The DEIR noted, however, that because final reclamation was not scheduled to begin until 2015 in the EMSA, and 2025 in other areas, there was a possibility that "interim" selenium impacts could occur as reclamation work was occurring but before reclamation was completed.

To address the potential interim impact, the DEIR considered whether technologies were available to reduce selenium in runoff to levels below the current standard of 5 µg/l. The DEIR concluded that a treatment system was not feasible, based on the anticipated high cost of installing and operating such a system. Before preparing the final environmental impact report ("FEIR"), however, the Planning Department retained another independent consultant, CH2M Hill, to study whether a treatment system was feasible.

In April 2012, CH2M Hill prepared a "Feasibility Assessment" which evaluated the engineering and cost considerations for a fluidized bed reactor ("FBR") system that was capable of achieving the current 5 µg/l selenium standard. CH2M Hill concluded that the technical feasibility of such a system was uncertain, without further study, because of varying runoff rates and other site-specific factors. CH2M Hill also projected installation and operating costs of approximately $165 million (excluding additional costs for "technology confirmation," or pilot testing, which CH2M Hill had recommended).

On June 26, 2012, the Board of Supervisors approved the amended Reclamation Plan, and certified the FEIR. With respect to water treatment, the Board expressly found that "a mitigation measure requiring the installation and operation of a treatment facility to treat selenium runoff during reclamation activities is not feasible, at this time" based on technological and economic factors. The Board did, however, impose conditions of approval that required Lehigh to perform further study of whether a water treatment facility was feasible for interim selenium discharges in advance of final reclamation.

Conditions of Approval

The June 2012 Conditions of Approval included four specific conditions (Nos. 79, 80, 81, 82) that addressed the possibility of interim selenium impacts. In general, these required numerous "best management practices" for selenium control; ongoing sampling and testing for selenium; and further study of a treatment facility through a pilot system. The conditions also required the Planning Commission to consider whether a treatment system was warranted in the event that interim discharge requirements were not met.

Condition 79 provides:

> 79. **Interim Stormwater Monitoring Plan**:
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> Prior to the start of reclamation activities, the Mine Operator shall develop a Stormwater Monitoring Plan for sampling and testing stormwater, that would supplement preexisting surface water monitoring required by General Industrial Storm Water and Sand and Gravel NPDES Permit and any other applicable permits designed to specifically monitor surface water during reclamation activities in active and inactive excavation and backfill areas, and locations where water discharges to Permanente Creek. The purpose of this plan is to evaluate performance of temporary BMPs and completed reclamation phases and to identify areas that are sources of selenium (measured on recoverable basis), sediment, or high TDS. At a minimum, the plan shall require the Mine Operator to inspect BMPs and collect water samples for analysis of TDS and metals, including selenium, within 24 hours after a qualifying rain event and sample non-stormwater discharges when they occur. If elevated selenium, sediment, or TDS is identified through sample analysis, the Mine Operator shall identify the source and apply any new or modified standard BMPs available. BMPs that show sign of failure or inadequate performance shall be repaired or replaced with a more suitable alternative. Following implementation, the Mine Operator shall retest surface water to determine the effectiveness of such modifications, and determine whether additional BMPs are necessary. *(Implements Mitigation Measures 4.4-5 and 4.10-2b)*
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> For Phase I, submit the Stormwater Monitoring Plan for Phase I to the Planning Manager for review and approval prior to October 1, 2012. For Phase II and III, submit a Monitoring Plan to the Planning Manager for review and approval sixty (60) days prior to the start of Phase II. Stormwater testing results shall be submitted to Planning Manager on a monthly basis between October 15 and

April 15 of each year. If a qualifying rain event did not occur during any month during this period (and stormwater testing was not conducted), notification shall be submitted to the Planning Manager in lieu of testing results.

Condition 80 provides:

> 80. **Monitoring and Determination of BMP Effectiveness for the EMSA:**
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> a. Within 30 days of RPA approval, sampling and testing shall occur within 24 hours after a qualifying rain event. If no qualifying rain event occurs within 30 days of RPA approval, then testing shall begin at the first qualifying rain event. Testing shall be conducted in accordance with the Interim Stormwater Monitoring Plan developed and approved in accordance with Condition #79.
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> b. If test results for two consecutive years show that stormwater discharging from the EMSA into Permanente Creek exceeds total recoverable selenium of Basin Plan Water Quality Objective, currently 5 µg/L (micrograms per liter), or other applicable discharge requirement as determined by the RWQCB, then the County shall schedule a public hearing before the Planning Commission to determine whether the Mine Operator is complying with stormwater discharge requirements. For purposes of triggering Planning Commission review, the sampling shall occur at locations where water discharges to Permanente Creek.
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> c. If the Planning Commission determines that the Mine Operator is not complying with discharge requirements, then the operator shall install a treatment system (or alternative) as described in Condition #82. *(Implements Mitigation Measures 4.4-5 and 4.10-2c)*

In addition, Condition 81 states:

> 81. **Monitoring and Determination of BMP Effectiveness for the WMSA and Quarry Pit:**
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> a. Within 30 days of RPA approval, sampling and testing shall occur within 24 hours after a qualifying rain event. If no qualifying rain event occurs within 30 days of RPA approval, then testing shall begin at the first qualifying rain event. Testing shall be

conducted in accordance with the Interim Stormwater Monitoring Plan developed and approved in accordance with Condition #79.

b. If test results for two consecutive years show that stormwater discharging from the EMSA into Permanente Creek exceeds total recoverable selenium of Basin Plan Water Quality Objective, currently 5 µg/L (micrograms per liter), or other applicable discharge requirement as determined by the RWQCB, then the County shall schedule a public hearing before the Planning Commission to determine whether the Mine Operator is complying with stormwater discharge requirements. For purposes of triggering Planning Commission review, the sampling shall occur at locations where water discharges to Permanente Creek.

c. If the Planning Commission determines that the Mine Operator is not complying with discharge requirements, then the operator shall install a treatment system (or alternative) as described in Condition #82. *(Implements Mitigation Measures 4.4-5 and 4.10-2c)*

a. Within 30 days of the start of reclamation activities for Phase II, the Mine Operator shall conduct monthly water sampling and testing results in compliance with the Interim Stormwater Monitoring Plan, as described under Condition #79.

b. If test results for two consecutive years show that selenium levels are higher than base levels, then the County shall schedule a public hearing before the Planning Commission to determine whether the reclamation activities are causing an increase in total selenium above the base levels. "Base levels" shall be defined as water testing results for an average for two years immediately prior to start of Phase II reclamation for discharge into Permanente Creek from the WMSA and Quarry Pit. For purposes of triggering Planning Commission review, the sampling shall occur at locations where water discharges to Permanente Creek.

c. If the Planning Commission finds that reclamation activities are causing an increase in selenium over base levels, then the Mine Operator shall install a treatment system (or alternative) as described under Condition #82. *(Implements Mitigation Measures 4.4-5 and 4.10-2d.)*

Finally, Condition 82 states:

a. Within 30 days of RPA approval, the Mine Operator shall begin designing a treatment facility (or alternative) and pilot system for discharge into Permanente Creek. The treatment shall be designed to achieve the Basin Plan Water Quality Objective for selenium (total recoverable selenium of 5 µg/L) for discharge from the EMSA as defined in Condition #80, and/or to achieve the "base level" standard for the WMSA and Quarry Pit as defined in Condition #81 *(reference to Mitigation Measures 4.10-2d).*

b. The Mine Operator shall complete design, pilot testing, and feasibility analysis for a treatment facility within 24 months of RPA approval or by such other time as may be prescribed by the RWQCB.

c. The Planning Commission shall hold a public hearing no later than 30 months after RPA approval to determine feasibility of the treatment facility (or alternative). The Planning Commission may defer the public hearing if the RWQCB determines that additional time is necessary to complete the design, pilot testing, and feasibility analysis. If the Planning Commission determines that a treatment facility is feasible, the Planning Commission shall also establish a timeline for implementing the treatment facility.

d. Construction, installation, and operation of a treatment facility (or alternative) shall be required if discharge requirements are not met as described under Conditions # 80 and # 81 based on a determination of the Planning Commission, and if it has been determined feasible by the Planning Commission following a public hearing. *(Implements Mitigation Measures 4.4-5 and 4.10-2e.)*

Post-Approval Stormwater Testing in EMSA

Lehigh tested its stormwater discharges from the EMSA and other areas during the two years since the Reclamation Plan's approval. Stormwater testing in the 2012-2013 wet season showed negligible selenium in runoff from the EMSA, measured at the discharge of Pond 30 to Permanente Creek. These tests showed that selenium was either Non Detect ("ND") or at concentrations slightly higher (<1 ug/L) than the current water quality criteria, 5 ug/L. During the 2013-2014 wet season, sampling from two Pond 30 discharges were higher and exceeded the current criteria for selenium.

Lehigh responded to these testing results by instituting the procedure required by Condition 79. That condition requires, if elevated selenium is detected by sampling and testing, that Lehigh identify the source and modify its "best management practices" as needed to address the issue.

In July 2014, Lehigh provided the County with a report which described the actions that Lehigh would employ to prevent elevated concentrations of selenium from discharging from the EMSA. (See Attachment 1.)

In its report, Lehigh informed the County that it would commence final reclamation in the EMSA on an advance schedule, including installing a non-limestone cover. These actions implement the "source control" strategies in the Reclamation Plan that were peer reviewed by the County's consultants, and which will reduce selenium to levels meeting the current water quality criteria. Lehigh will begin to install the non-limestone cover by October 15, 2014, and complete the process in the 2015 dry season. During the 2015-16 wet season, Lehigh will perform at least three rounds of stormwater testing (pursuant to Conditions 76(f) and 79) to verify that the cover is effectively controlling selenium, before applying a topsoil layer and planting the EMSA with native grasses, shrubs and trees.

Feasibility Analysis

The Planning Commission must determine, pursuant to Condition 82, whether it is "feasible" to build and operate a water treatment system that is capable of controlling selenium to levels consistent with the current discharge standard, 5 ug/L. The term "feasible" has a specific meaning under CEQA. Public Resources Code section 21061.1 defines it as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors." CEQA's Guidelines add that a determination of feasibility may take into account "legal" factors. (Cal. Code of Regulations, tit. 14, § 15364.)

The circumstances that bear on the feasibility of water treatment vary for different areas of the Quarry. The issue of feasibility must be analyzed separately for the Quarry Pit/WMSA, versus the EMSA.

Quarry Pit and West Materials Storage Area ("WMSA")

Since the Reclamation Plan's approval, Lehigh has diligently pursued emerging technologies to control selenium discharges from the pit and WMSA. Lehigh's focus has centered on the pit and WMSA because these areas together are the source of the majority of water discharges from the Quarry. For the same reasons, discharges containing selenium from the pit/WMSA have been the focus of the Regional Water Board's permitting efforts. Runoff from the EMSA, in contrast, is episodic and comparatively small.

In August 2013, Lehigh shared an early proposal with the County to build a water treatment system in a location east of the pit near the Quarry offices. The project description that Lehigh submitted to the Planning Department is included in Attachment 2. The project proposed to install a number of anaerobic bioreactors that remove selenium from pit/WMSA water. This proposal had certain drawbacks, however. The system would have required a sizeable influent pond (300 ft. x 150 ft.) of up to 14 acre-feet of capacity to ensure that flows entering the

bioreactors were uniformly low in suspended sediments. The system also required cylindrical steel tanks (150,000 gal/each) and a metal building (90 ft. x 85 ft. x 32 ft.) for housing equipment. The footprint, location, visual profile and potential environmental impacts of this system presented a range of concerns. Lehigh subsequently withdrew this proposal.

Concurrently, Lehigh continued to explore alternative technologies. In August 2013, Lehigh learned of a new microbial treatment system designed by Frontier Water Systems. The Frontier water treatment system was developed by the individuals who pioneered the "ABMet" systems that had been considered the state of the art in selenium treatment. The Frontier system utilizes non-hazardous bacteria to establish anaerobic "reducing" conditions, which change the selenium from a dissolved state to a solid state that can precipitate out in a solid form and be collected for disposal.

The Frontier treatment system represents the only commercially-available technology that appears capable of treating the highly-variable, yet consistent (i.e. occurs on a large number of days annually) inflow rates which characterize the Quarry pit dewatering flows and runoff, while meeting the extremely low selenium effluent limits established by the current water quality standards. Its compact, modular design offers a major advantage over other systems. The system does not require an influent pond, reducing the overall footprint. Equipment is housed mainly in trailer-sized modules that can be easily relocated, and do not need fixed foundations.

