



February 15, 2013

Mr. Vinoo Jain  
Water Resources Control Engineer  
California Regional Water Quality Control Board for the Central Valley Region  
11020 Sun Center Drive, #200  
Rancho Cordova, CA 95670-6114

**Re: Amendment to Report of Waste Discharge (ROWD); Feather River Organics Compost Facility; Waste Discharge Requirements Order R5-2003-0093 (WDR Order); Recology Yuba-Sutter; Yuba County, CA**

Dear Mr. Jain:

This letter and the attached transmittal responds to your letter dated September 26, 2012 and your follow-up email correspondence regarding the submission of an amended Report of Waste Discharge for the Recology Yuba Sutter site in Marysville, which includes the closed Recology Yuba-Sutter Landfill (formerly the YSDI Landfill) and the active Feather River Organics Compost Facility ("Feather River Organics") (formerly the YSDI Composting Facility).

At the outset, Recology would like to emphasize its commitment to regulatory compliance, protection and preservation of the environment, and the sustainable use of resources. Recology is dedicated to the science and practice of resource recovery, which reclaims materials traditionally viewed as waste and transforms them into raw inputs to create new and useful products. Recology strives to make the best and highest use of all resources by increasing the diversion of waste from landfills through environmentally beneficial practices such as composting and recycling. Through its Feather River Organics and other composting facilities, Recology provides a sustainable organics infrastructure that promotes the beneficial use of materials that otherwise would be disposed of as waste.

As you know, the site where the Feather River Organics is located has a long history. The site operated as a landfill for nearly 30 years, from 1967 to 1996. Volatile organic compounds and elevated inorganic water quality parameters have been found in monitoring wells at the site since the monitoring began in 1987. Recology accordingly implemented a corrective action and monitoring program and the site has been subject to Regional Board oversight and regulatory orders for more than two decades, including Waste Discharge Requirements Order No. 89-091 (adopted May 26, 1989), Waste Discharge Requirements Order No. 97-250 (adopted December 5, 1997), and Waste Discharge Requirements Order No. R5-2003-0093 (adopted June 18, 2003). Monitoring, post-closure maintenance and corrective action at the site continue to be governed by the Regional Board's 2003 WDRs.

The LF-1 area of the landfill was closed in 1984 in accordance with the regulations in effect at that time. The LF-2 area of the landfill stopped accepting waste in 1988 and a closure cover was constructed in 1995, pursuant to a closure plan submitted to the Regional Board in January 1993 and an amended report of waste discharge submitted to the Board in August 1993. The LF-3 area stopped accepting waste in 1996 and a closure cover was constructed in 1997, pursuant to an amended report of waste discharge submitted to the Regional Board in May 1997 and a closure report submitted to the Board in November

1997. In addition, a shallow interceptor trench was constructed in 2003 to control the migration of landfill gas at LF-3, pursuant to an amended report of waste discharge submitted to the Regional Board in April 2002 and an engineering and feasibility study submitted to the Board in September 2002. Recology also has installed a landfill gas extraction system at the site and currently is proceeding with extending the system at LF-1, in coordination with both the Yuba County Department of Environmental Health and the Regional Board. As an additional component of its corrective action program, Recology has completed an inspection of the subsurface pipelines and paved surfaces at LF-1 and has submitted a work plan to the Regional Board for completing repairs and improvements.

In April 2011, the Regional Board issued a Notice of Violation to Recology due to the presence of the same constituents of concern that have been detected in groundwater at the site for more than a quarter of a century. As requested by the Board in its April 2011 NOV, Recology's technical consultant prepared a detailed evaluation of the site's monitoring system and corrective action program for LF-1 and LF-2. See Golder Associates Inc., *Monitoring System Evaluation and Corrective Action Effectiveness* (July 29, 2011). This evaluation made the following findings:

- The corrective actions at LF-2 have been effective, the quality of the groundwater downgradient of LF-2 has improved, and there is no need to implement additional correction actions at this portion of the closed landfill.
- Two of the volatile organic compounds (cis-1,2-dichloroethene and vinyl chloride) that have historically been detected in groundwater downgradient of LF-1 will be below the method detection limit within a few years.
- Concentrations of other constituents at LF-1 have been declining overall, but appear to fluctuate and may be influenced by the amount of annual rainfall. The evaluation therefore recommended further study of potential corrective actions.