In fall 2013, Lehigh installed a pilot system using the Frontier technology. The pilot system operated at the 750-level pond within the Quarry pit (see Attachment 3 photographs). The pilot system received an inflow of approximately three gallons per minute from the pit/WMSA over a four-week period in October and November 2013. The results exceeded expectations. The pilot system repeatedly reduced selenium to levels below the current standard, 5 ug/L. The pilot system results are contained in the report provided in Attachment 3, and also shown in the table below.

Pilot System Selenium Results
(Values in ug/L)

Date	Influent SE	Stage 1 SE	Stage 2 SE	Final SE
10/16/13	1.8	1.7	0.48	--
10/21/13	ND	ND	ND	--
10/28/13	26	21	15	--
10/30/13	31	22	14	15
10/31/13	60	40	23	22
11/4/13	57	26	8	7.7
11/6/13	57	25	5	4
11/7/13	62	28	5.7	5
11/11/13	57	25	5.2	3.1
11/13/13	65	23	3.4	2.3
11/15/13	58	17	2	1.3

The data generated by the pilot system indicated that the Frontier technology can be scaled to a larger treatment system with consistent results. Consequently, Lehigh is currently proceeding to implement a larger, interim treatment system ("ITS") that will be completed by October 2014 in a location adjacent to Pond 4A, south of the Quarry pit. The location and approximate footprint of the ITS is illustrated in the report provided under Attachment 3. The ITS will treat and remove selenium from up to 24,000 gallons per hour from the pit. The ITS is scheduled to be operational during the 2014-15 wet season. The data generated over the next two years will permit Lehigh to determine whether it is technically possible to expand the system's inflow capacity to handle all water discharged from the Quarry pit and WMSA.

In summary, the information developed by Lehigh since the Reclamation Plan's approval indicates, on a preliminary basis, that it is feasible to install a water treatment system that is capable of treating water from the Quarry pit and WMSA to levels below the current 5 ug/L standard for selenium. Lehigh anticipates that the data generated during the following two wet seasons (2014-15, 2015-16) will permit a final determination. Lehigh submits that it is appropriate to amend the Conditions of Approval to acknowledge that the ITS will operate, and to thereafter reassess (in April 2016 or later) the feasibility of this technology to treat all pit and WMSA water.

East Materials Storage Area ("EMSA")

A water treatment system for EMSA discharges presents a different set of considerations. At the outset is a timing issue. The approved Reclamation Plan requires reclamation to commence in the EMSA earlier than in other areas of the Quarry. Final reclamation, including placement of a non-limestone cover, must begin by 2015 in the EMSA, whereas reclamation in other areas will not begin until at least 2025. Moreover, Lehigh has committed to starting final reclamation on an even earlier schedule. As stated in Lehigh's July 2014 report, Lehigh will begin installation of a non-limestone cover in October 2014 and complete the cover in mid-2015. As such, a treatment system would have utility for no more than one wet season (2014-15), after which the protective non-limestone cover will be in place.

The EMSA's physical configuration is also a factor. The EMSA is a stockpile which occupies approximately 54 acres. The EMSA is designed so that storm runoff flows to a series of ditches, and then to a series of sedimentation basins, including a final basin (Pond 30), which discharges into Permanente Creek. Because of the EMSA's size and drainage controls, and because the EMSA is composed mainly of pervious fill, it generates relatively little runoff to the creek. For example, the EMSA produced only two measurable discharges during the 2012-13 and 2013-14 wet seasons, respectively. (See Attachment 1.) The EMSA contrasts with the pit/WMSA area, which covers a much larger drainage area and delivers a consistent flow of water to Permanente Creek for much of the year.

In light of the above factors, Lehigh has considered whether a stand-alone water treatment facility for the EMSA is feasible. Feasibility means that that an action is capable of being accomplished in a successful manner within a reasonable period, taking into account

"technological factors." It is well known, however, that current treatment technologies, including the Frontier system, require a steady inflow to establish and maintain anaerobic "reducing" conditions. A treatment system is not able to function effectively based on the small, intermittent discharges which characterize the EMSA. Unlike the pit, which collects and stores water from a large area that can be pumped in a continuous flow, the EMSA rarely generates a treatable volume of runoff. Based on these considerations, it is clear that a stand-alone treatment facility at the EMSA is technologically infeasible.

As an alternative, Lehigh also has considered if it is feasible to treat EMSA stormwater runoff by pumping the water to Pond 4A, where the ITS facility is located. Such a project would require a series of pumps and pipes to deliver water from the EMSA to the treatment facility. The project would require approximately 1.7 miles of pipe to link Pond 30 (in the EMSA) to the location of the treatment facility at Pond 4A. It also would require pumps to lift water over a 700-foot vertical gradient, in order to cross a ridge separating the EMSA from the facility. The approximate alignment of the piping and pumping system is illustrated below.

A water delivery system presents timing issues, however, as prefaced above. Lehigh estimates that it would require approximately two years to design and construct a water delivery system (excluding any time that may be required for the Planning Department to prepare an environmental review). By the time this system would be operational, the EMSA will already have been covered with the non-limestone layer called for by the Reclamation Plan to protect against selenium, and the delivery system would no longer have usefulness. In short, this

alternative is not "capable of being accomplished in a successful manner within a reasonable period of time..." (Pub. Resources Code, § 21061.1.)

In addition, Lehigh currently does not have legal authority to deliver water from the EMSA to the ITS for treatment and discharge. In March 2014, the Regional Water Board issued Lehigh a water discharge permit and a cease and desist order. The permit and CDO authorize a very specific set of discharges from the Quarry. In particular, the permit and CDO allows Lehigh to use the ITS for treating process water discharges from the Quarry pit. It does not, however, authorize Lehigh to redirect stormwater runoff from other areas of the Quarry (such as the EMSA) to the ITS for treatment. As such, an alternative that involves pumping EMSA water to the treatment facility is legally infeasible at this time. (Cal. Code of Regulations, tit. 14, § 15364.)

Delivering EMSA water to the ITS also raises technological issues. A primary concern is the risk of upsetting the treatment system by the variations in water temperature and quality represented by the EMSA influent. The performance of the microbial system depends on the characteristics of the influent. A microorganism's ability to survive in water depends on the oxidation/reduction potential ("ORP") of the water, which is affected by the temperature and quality of the influent. During pilot testing in 2013, Frontier observed that fluctuations in the influent temperature affected system performance, and recommended that Lehigh draw water from its well system rather than surface water. As the EMSA produces only surface water, water from the EMSA would have a different profile for temperature and suspended solids than the pit/WMSA influent. It cannot be determined at this time whether the ITS can effectively absorb and tolerate such influent variations without reducing performance. As a result, this alternative is not feasible at this time based on technological factors. (Pub. Resources Code, § 21061.1.)

The anticipated costs of a water delivery system also bear consideration. Lehigh estimates that the cost of designing and installing a water delivery system would exceed $4 million. As previously noted, however, a delivery system would be rarely used because the EMSA seldom generates enough runoff to cause a discharge. It is appropriate to balance the usefulness of delivery system against the costs of the system. In this case, because the anticipated costs of the delivery system appear to far outweigh any usefulness which the delivery system may have, this alternative appears to be economically infeasible. (Pub. Resources Code, § 21061.1.)

Similar to a water delivery system, Lehigh also analyzed the option of transporting water from the EMSA to the treatment facility using off-road trucks. In this scenario, water collected in Pond 30 would be pumped into off-road water trucks that Lehigh would be required to purchase (although the Quarry has existing water trucks, it does not have any available water trucks that are capable of driving through the cement plant which may not exceed an 8,000 gallon capacity). Loaded trucks would travel an approximately 1.9-mile route from the EMSA to the treatment facility and then return. The alternative of trucking water to the treatment system confronts many of the same issues posed by a pumping delivery system. The Regional Water Board permit and CDO do not provide Lehigh with the legal authority to deliver water from the EMSA to the ITS. In addition, introducing EMSA water into the treatment facility can unbalance the

microbial system. Thus, for the same reasons that a pump-based delivery system is infeasible, trucking EMSA water to the treatment facility is infeasible as well.

Finally, Lehigh has considered whether there are alternatives to a water treatment facility that will prevent untreated runoff from entering Permanente Creek, in the event that discharges from the EMSA following installation of the cover do not meet the current 5 ug/L selenium standard. In this regard, Condition 82(c) states the Planning Commission may consider an "alternative" to a treatment facility. In this regard, Lehigh has considered the possibility of enlarging Pond 30 (at the base of the EMSA) to a capacity that will minimize the likelihood of a stormwater discharge to Permanente Creek under foreseeable storm events. The enlarged pond would be designed and sized based on the Regional Water Board's requirements.

At this time, the alternative of enlarging Pond 30 appears to be feasible, subject to the need for a subsurface analysis to ensure that the area surrounding Pond 30 can accept an enlarged pond. Lehigh believes it would be appropriate for the Planning Commission to require Lehigh to provide a status update regarding the feasibility of enlarging Pond 30 at the time of the 2015 annual report.

Conclusion

Lehigh appreciates the opportunity to provide this input to the Planning Commission, and looks forward to answering questions.

ATTACHMENT 1

East Materials Storage Area
Condition No. 79 – Modifications to Best Management Practices

This document describes the actions currently planned by Lehigh Southwest Cement Company to address the recent sampling results from the East Materials Storage Area ("EMSA") to comply with the June 26, 2012 Conditions of Approval.

On June 26, 2012, the Santa Clara County Board of Supervisors approved an amended Reclamation Plan for the Permanente Quarry, which encompasses the EMSA. Among the range of issues addressed by the amended plan was the presence of selenium in elevated concentrations in stormwater runoff from portions of the quarry, including the EMSA. To address this issue, the Reclamation Plan and Conditions of Approval contained several requirements designed to reduce or eliminate selenium. A wide range of water monitoring provisions, best management practices, and sediment controls are set forth in Condition Nos. 74 through 81.

Among them, Condition 79 provides that Lehigh must monitor stormwater discharges from the EMSA for selenium and other pollutants. Lehigh does this by sampling its stormwater discharges from the EMSA at the outfall structure located at Pond 30. In the 2012-13 and 2013-14 wet seasons, Lehigh tested four measurable discharges. Samples in December 2012 indicated that selenium was non-detectable or dropping compared to past results. Sampling in early 2014, however, showed a comparative increase in selenium.

Pond 30 Sampling Results 2012-2014	
Date	Result (in ug/l)
12/5/12	5.9
12/26/12	Non-Detect
2/27/14	14.6
4/2/14	29.2

The increase in selenium is the likely result of activities in the EMSA that may have exposed areas holding higher concentrations of limestone, which is known to release selenium when exposed to air and water.

In circumstances where elevated selenium levels have been detected in EMSA stormwater discharges, Condition of Approval No. 79 requires Lehigh to identify the source of the selenium and modify its best management practices to address the issue. Condition No. 79 provides, in relevant part:

> If elevated selenium, sediment, or TDS is identified through sample analysis, the Mine Operator shall identify the source and apply any new or modified standard BMPs available. BMPs that show sign of failure or inadequate performance shall be repaired or

replaced with a more suitable alternative. Following implementation, the Mine Operator shall retest surface water to determine the effectiveness of such modifications, and determine whether additional BMPs are necessary.

Lehigh will take the following steps to implement these modified best management practices, and according to the following schedule:

1. By July 31, 2014, Lehigh will retain geological and geotechnical consultants to complete an inspection of the EMSA to identify concentrated areas of limestone for removal or regrading. Lehigh expects that removal or cover of this material alone will return runoff concentrations of selenium to 2012 levels.

2. By July 31, 2014, Lehigh will retain geological and geotechnical consultants to identify the sources of suitable non-limestone rock cover material and to oversee the placement of cover materials (a contract/resume for this consultant already has been provided to the County).

3. By October 15, 2014, Lehigh will commence installing the non-limestone cover. Non-limestone rock will be harvested as it is produced from mining operations. Rock will be delivered directly to the EMSA from the quarry after mining, or temporarily stockpiled if it is infeasible to deliver material directly to the EMSA for placement. Lehigh will advise staff of any temporary stockpiles in advance. Placement and testing of cover materials will be supervised by a certified engineering geologist as required by Condition No. 74.

4. Once the non-limestone cover is installed, Lehigh will conduct stormwater sampling to verify that the cover is functioning to reduce or eliminate selenium in EMSA runoff. Lehigh will perform at least three rounds of stormwater sampling under Condition No. 76(f) and No. 79. Samples will be collected during the 2015-16 rainy season, and successive wet seasons until rains are sufficient to permit three or more rounds of sampling. Sampling and testing will be conducted and reported as follows:

- Lehigh will sample EMSA discharges for selenium, total dissolves solids and metals.
- Lehigh will collect samples within 24 hours after each qualifying rain event.
- Lehigh will provide laboratory testing results to County staff on a monthly basis during the wet season (October 15-April 15).

The cover design received a detailed review by the County's consultants prior to Reclamation Plan approval. The County's consultants concurred that the cover will be effective to reduce or eliminate selenium in runoff. Should the cover not perform as expected, Lehigh will

consider its options for routing EMSA stormwater runoff to the interim water treatment system which Lehigh is developing in furtherance of Condition No. 82.

ATTACHMENT 2

Project Description

1. Project Overview

On June 26, 2012, Santa Clara County ("County") approved the Reclamation Plan for the Permanente Quarry ("Quarry"), a limestone and aggregate quarry located at 24001 Stevens Creek Boulevard, Cupertino, Santa Clara County, California (Figure 1). The County granted approval upon the condition that the operator, Lehigh Southwest Cement Company ("Lehigh")[1], study the feasibility of building and effectively operating a treatment system to ensure that discharges from the Quarry meet certain standards for water quality, and specifically, for selenium. Additionally, in April 2013 Lehigh entered into a consent decree with the Sierra Club which requires Lehigh to install a treatment system to remove selenium and other constituents from the Quarry's water discharges.

At this time, Lehigh proposes to build an interim water treatment system ("ITS") to remove selenium from water discharged from the Quarry pit into Permanente Creek. The ITS is intended to further Lehigh's effort to determine if it is feasible to build and operate a treatment system for all Quarry runoff according to the June 26, 2012 conditions of approval. The ITS also is intended to meet the consent decree's requirements. Lehigh seeks the County's approval of a Reclamation Plan amendment ("Project") to recognize the installation of the ITS, and to describe its operation and its eventual reclamation.

The ITS will cover 2.5 acres (the "Project Area") entirely within the existing Reclamation Plan boundary (Figure 2). The ITS will treat up to 400 gallons per minute of water from the Quarry pit using treatment equipment to be installed along the pit's eastern rim. Treated water would be pumped to an existing outfall which discharges to Permanente Creek. The ITS is not designed to treat water from other areas of the Quarry that do not drain into the Quarry pit.

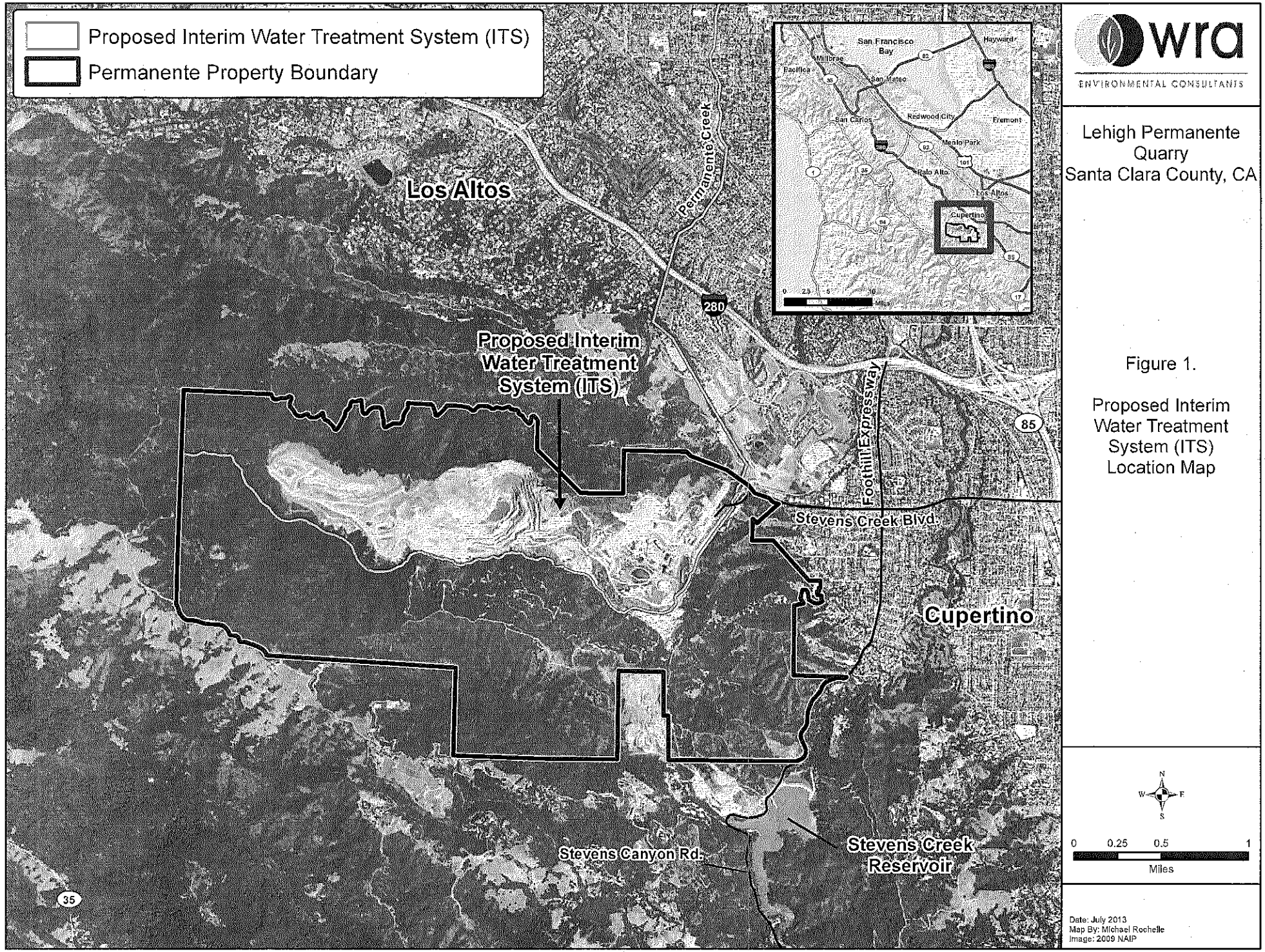
Lehigh anticipates that it will eventually install a "final" treatment system to treat water discharged from other portions of the Quarry. The final treatment system is not addressed by this Reclamation Plan amendment. Although the final system is expected to utilize some of the same equipment and infrastructure used by the ITS, the ultimate design, configuration and selection of technology in the final system will depend on data collected during operation of the ITS, and it is speculative to forecast the details of the final system at this point in time. If a later amendment is necessary to accommodate a comprehensive final system, it will be processed after the final system design is selected.

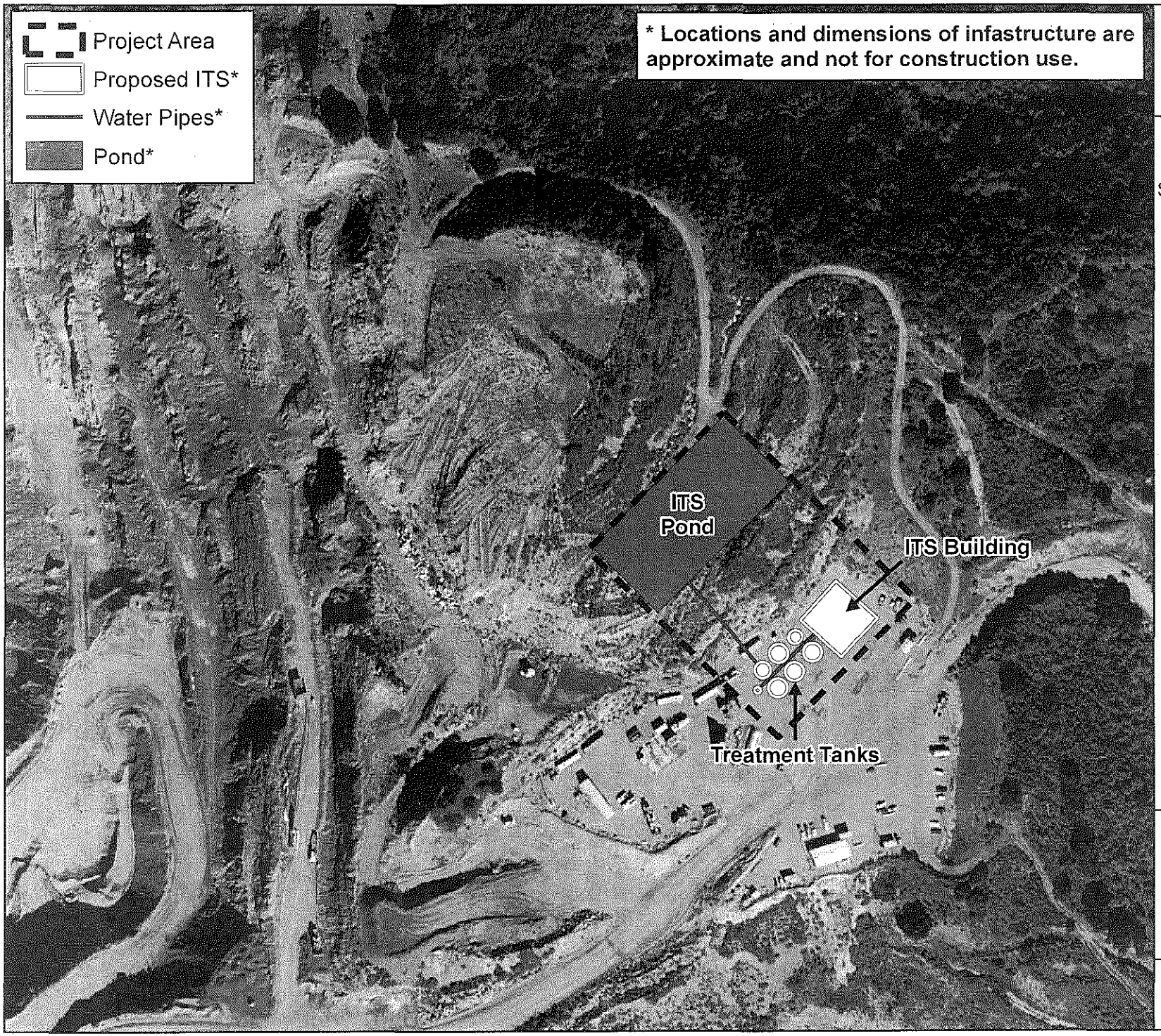
2. Project Location

2.1 Regional Setting

The Quarry is located in an unincorporated area of the County to the west of the City of Cupertino, and approximately two miles west of the Interstate 280 intersection with Highway 85.

[1] The Permanente Quarry (Mine ID No. 91-43-0004) is owned by Hanson Permanente Cement, Inc. and operated by Lehigh. Lehigh and Hanson both are part of the HeidelbergCement Group, a worldwide producer of construction materials.


Proposed Interim Water Treatment System (ITS)
Permanente Property Boundary
Los Altos
Permanente Creek
280
Proposed Interim Water Treatment System (ITS)
Foothill Expressway
85
Stevens Creek Blvd
Cupertino
Stevens Canyon Rd.
Stevens Creek Reservoir
35
San Francisco Bay
Hayward
Millbrae
Pacifica
San Mateo
San Carlos
Redwood City
Fremont
Menlo Park
Palo Alto
Los Altos
Cupertino
0 2.5 5 10 Miles
wra
ENVIRONMENTAL CONSULTANTS
Lehigh Permanente Quarry
Santa Clara County, CA
Figure 1.
Proposed Interim Water Treatment System (ITS) Location Map
N
W
E
S
0 0.25 0.5 1
Miles
Date: July 2013
Map By: Michael Rochelle
Image: 2009 NAIP
Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Viewshed\Location.mxd



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ENVIRONMENTAL CONSULTANTS

Lehigh Permanente Quarry
Santa Clara County, CA

Figure 2.

Site Map for Proposed Interim Water Treatment System (ITS)

N
W E
S

0 50 100 200
Feet

Date: July 2013
Map By: Michael Rochelle
Image: 2009 NAIP

Path: L:\Acad 2000 Files\16000\16143-4\ArcMap\Viewshed\Site Plan.mxd

Vehicle access to the Quarry is provided via Stevens Creek Boulevard or Foothill Expressway and Permanente Road. The property address is 24001 Stevens Creek Boulevard, Cupertino, California, 95014.

The Quarry is located in the eastern foothills of the Santa Cruz Mountains, which are part of California's Coast Range and which separate the San Francisco Bay Area from the Pacific Ocean along the San Francisco Peninsula. Lehigh's approximately 3,510-acre ownership is bordered by large open space areas to the north, south and west, and is in proximity to urban areas to the east. North and northeast are the Rancho San Antonio County Park and Mid-Peninsula Regional Open Space District land. The closest residential areas are in the cities of Cupertino, Los Altos, Palo Alto, and Saratoga.