In a letter dated December 6, 2011, Regional Board staff instructed Recology to prepare an updated engineering feasibility study outlining the additional corrective actions that could be undertaken. Regional Board staff also recognized in the letter that Recology was working with Yuba County on the installation of a new monitoring well at the southwest corner of LF-1.

On March 28, 2012, the Regional Board issued another Notice of Violation to Recology due to the continued detection of the same constituents of concern that have been present in groundwater at the site since 1987. The Board issued the notice even though Recology was in the midst of preparing the updated engineering feasibility study that the Board previously had requested. In June 2012, Recology and its consultant completed the feasibility study, which recommended extending the landfill gas extraction system for the site to the southeastern side of LF-1 and conducting an evaluation and any necessary repairs with respect to the subsurface pipelines and paved surfaces at LF-1. See Golder Associates Inc., *Engineering Feasibility Study and Amended Report of Waste Discharge, South Area Landfill LF-1* (June 29, 2012). As noted above, Recology has proceeded to implement these recommendations, in coordination with both Yuba County and Regional Board staff.

Recology understands that Regional Board staff is focused on addressing the water quality issues at the site. Respectfully, however, we do not believe that the issuance of notices of violation is warranted each time monitoring data shows the continued presence of the same constituents that have long been detected in groundwater at the site. Rather, we believe that the ongoing corrective action process, under Regional Board oversight pursuant to the 2003 WDRs, is the most appropriate forum for addressing the water

quality issues at the site. As part of this ongoing process, we are committed to working cooperatively with Regional Board staff to design and implement effective, practicable and scientifically supported corrective measures.

With this background in mind, the remainder of this letter responds individually to each comment made in your September 26, 2012 letter. Each of these comments is numbered and briefly summarized in italics, followed by Recology's response.

1. Regional Board Staff Comment: *States that the Feather River Organics is an unpermitted composting facility.*

The Feather River Organics composting facility has been permitted by the City of Marysville since 1997. It is currently permitted under the City's Use Permit UP-11-05, which amended the original 1997 permit, UP-07-06. In adopting UP-11-05, the City conducted an environmental review under the California Environmental Quality Act. Feather River Organics also has been permitted by the California Integrated Waste Management Board (now CalRecycle) since 1998 under Solid Waste Facility Permit #58-AA-0015. This permit is overseen by the local enforcement agency, the Yuba County Department of Environmental Health, and Feather River Organics has been constructed and is operated in accordance with the applicable CalRecycle and Yuba County requirements. Feather River Organics also holds a Permit to Operate issued by the Feather River Air Quality Management District (PTO P29003).

In May 2001, Recology submitted an engineering study and amended report of waste discharge to the Regional Board and requested water quality permitting coverage for Feather River Organics under the Board's Resolution No. 96-031, *Conditional Waiver of Waste Discharge Requirements for Composting Operations* ("1996 Waiver"). The Regional Board's 1996 Waiver covered all qualifying compost operations in the Central Valley region and was part of a larger statewide trend, followed by most of the Regional Boards in the 1990s, to adopt waivers of WDRs for specified composting facilities.

In August 2001, after Recology submitted additional technical information requested by the Regional Board, the Board's Executive Director made the following determination in waiving waste discharge requirements for Feather River Organics:

We have determined that the proposed composting project will not adversely affect water quality provided it is operated in accordance with your submittals to this office, Resolution No. 96-031, and General Industrial Storm Water Permit No. 5S58S001223.

Waste discharge requirements for the [Feather River Organics] composting facility are hereby waived. This waiver is granted with the condition that the facility will be operated as described in the amended [Report of Waste Discharge] and in accordance with Resolution No. 96-031 and applicable Yuba County Health Department and Planning Department requirements and conditions.<sup>1</sup>

Thus, the Regional Board reviewed the extensive technical information submitted by Recology with respect to its composting operations on the site and the Board affirmatively authorized those operations to proceed.