The existing Reclamation Plan boundary covers approximately 1,238 acres of Lehigh's ownership. From this boundary, the City of Cupertino is approximately 0.45 mile to the east, the City of Los Altos is 1 mile northeast, and the City of Saratoga is 3.25 miles to the southeast. Two census-designated residential areas (Loyola and Los Altos Hills) are approximately 1 mile north. A separate surface mining operation, the Stevens Creek Quarry, is located approximately 1 mile south.

The Project Area is within the unincorporated County and is subject to the County's land use jurisdiction.

2.2 Project Area

The Project Area is the area occupied by the ITS, which includes the treatment equipment and related infrastructure, including the pumps, pipes, tanks, and pond. The Project Area occupies a total of 2.5 acres in the central portion of the Quarry. The Project Area includes the influent pond, the treatment system/building, and pipelines connecting the two (Figure 2). The ITS does not include all of the areas over which storm runoff flows which will be treated by the ITS because the Project will cause no physical change to such areas. Topography in and around the Project Area is generally steep with elevations from 450 feet above sea level ("asl") at the eventual pit bottom to 1,350 asl at the inflow pond. The Project Area lies north of Permanente Creek, a perennial stream which is a tributary to San Francisco Bay.

3. Existing Land Use

3.1 Existing Land Use in the Project Area

The Project Area is within an ongoing surface mining operation. These land uses are characterized by a range of mining activities which include overburden removal, drilling and blasting, extraction of rock, and hauling and rock processing. These activities also are marked by the use of heavy mining equipment, including excavators, bulldozers, drill rigs and off-road haul trucks to extract and transport mined material. These land uses will not change with either the construction of the water treatment system or the proposed amendment to the Reclamation Plan.

Surface mining operations at the Quarry take place without a use permit from the County because the Quarry is considered a legally nonconforming use. In March 2011, the Santa Clara County Board of Supervisors formally determined that the Quarry was "vested" and delineated

the geographic scope of the vested right. The Project Area is entirely within the area determined by the Board of Supervisors to be vested.

3.2 Existing Land Uses in the Vicinity

Existing land uses within the immediate vicinity of the Project Area, and within Lehigh's ownership, are surface mining and processing, and cement manufacturing at the Cement Plant. To the west, the nearest land that is not operated by Lehigh is open space approximately 0.5 mile away. To the south, the nearest non-Lehigh land use is the Stevens Creek Quarry, another mining operation. Other existing uses farther south and more than 0.5 mile from the Project Area include rural residential and small agricultural uses. To the east, the nearest non-extractive uses are open space and recreational uses related to the Rancho San Antonio County Park, the Gates of Heaven Cemetery and residential subdivisions. North, the nearest non-extractive uses are open space and recreational (i.e., Mid-Peninsula Regional Open Space District and Rancho San Antonio County Park lands). The nearest residences to the Project Area is located a minimum of one mile to the north and northeast.

4. Project Purpose and Need

4.1 Overview

The Project is a Reclamation Plan amendment that would recognize the installation and operation of the ITS, and provide for its removal and reclamation.

As background, SMARA and the County's surface mining ordinance require that mining operators have an approved reclamation plan which describes how land affected by mining lands will be reclaimed to allow post-mining land uses. (Pub. Res. Code § 2770; Santa Clara County Code § 4.10.370(C).) Reclamation is defined by state law as:

> [T]he combined process of land treatment that minimizes water degradation, air pollution, damage to aquatic or wildlife habitat, flooding, erosion, and other adverse effects from surface mining operations, including adverse surface effects incidental to underground mines, so that mined lands are reclaimed to a usable condition which is readily adaptable for alternate land uses and create no danger to public health or safety. The process may extend to affected lands surrounding mined lands, and may require backfilling, grading, resoiling, revegetation, soil compaction, stabilization, or other measures.

(Pub. Res. Code § 2733.)

The Reclamation Plan originally was approved by the County in March 1985. The 1985 Reclamation Plan covered a 25-year period and an area of 330 acres. In 2007, the Quarry began the process of updating the reclamation plan to account for changes in site conditions and also to address certain compliance issues. The County approved the amendment on June 26, 2012. As amended, the Reclamation Plan describes the process of reclaiming all operational components, and areas of historic disturbance from with earlier periods of site operation.

The need for the ITS is based partially upon the 2012 Reclamation Plan amendment approval. The County recognized at that time that some water discharges may contain selenium, which is a naturally-occurring substance. As a result, the June 26, 2012 approval included conditions which were designed to reduce or eliminate selenium from groundwater and storm runoff. Condition 82 identified the option of building a treatment plant. However, in light of uncertainty over whether such a plant could be feasibly built and operated, Condition 82 required that Lehigh first operate a pilot program to determine if treatment was feasible and second, to assess whether interim best management practices could effectively control selenium, before requiring a treatment system.

Lehigh has since installed a small-scale pilot treatment system. The results of the small-scale program indicate that the technology for treating selenium with the prevailing site conditions and flow volumes is potentially achievable, and the next step towards that goal is the operation of the ITS, an intermediate system. The ITS' performance will assist Lehigh to determine whether it is feasible to build and operate a treatment system for all Quarry runoff, pursuant to Condition 82. Also, in April 2013, Lehigh ended litigation by the Sierra Club by entering into a consent decree which required Lehigh to construct an interim treatment system to remove selenium from the Quarry's discharges. The ITS is also intended to accommodate the requirements of the consent decree.

4.2 Objectives

The Project's objectives are to:

- Approve an amendment to the Reclamation Plan to recognize the installation and operation of a water treatment system.
- Ensure that structures, equipment and facilities associated with the water treatment facility are properly reclaimed to avoid or eliminate residual hazards to public health and safety.

5. Project Elements

5.1 Overview

The ITS would function by delivering water stored in the Quarry pit to a pond and a series of treatment tanks located on the eastern edge of the Quarry pit (see Figure 2). Treated water will be pumped to Pond 4A and discharged to Permanente Creek from Pond 4A using the same outfall which the Quarry currently uses to discharge water that either collects in the pit or is captured by the system of groundwater wells in the pit. A supplemental technical description is provided as part of the application package following this Project Description. The following is a summary of the main operational elements.

5.2 Physical Features

The ITS will include the following physical components:

Storage Pond: The ITS will include a lined pond to ensure that flows entering the treatment equipment are uniformly low in suspended sediments. The pond will be between 10 and 14 acre-feet in capacity at the maximum water level with at least two feet of freeboard. Pond edges will be bermed to eliminate stormwater inflow to the pond from runoff. The pond dimensions will be

approximately 150 feet by 300 feet. Inflow and outflow control structures will allow suspended solids to settle before water is drawn into the treatment equipment. The pond will have a single geomembrane liner, protected by a granular surface over the liner, so that sediment can be removed without damaging the liner. The pond serves the following purposes:

- Surge control – The pond will protect the treatment processes from rapid changes in flow rate in the quarry dewatering system and associated with high flow rate backwash and recycle flows.
- Constant flow – The pond will allow for the ITS to be set for a constant flow rate, with level controls in the pond signaling when gradual flow rate changes are needed.
- Sedimentation – The pond will reduce peaks in suspended solids to the ITS which may occur in the dewatering system from time to time, especially during the wet season.

Tank System: The ITS is comprised of a series of treatment tanks, up to 150,000 gallons each in volume, connected by piping, valves, and pond pumps to move the water through the system, and controls and instruments to manage and monitor treatment performance. The tanks will be sited outside of the building, described below (see Figure 2).

Building: A steel building will be constructed to house additional treatment equipment, including filtration and pH adjustment (Figure 2). The building will be approximately 85 feet wide by 90 feet long, with wall heights of 20 feet and a maximum roof peak of 32 feet. Process controls, electrical connections and other minor process support equipment will be housed in the building. The ITS will not require upgrades to the existing electrical lines to the Quarry office area.

The tanks and building profiles are expected to be sufficiently low to avoid visibility from the Santa Clara Valley floor. Additionally, structures will be painted with a color compatible with the surrounding landscape to minimize their visual impact.

Lehigh anticipates that operation of the ITS will not change the overall volume of water discharged into Permanente Creek at the current time. Presently, flows are variable and generally represent the volume of water needed to dewater the Quarry pit. Flows into Permanente Creek through the ITS will be designed to accomplish the same objective.

5.3 Hours and Personnel

The ITS will operate continuously. Up to two (2) full-time employees will be required to monitor system performance using a workstation within the building structure. Employees will be present only during normal business hours. Employees will utilize the neighboring Quarry offices for restroom and break facilities.

5.4 Hazardous Materials Management

Hazardous materials associated with the project include chemicals necessary for use in the treatment process. Residuals from the process itself, including biological and chemical residues generated by the treatment equipment during the process of water treatment, are not expected to exhibit hazardous characteristics. The technical supplement includes a further description of the expected characteristics of the ITS inflow, the storage and use of chemicals in the treatment process, the disposal of residuals generated by the process, and operational health and safety.

5.5 Operational Electricity Usage

The ITS will utilize electrical power for system operations. The expected 460V, 3-Phase electrical loadings are as follows:

- ITS – 150 Kilowatt-hours (KwH) per year
- Building (heating/ventilation) – 31 KwH per year

Electricity during operations will be supplied by a line drawing power from PG&E.

6. Construction Equipment and Labor

6.1 Grading and Earthworks

The ITS will require earthworks grading to construct a pad for construction of the structures, tankage, and the lined inflow pond (Figure 2). Currently, Lehigh anticipates that grading in the following volumes will be necessary (estimates may be updated prior to construction):

- Bulk grading excavation: 15,000 cubic yards (cy).
- Bulk grading fill (18" base rock on rock pad): 10,000 cy.
- Pond liner / soil veneer fill: 800 cy (using 3/8-inch diameter or smaller rock, obtained on-site or through import).

6.2 Construction Equipment

The detailed list of construction equipment for the ITS project is provided in the Air Quality Impact Analysis. A summary of that is provided in Table 1.

The construction phase of the project will require the following truck trips for delivery of construction material and fuel:

- 203 round trips (RTs) made by an over-the-road diesel tractor-trailer for delivery of construction material
- 12 RTs by a diesel powered fuel truck for diesel fuel delivery
- 2400 RTs by light-duty (gasoline) pickups for personnel and craftsmen ingress/egress

Table 1
ITS Diesel Construction Equipment Use

Equipment Type	ITS Plant	Pond	Total Hours	HP	Hp-hours
Front End Loader (Cat 962)	135		215	221	47515
Excavator (Cat 245)	80	80	160	325	52000
Excavator (Cat 320)			80	138	11040
Rubber-tired Backhoe (Cat 450F)	135	24	159	125	19875
4WD Forklift Cat GP50K	425	40	465	97	45105
Bobcat, JD257 or equal (S250 used)	65		65	75	4875
Boom Crane (Grove AP206)	20		20	66	1320
JLG Man Lift (JLG 260 MRT)	1000		1000	25	25000
Compactor/drum roller (Cat CS 64)	40	48	88	156	13728
Generator (49 HP)	1200	40	1000	49	49000
777 On-site Truck		20	20	870	17400
Articulated Dump Truck (Volvo A40F)		160	160	476	76160
Tracked Dozer (Cat D9)		128	128	410	52480
Welder (diesel)			450	45	20250

6.3 Construction Labor

Construction of the ponds will involve the following labor:

- Ten (10) heavy equipment operators and off-road truck drivers;
- One superintendent;
- One foreman;
- Four laborers for the earthworks and inlet/outlet control portion of the project;
- One geomembrane superintendent;
- One geomembrane quality control technician;
- Two geomembrane welding technicians;
- Six geomembrane laborers; and
- Additional truck drivers for delivery of pipe, geomembrane, and select soil veneer.

6.4 Construction Schedule

ITS construction will begin in January 2014 and is planned to become operational by October 1, 2014, according to the following schedule.

- Design engineering – currently ongoing through Q2 2014

- Completion of onsite pilot testing – August 2013
- Submittal of RPA Application – August 2013
- Technology selection – September 2013
- Execution of technology purchase contract – Q4 2013
- ITS construction commencement – January 2014
- System operational - October 1, 2014

7. Geotechnical Analysis

The inflow pond, treatment tanks and building will be sited in areas that have received geotechnical review to ensure that soil and slope stability conditions meet Good Engineering Practices. Golder Associates completed core drilling, laboratory testing, and slope stability analyses in August 2013 which verify the following minimum slope stability criteria:

- Pond level: *To be added following completion of geotechnical review.*
- Tanks and Building level: *To be added following completion of geotechnical review.*

8. Reclamation

The ITS will be reclaimed within Phase 3 of the existing reclamation phasing, after most disturbed areas have been reclaimed. Reclamation of the Project Area will match the approved reclaimed condition for the "Crusher and Quarry Office Area" in the existing Reclamation Plan, without change in the ultimate reclamation end use. Generally, reclamation of the ITS will entail the following:

- Removal and proper disposal (or re-purposing) of all appurtenant water control structures and piping.
- Removal and proper disposal of all pond liners.
- Re-grading of the pond excavation, with fill as-needed to create smooth final grades according to the existing Reclamation Plan.
- Removal of any temporary stockpiles.
- Application of a vegetation layer consistent with that required by the Reclamation Plan
- Re-vegetation of the restored pond areas consistent with that required by the Reclamation Plan.

Additional details regarding the steps for reclaiming the ITS will be included in revisions to the 2012 Reclamation Plan.

9. Amendments to the 2012 Reclamation Plan

The addition of the ITS to the Quarry facility will require amending the June 26, 2012 Reclamation Plan text to recognize the new facility infrastructure and use. The proposed additions to the text are depicted below in bold text. There are no deletions to the text.

Page 27:

Crusher and Support Area: The Crusher and Support Area is an existing area which contains primary and secondary crushing stations, Quarry offices, **water treatment facilities** and maintenance areas. The Crusher and Support Area is located to east of the North Quarry and to the west of the EMSA. This part of the Quarry currently totals approximately 60 acres and serves as a general support area for ongoing operations. Approximately 7 acres of the Crusher and Support Area will be incorporated into the North Quarry under this Amendment, reducing the final acreage to approximately 53.4 acres.

Page 42:

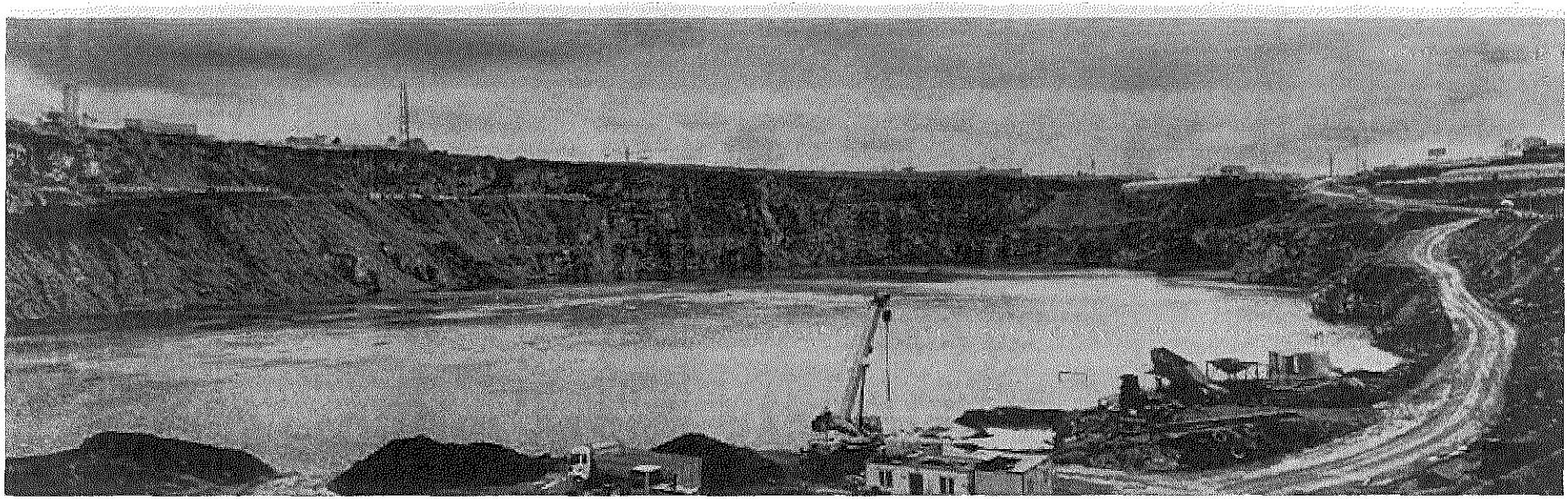
Crusher and Support Area

Reclamation of the Crusher and Support Area will involve the dismantling and demolition of structures as required. The scrap will be sold for salvage value or removed from the site. Facilities located within the Crusher and Support Area include the primary crusher, secondary crushers, **water treatment facilities** and an equipment maintenance facility. A small amount of hazardous materials such as fuels, oils and other vehicle fluids are stored at the equipment maintenance facility. **In addition, the water treatment facilities will generate a small amount of residual material (less than 4,000 lbs. annually) that will be tested for hazardous waste characteristics.** Containers holding these materials will be transported off-site by an approved carrier per State and Local regulations. The Quarry offices are portable and will be removed from the site. The above ground fuel tank located adjacent to the Quarry offices will be emptied, cleaned and tested per State and Local regulations prior to transporting offsite by an approved carrier.

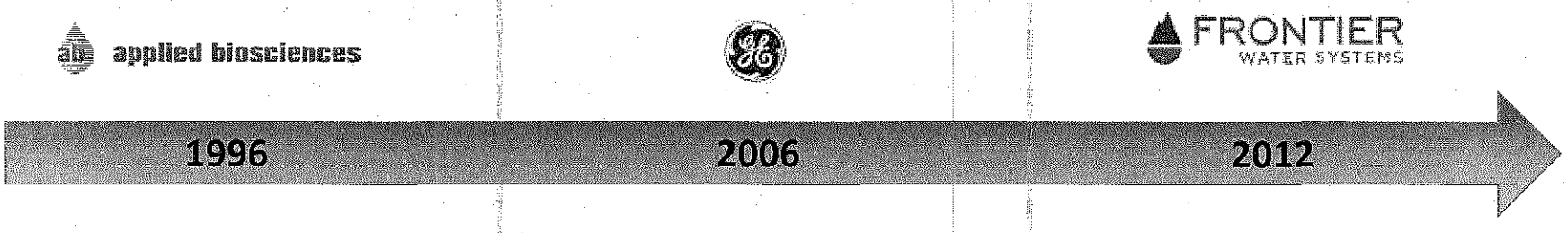
ATTACHMENT 3

State of the Art Biological Selenium Solutions for Mining

FRONTIER
WATER SYSTEMS



Who is Frontier Water Systems?



- Tim Pickett Co-Founds Applied Biosciences Corporation in SLC, UT
- Selenium product line launched
- Multiple ***full scale*** installations and pilot trials

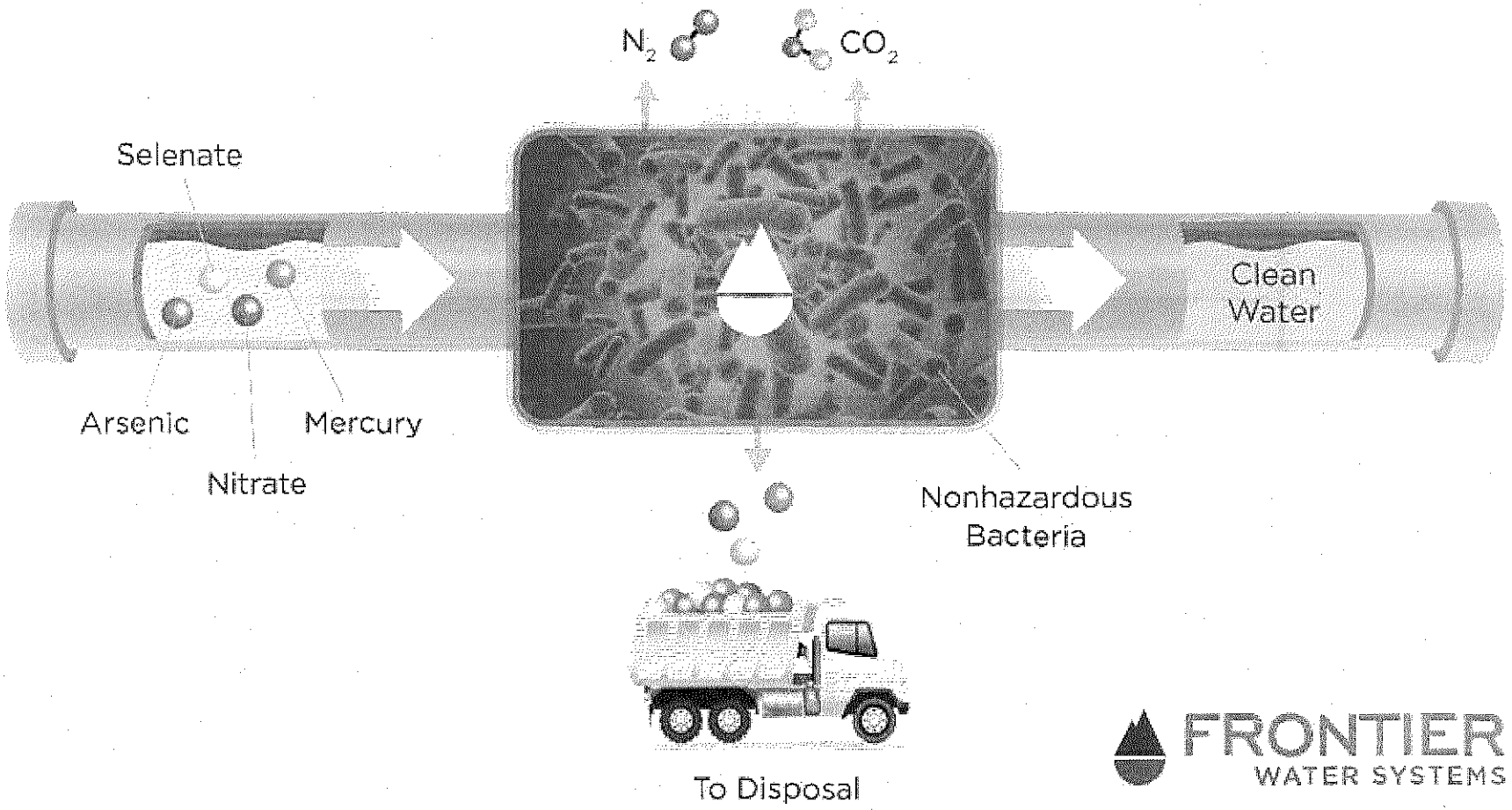
- Applied Biosciences is ***acquired by GE***
- ABMet® recognized as ***best available technology*** *for selenium treatment*

- ***Founders*** Tim Pickett and James Peterson exit GE *May, 2012 to form* ***Frontier Water***
- ***Next generation*** anoxic biofilter system developed for selenium treatment

Biological Selenium Reduction

SeO_4^{2-} + org. C → SeO_3^{2-} + org. C → Se^0 + CO_2 + H_2O

NO_3^- + org. C → NO_2^- + org. C → N_2 + CO_2 + H_2O



FRONTIER WATER SYSTEMS

Biological Selenium Project Experience

Plant	Vendor/Engineer/ Contractor	Year	Design Flow
Wharf Resources, Ross Valley Project South Dakota.	Applied Biosciences/ Wharf Resources	2002	300 gpm
Wharf Resources, Annie Creek Biotreatment System, South Dakota	Applied Biosciences/ Wharf Resources	2002	300 gpm
Wharf Resources, Foley Liner Project, Selenium And Nitrate Biotreatment System	Applied Biosciences/ Wharf Resources	2003	300 gpm
Zortman Landusky Mine Biotreatment System	Applied Biosciences/ Spectrum Eng	2003	300 gpm
Goldcorp, Couchenour Mine Tailings Biotreatment Plant, Ontario, CANADA	Applied Biosciences/ Merit Consulting	2004	250 gpm
Progress Energy, ABMet Bioreactor System, FGD Blowdown, Roxboro, NC	Zenon/Pharmer Eng/ Whorley Parsons	2006	1400 gpm
Duke Energy Belews Creek ABMet Bioreactor System, NC USA	Zenon/Siemens/ Crowder	2008	640 gpm
Progress Energy Mayo Station ABMet Bioreactor System, NC USA	GE/Zachry/	2009	260 gpm
Duke Energy Allen Station ABMet Bioreactor System, NC USA	GE/Siemens/ Crowder	2009	440 gpm
AEP Mountaineer ABMet Bioreactor System, WV USA	GE/HDR/Bowen	2011	600 gpm
Umicore ABMet Bioreactor System Belgium	GE/TBD	In design	800 gpm