As noted in your September 26, 2012 letter, the Regional Board's 1996 Waiver expired in 2003. This was because of Senate Bill 390 (1999), which provided for the automatic expiration of all existing

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<sup>1</sup> Letter from Mr. Gary M. Carlton, Regional Board Executive Officer, to Mr. Paul Sherman, Norcal Waste Systems, Inc., dated Aug. 14, 2001.

waivers of WDRs in the state. As the State Water Resources Control Board has explained, this law left many composting facilities that were previously covered by waivers of WDRs without water quality permit coverage. The State Board has stated: "Many composting facilities have not been issued either WDRs or a waiver of WDRs. The green composting waiver expired so a new Water Board order is needed for those composting facilities that were under that waiver." See SWRCB, *Concepts for a Proposed Statewide Order for Composting Facilities* (Draft Sept. 8, 2011), at pp. 1-2 (available on the State Board's website at [http://www.swrcb.ca.gov/water\\_issues/programs/compost/](http://www.swrcb.ca.gov/water_issues/programs/compost/)). Although the composting waivers expired more than 10 years ago, to date the State Board's process of adopting a new order is still ongoing.

Further, despite the expiration of the Regional Board's 1996 Waiver, the Board has continued to regulate the site where Feather River Organics is located through its Waste Discharge Requirements Order No. R5-2003-0093 (adopted June 18, 2003).

In a letter dated May 17, 2012, you indicated that Regional Board staff, based on its periodic review of individual facility permits, identified a need to update the 2003 WDRs for the site to address the composting operations. The letter therefore requested an amended report of waste discharge, and Recology is committed to working cooperatively with the Regional Board to provide the information requested by Board staff.

2. Regional Board Staff Comment: *States that the 2001 Golder Report is outdated and does not reflect current conditions at the site.*

As requested, Golder Associates conducted an investigation to reevaluate the current subsurface conditions at LF-1. Golder's report, entitled *Subsurface Characterization of the Compost Pad at the Recology Yuba-Sutter Facility* (Feb. 2013), is attached to this letter as Appendix A. Recology has also provided updated information with respect to the compost cover in Appendix B to this letter, which contains copies of past site inspection reports by CalRecycle and Yuba County.

As part of its investigation, Golder evaluated four different areas of LF-1, which are depicted in Figure 1 of its report:

- The area with a vegetated cover where composting operations do not occur (Area 1 - Vegetated LF-1 Cover).
- The composting area with an aggregate base pad, which was the subject of the 2001 Golder study (Area 2 - Original Compost Pad).
- The composting area where an aggregate base pad was installed after 2001 (Area 3 - Compost Extension Pad). The composting pad in this area was constructed to meet the specifications outlined in the 2001 Golder study.
- The compost storage and staging area, which currently is not surfaced with a low-permeability aggregate material (Area 4 - Compost Storage Area).

The new Golder investigation found that the moisture content in the soils underlying the areas where composting operations occur (Areas 2-4) were either similar to - or less than - the moisture content in the

soils underlying the area where no composting operations occur (Area 1).<sup>2</sup> The measured moisture contents are consistent with the modeling results provided in Golder's 2001 report, which predicted that the performance of the compost pad in impeding infiltration would exceed the performance of the vegetated soil cover.

Based on its investigation, Golder recommends the following actions to improve the performance of the LF-1 cover in helping to impede water filtration: (a) adding aggregate base material to Area 2 (Original Compost Pad) to restore the thickness of the pad to a minimum of 0.5 feet in accordance with the technical specifications in Golder's 2001 study; (b) improving Area 4 (Compost Storage Area) by adding a low-permeability aggregate base material to a minimum thickness of 0.5 feet; (c) periodically verifying the aggregate base thickness in Areas 2, 3 and 4, and restoring this aggregate base as necessary; (d) periodically grading the compost pad. Recology is committed to implementing these recommendations in a timely manner.