Taking Selenium Treatment a Step Forward

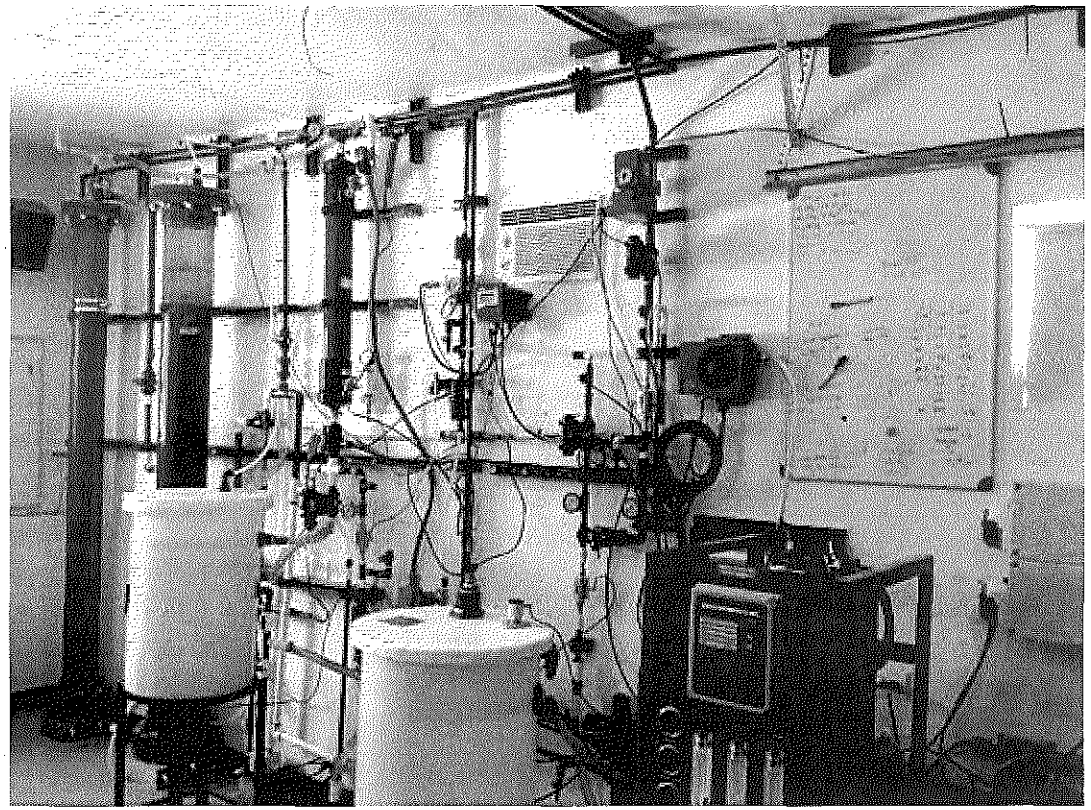
3 Product Objectives:

1. Smallest Footprint and Height

1. Modular Packaged Equipment (Transportable)

2. Complete Effluent Quality From a Single Process Solution:

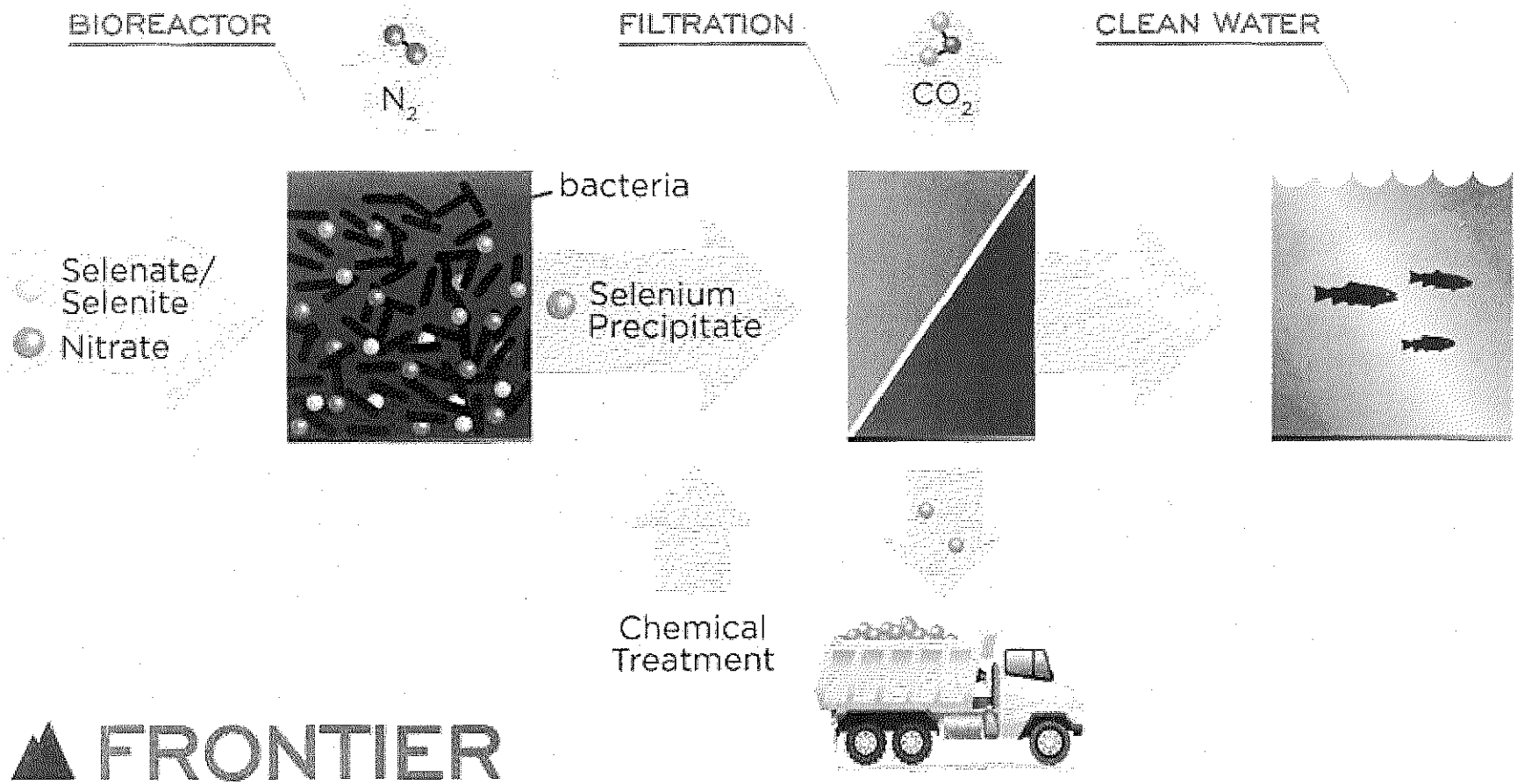
Constituent	Target
Selenium	<5 ug/L
Nitrate	<0.1 mg/L
BOD	< 10 mg/L
TSS	<5 mg/L



Mine Options for Selenium Treatment

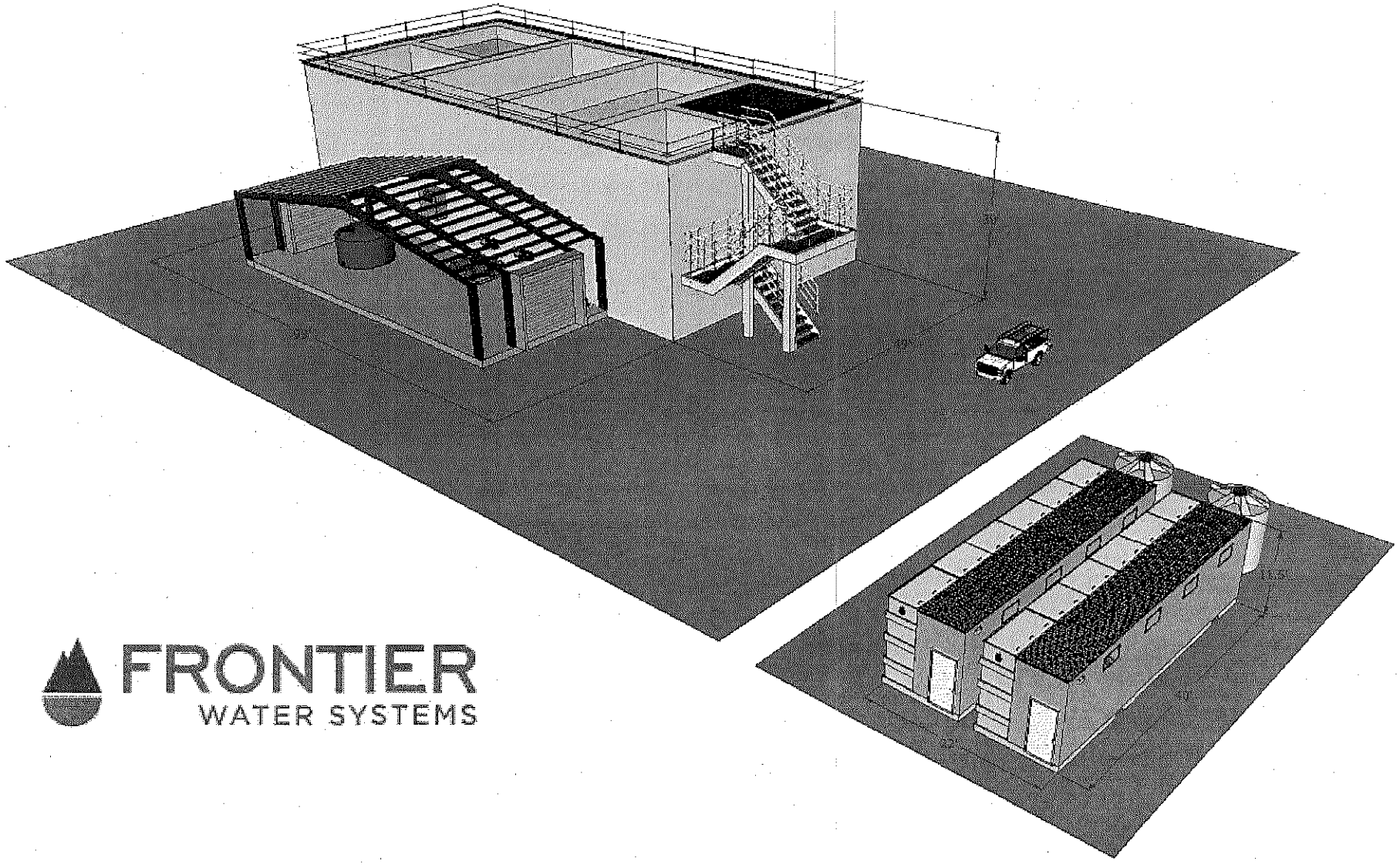
	Total Effluent Selenium (< 5 ug/L)	Footprint	Effluent BOD/TSS	Solids/Residuals	O+M Cost	Installed Cost
Chemical - ZVI	✖	✔	✖	✖	✖	✔
Fixed Bed Bioreactor (ABMet®)	✔	✖	✔	✔	✔	✖
Fluid Bed Bioreactor	✖	✔	✖	✔	✖	✖
Frontier Water Systems	✔	✔	✔	✔	✔	✔

The Frontier Selenium Process



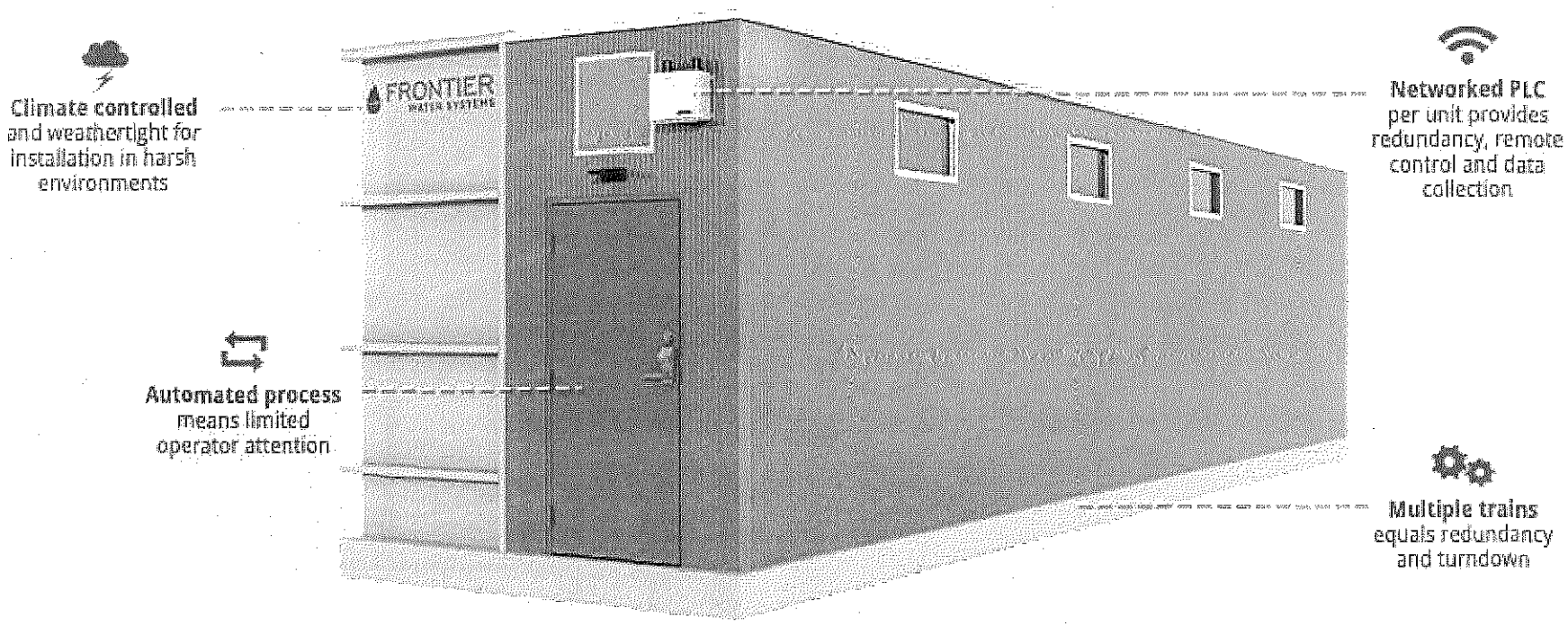
FRONTIER
WATER SYSTEMS

500 gpm Selenium Treatment Comparison

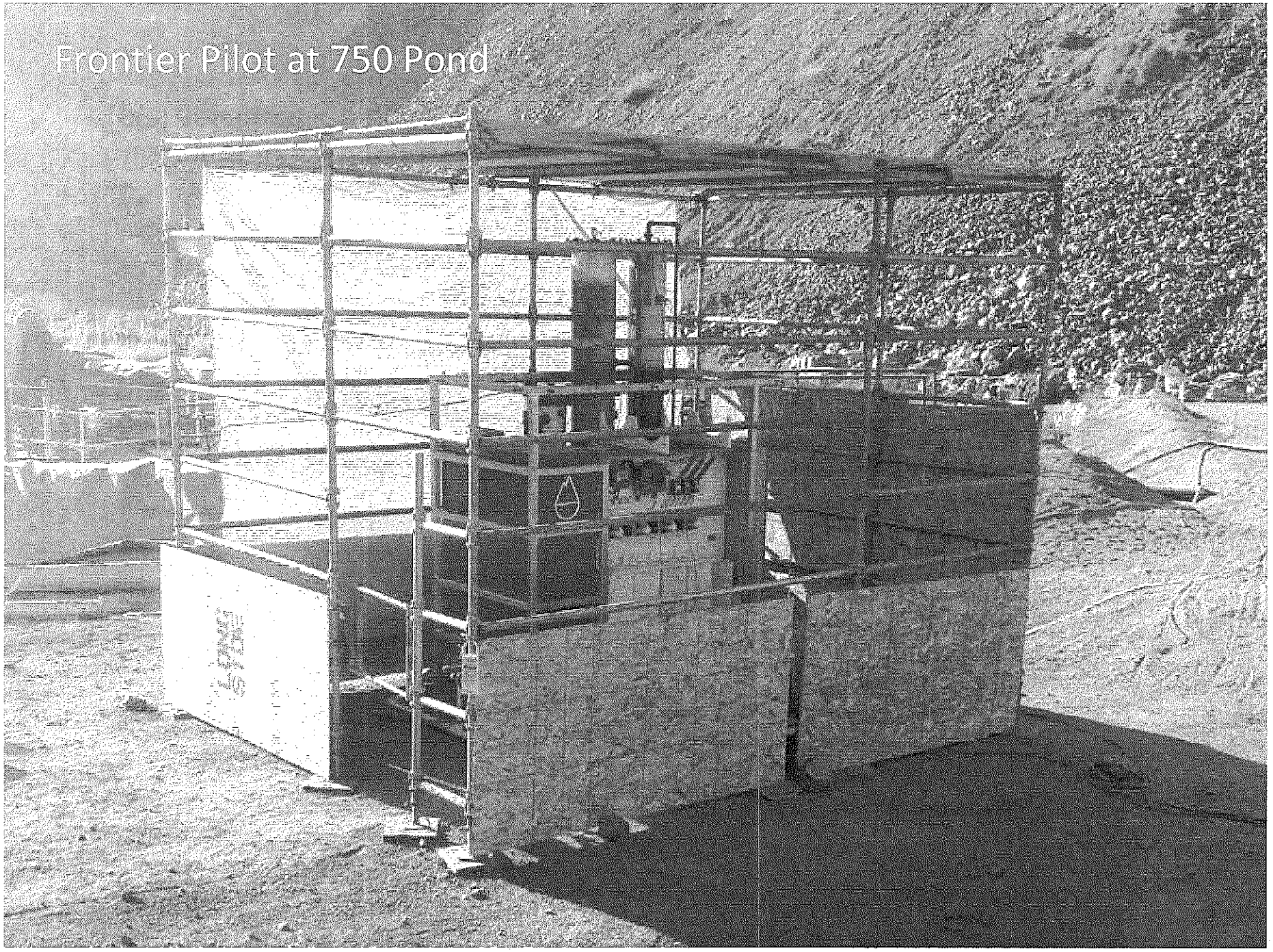


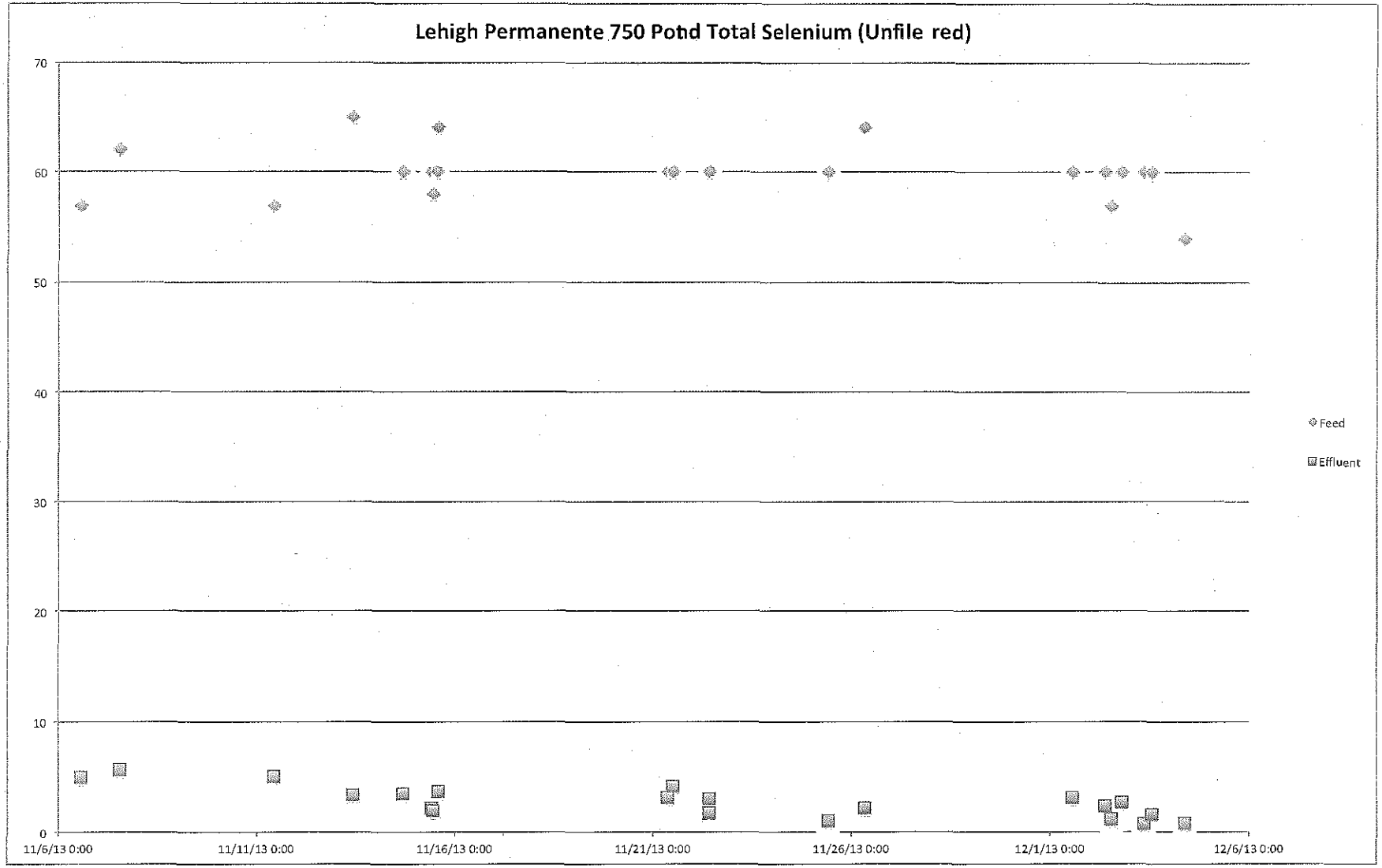
FRONTIER
WATER SYSTEMS

The BX Module - State of the Art Biological Selenium Treatment

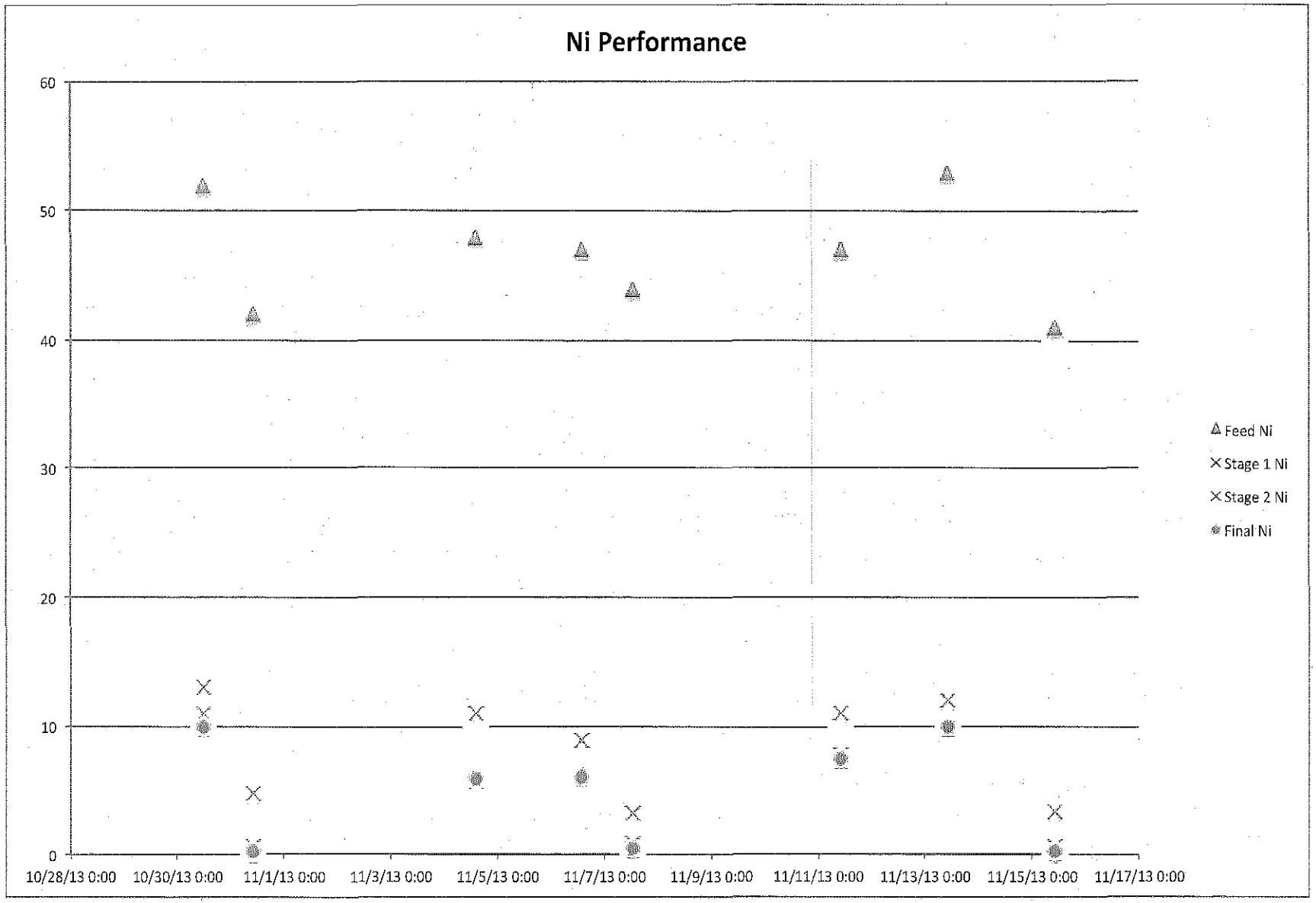


- Shorter Retention Time
- Lower Reactor Height
- Less Nutrient Consumption
- Effluent BOD < 10 mg/L
- Total selenium < 5 ug/L