3. Regional Board Staff Comment: *States that Recology's June 29, 2012 Engineering Feasibility Study does not discuss any corrective actions related to the composting operations at the site.*

As noted above in the response to comment #2, Golder's new compost pad investigation found that the soil moisture content beneath the Feather River Organics composting operations was either similar to - or less than - the soil moisture content beneath the area in LF-1 where no composting operations occur.

It also is important to note that nitrate concentrations in groundwater monitoring wells downgradient of the Feather River Organics composting operations are all low, less than 1 mg/L, which is consistent with background concentrations. Since compost contains abundant nitrogen, the lack of elevated nitrate concentrations downgradient of the composting operations demonstrates that those operations have not negatively affected groundwater quality.

As a result, it does not appear that additional corrective action measures are warranted for operations at the Feather River Organics compost facility beyond the actions Recology has committed to implement. These actions include a number of improvements at LF-1, including repairing paved surfaces and subsurface pipelines, extending the landfill gas extraction system, and improvements to the cover as recommended by Golder in its new compost pad study.

4. Regional Board Staff Comment: *States that the Feather River Organics compost facility is considered a "new" compost unit under the State Water Resources Control Board's draft statewide WDRs for composting operations, and that Feather River Organics will be subject to site-specific WDRs issued by the Regional Board.*

As noted above, the State Board is considering adoption of a statewide General Order for composting operations. Given that the provisions in the statewide Order have not yet been finalized, it is premature at this point to reach a definitive conclusion as to how Feather River Organics would be classified under the Order.

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<sup>2</sup> Specifically, Golder found that (a) the moisture content in the soils underlying Area 2 (Original Compost Pad) and Area 3 (Compost Extension Pad) were either similar to - or less than - the moisture content in the soils underlying Area 1 (Vegetated LF-1 Cover); and (b) the moisture content in the soils underlying Area 4 (Compost Storage Area) were similar to the moisture content in the soils underlying Area 1 (Vegetated LF-1 Cover).

One of the issues the State Board has faced in its efforts to develop a statewide Order is that relatively little data is available indicating negative water quality impacts resulting from composting operations; as a result, the extent to which regulatory measures are necessary, and if so what specific measures and requirements should be adopted, is not yet well defined. As the State Board has explained in its August 2012 CEQA study of the draft statewide Order: "Preliminary water quality information collected indicates that composting of the feedstocks and additives, and/or the incorporation of amendments as specified in this Order, is relatively innocuous, when compared to the composting of such feedstocks as municipal solid waste, animal carcasses, and/or untreated sewage sludge." SWRCB, *Draft Initial Study for General Waste Discharge Requirements for the Discharge of Wastes at Compost Management Units* (Aug. 3, 2012), at p. 23.

It is nevertheless our understanding that the Regional Board may decide to issue site-specific permitting requirements that cover the operations at the Feather River Organics compost facility. Recology is committed to working cooperatively with Regional Board staff on the appropriate permit provisions to be developed as the permitting process moves forward.

5. Regional Board Staff Comment: *Expresses a concern that composting operations above the cover at LF-1 are not consistent with Best Practicable Treatment or Control ("BPTC") measures typically used to maintain the integrity of the landfill closure cover.*

Your letter of September 26, 2012 cites Section 20950(a)(1) of the Title 27 Regulations, which states in relevant part: "If a portion of a Unit was completely closed in accordance with an approved closure plan by November 27, 1984, the cover over the closed portion does not need to be modified to conform to the SWRCB's additional closure requirements in these regulations, unless monitoring data indicate impairment of beneficial uses of ground water." Based on this provision, the letter states that the cover at LF-1 is subject to certain requirements of the Title 27 Regulations and that composting operations at Feather River Organics appear to be inconsistent with those requirements. Specifically, the letter cites Section 20950(a)(2)(A)1 (minimizing the infiltration of water), Section 21090(a)(4) (conducting periodic leak searches), and Section 21090(a)(5) (regulating discharges of liquids to the cover).