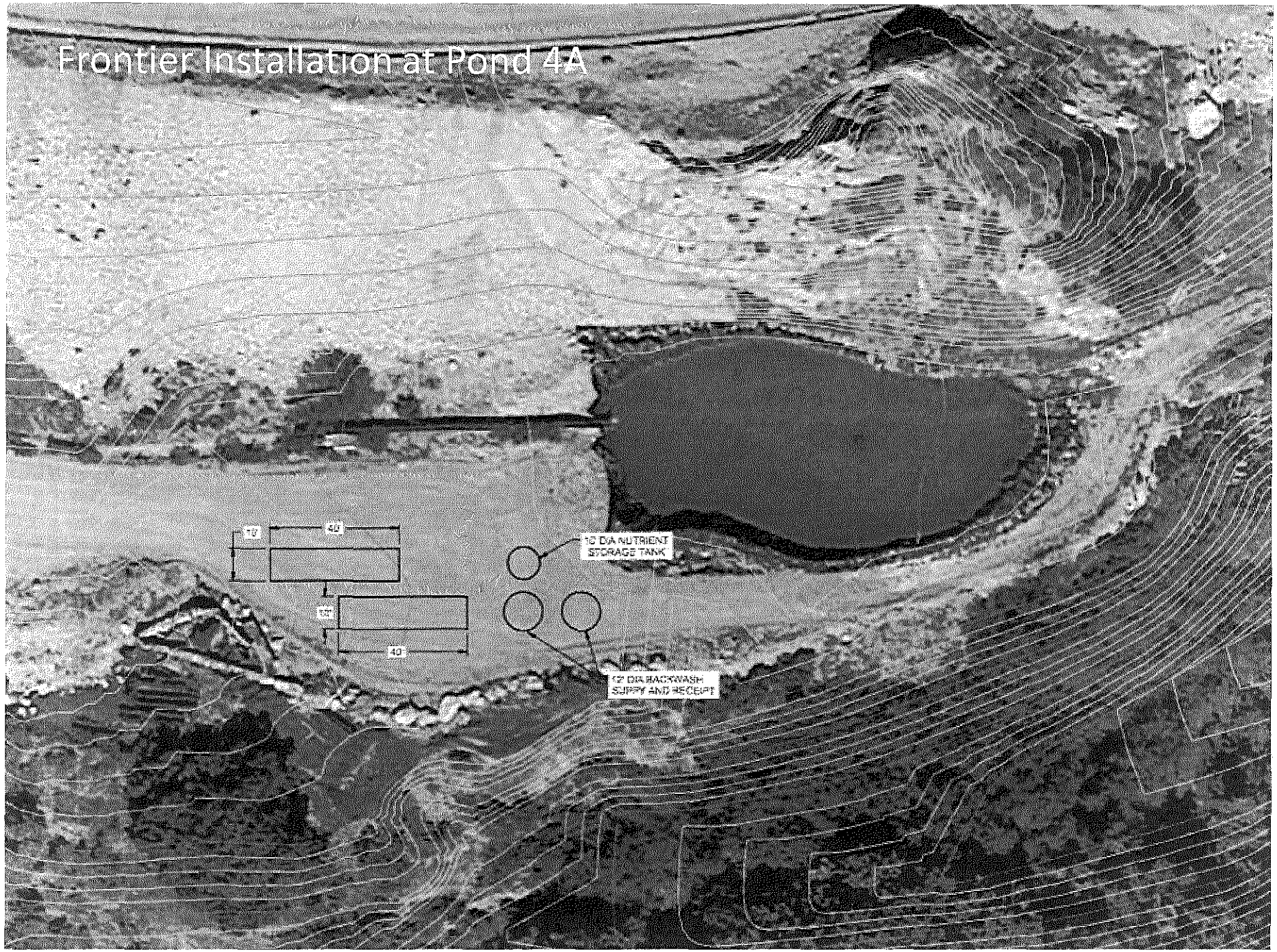

Frontier Pilot at 750 Pond

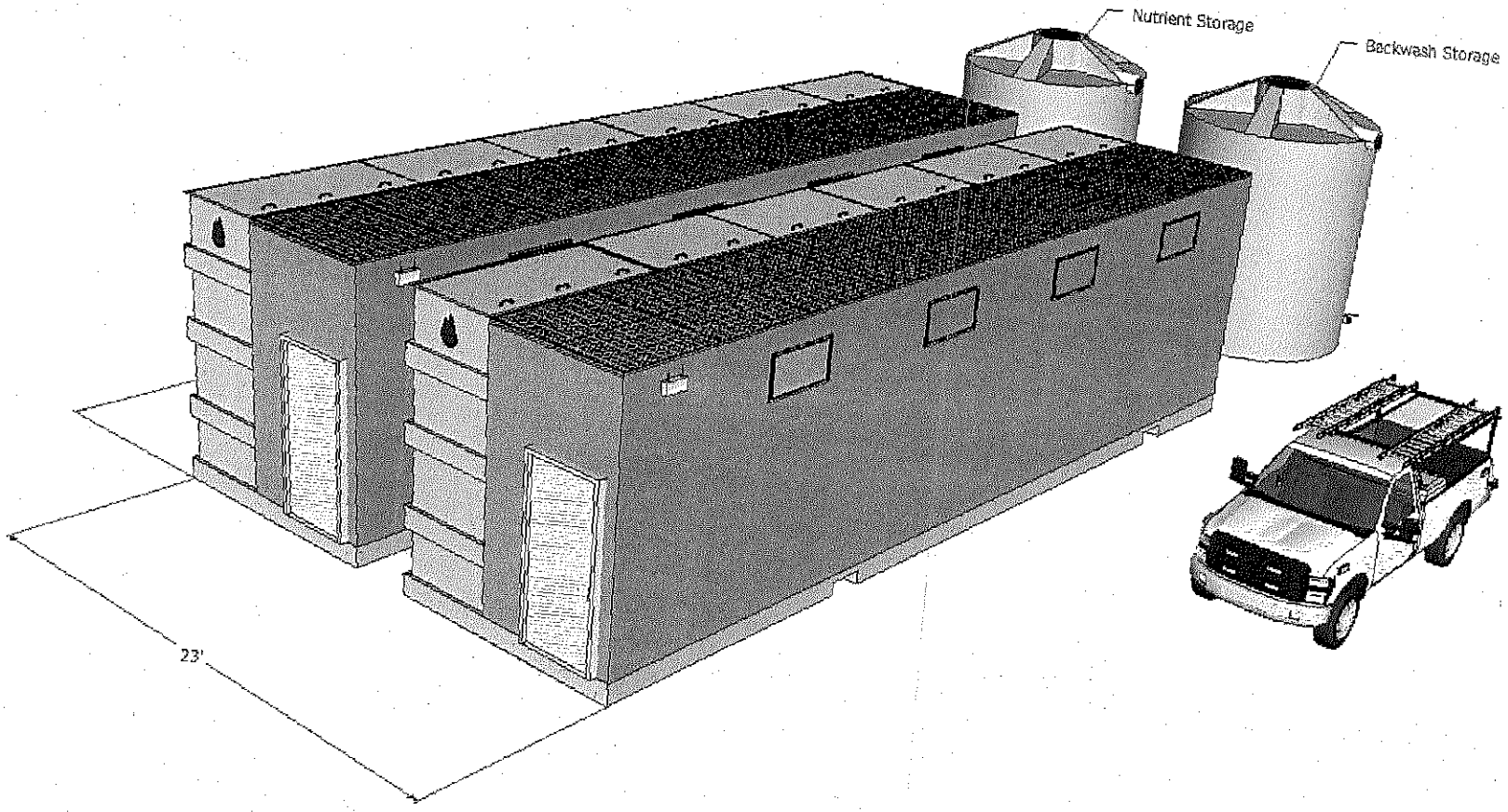


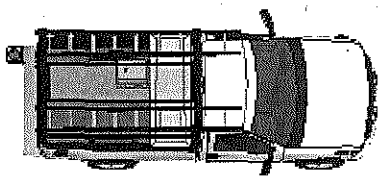
Note: Feed water concentrations were artificially elevated due to low selenium in quarry well water.

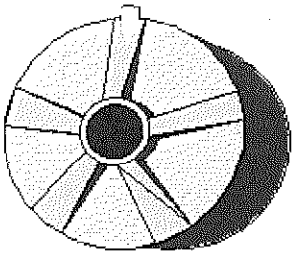

Ni Performance
60
50
40
30
20
10
0
10/28/13 0:00
10/30/13 0:00
11/1/13 0:00
11/3/13 0:00
11/5/13 0:00
11/7/13 0:00
11/9/13 0:00
11/11/13 0:00
11/13/13 0:00
11/15/13 0:00
11/17/13 0:00
Feed Ni
Stage 1 Ni
Stage 2 Ni
Final Ni

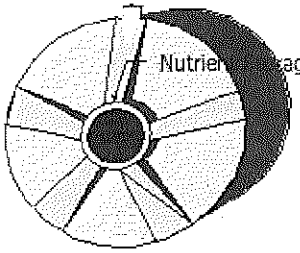
Frontier Installation at Pond 4A




Nutrient Storage
Backwash Storage
23'



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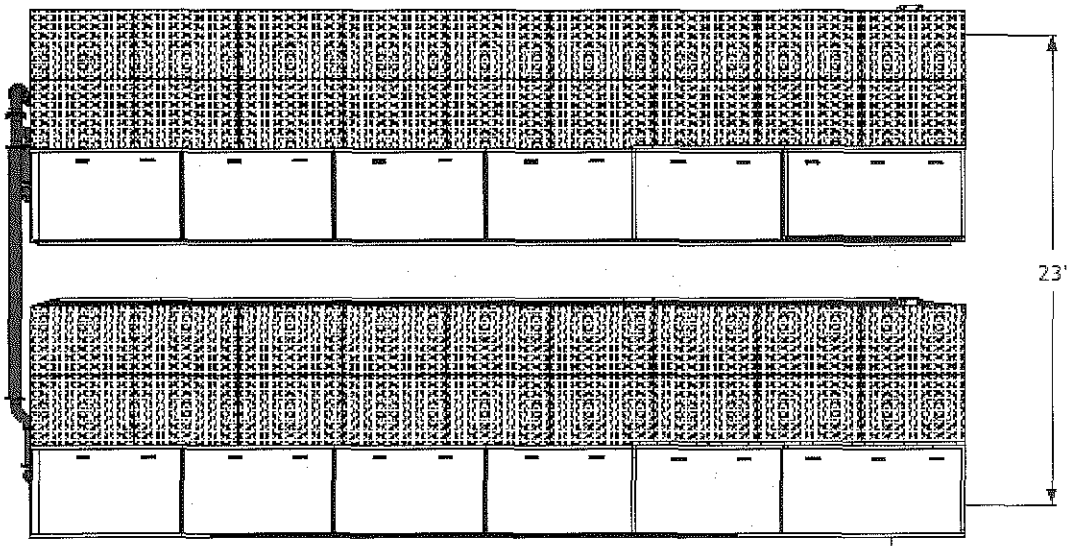
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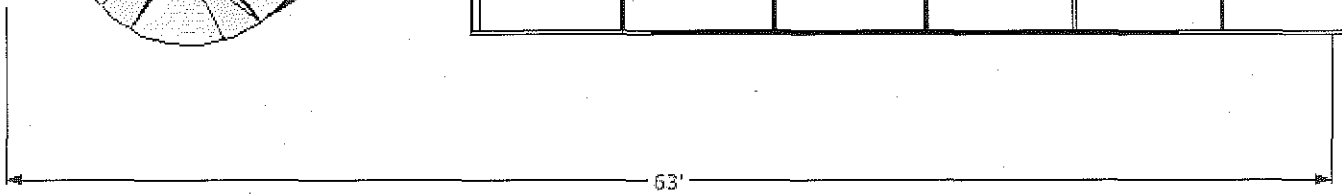
63'

ESA

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Memorandum

date March 27, 2015

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

Rob Eastwood
Department of Planning and Development
County of Santa Clara

from Peter Hudson PG, CEG
Environmental Science Associates

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 (µg/L). The 5 µg/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 81µg/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.