First, it is important to note that the quoted language in Section 20950(a)(1) expressly states that beneficial uses must be impaired in order for the cover requirements in the Title 27 Regulations to apply to units closed by November 27, 1984. The quoted language would not appear to be triggered merely because constituents of concern are detected above background levels such that the state's Antidegradation Policy may apply.

But even assuming that the provisions of the Title 27 Regulations apply to the cover of LF-1, there does not appear to be any inconsistency between the composting operations at Feather River Organics and the protection of groundwater. Indeed, as noted above, the evidence in terms of soil moisture content and nitrate concentrations in groundwater indicates that these operations are not adversely affecting groundwater quality.

With respect to Section 21090(a)(4), Golder recently has completed evaluations of the paved surfaces and subsurface pipelines at LF-1 and of the condition of the compost pad. This demonstrates Recology's ability to conduct periodic inspections and repairs. And Recology has committed to a plan to conduct such regular inspections and repairs in the future, including the identified paving and pipeline repairs, periodic re-grading of the compost pad, weekly visual inspections of the compost pad, and periodic verification of the aggregate base thickness of the compost pad and restoration of the base as necessary.

The presence of existing operations and facilities does not prevent Recology from taking appropriate measures to maintain the integrity of the cover.

With respect to Section 21090(a)(5), your letter states that Golder's June 2012 Engineering Feasibility Study concludes that infiltration has exceeded the moisture holding capacity of the landfill causing leachate generation and groundwater contamination. Recology appreciates the Regional Board's concern with protecting groundwater at the site, but we do not read the June 2012 Golder report as making this conclusion. Rather, the report concluded that infiltration into the landfill during wetter years could be the cause of groundwater impacts, and it further concluded the cause of this infiltration could be due to cracked and damaged pavement and subsurface pipelines. It therefore recommended specific corrective actions to address these issues, which Recology is in the process of implementing. Golder's new compost pad study also recommended improvements that Recology will implement to further minimize water infiltration. The evidence does not appear to support a finding that the landfill's moisture holding capacity has been exceeded - and this is especially so given that the various improvements recommended by Golder are still in the process of being implemented.

In short, the presence of existing operations and facilities does not prevent Recology from conducting periodic inspections and making any necessary repairs to the cover at the site. In turn, these inspections and repairs are designed to minimize the infiltration of water. As a result, there appears to be no incompatibility with appropriate BPTC measures.

6. Regional Board Staff Comment: *Expresses a concern that underlying groundwater at certain times of the year is encroaching upon minimum separation between the landfill waste and the underlying groundwater.*

Recology received extensive scientific data on groundwater elevations and Yuba River trends from Golder only recently and we are still in the process of evaluating and verifying this information. Data logging continued until the last week of January and we received the initial report from our consultant earlier this week. We are also still trying to locate the April 1989 addendum that described the engineered alternative referenced in your letter, so that we can fully understand the issues presented. We will update this submission as soon as practicable to respond to this comment.

7. Regional Board Staff Comment: *Requests information regarding current conditions at the site, including a survey of the closure cover's current condition and an assessment of operations above the cover and the effect of the operations on water quality.*

Please see the responses to comments #2 and #3 above, which discuss Golder's new compost pad study, as well as the plan to repair paved surfaces and subsurface pipelines. As noted, the nitrate concentrations in groundwater monitoring wells show that Recology's operations are not adversely affecting groundwater quality.

In addition to Golder's new compost pad study, inspection reports from CalRecycle and Yuba County regarding the closure cover are attached to this letter as Appendix B.

8. Regional Board Staff Comment: *Requests information regarding the status of the Feather River Organics as a "new" compost management unit and how the facility will be managed to meet specified BPTC measures.*

Please see the response to comment #5 above.

9. Regional Board Staff Comment: *Requests information regarding the highest anticipated groundwater level below the closed landfill and the separation distance between this level and the bottommost location of the waste.*

Please see response to comment #6 above.

10. Regional Board Staff Comment: *Requests information on the impacts of elevated water levels in the Yuba River due to peak storm periods and how that affects groundwater elevation, and expresses a concern that the sloped areas at the site may allow hydraulic conductivity into the refuse when the Yuba River rises.*

Please see response to comment #6 above.

11. Regional Board Staff Comment: *Email correspondence subsequent to the September 26, 2012 letter requests analysis of laboratory results of samples taken on November 30 in terms of the requirements governing "designated wastes" and retention of storm water.*

Section 13173(b) of the California Water Code defines "designated waste" as "nonhazardous waste that consists of, or contains, pollutants that, under ambient environmental conditions at a waste management unit, could be released in concentrations exceeding applicable water quality objectives or that could reasonably be expected to affect beneficial uses of the waters of the state as contained in the appropriate state water quality control plan." In turn, the Regional Board's website contains a guidance document that provides a methodology for determining when this definition applies. See CVRWQCB Staff Report, *The Designated Level Methodology for Waste Classification and Cleanup Level Determination* (Updated June 1989) (available at [http://www.waterboards.ca.gov/rwqcb5/plans\\_policies/guidance/](http://www.waterboards.ca.gov/rwqcb5/plans_policies/guidance/)). As this guidance explains, this determination cannot be made based on contaminant concentrations alone.

To illustrate this point, the guidance provides an example of a liquid waste containing 4.5 mg/L of arsenic being discharged to an unlined surface impoundment over groundwater that may be used for domestic supply. The guidance recognizes that this concentration exceeds the applicable drinking water standard for arsenic (which was 0.05 mg/L at the time the guidance was issued) by a large margin. But it goes on to explain that as the liquid waste percolates through the soil, its arsenic concentration will be reduced by various attenuative mechanisms, such as adsorption and precipitation. It therefore explains that the key factual question for purposes of determining whether the liquid should be classified as a "designated waste" is whether these attenuative mechanisms are capable of sufficiently reducing the arsenic concentration before it reaches the groundwater. The guidance makes clear that this factual determination must be made based on both waste-specific and site-specific factors.

The methodology recommended in the guidance involves several steps, including (1) determining the waste concentrations in the liquid; (2) using various "water quality goals" to define the level of water quality that must be maintained in the receiving water; and (3) calculating the appropriate level of attenuation of the waste, which in turn involves evaluating a variety of site-specific factors that may either

increase or decrease the attenuation. The guidance lists one set of factors to evaluate for the protection of groundwater and another set of factors to evaluate for the protection of surface water.

For liquid wastes, the methodology in the guidance is summarized in the following equation:

$$\text{Designated Level} = \text{Water Quality Goal} \times \text{Environmental Attenuation Factor}$$

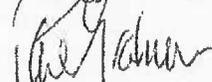
As illustrated by the discussion above, the laboratory results of the samples taken on November 30, 2012 at the Feather River Organics site do not answer the question of whether the "designated waste" classification applies. Rather, the answer to this question depends in large part on calculating the appropriate Environmental Attenuation Factor based on the site-specific conditions at Recology's Yuba-Sutter location.

Recology received the laboratory results from the Regional Board on January 22, 2013 and is still in the process of evaluating the data with respect to the issues presented for both ground and surface waters. We would like to discuss with you a work plan for addressing these issues.

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We appreciate your consideration of this letter and the attached documentation. We also would appreciate the opportunity to meet with you to discuss this submittal. Bryan Clarkson from Recology will contact you to schedule a meeting. If you have any questions or require additional information, please contact me at (530) 743-6321 or Bryan Clarkson at (707) 693-2108.

Sincerely,  
Recology Yuba-Sutter Landfill



Phil Graham  
General Manager

Enclosure

cc: Paul Donoho, Yuba County Environmental Health  
Joe Matz, Recology Yuba Sutter  
Bryan Clarkson, Recology Environmental Solutions



February 15, 2013

Project No. 123-97604

Mr. Bryan Clarkson  
Recology  
235 North First Street  
Dixon, CA 95620

**RE: SUBSURFACE CHARACTERIZATION OF THE COMPOST PAD AT THE RECOLOGY YUBA-SUTTER FACILITY, MARYSVILLE, CALIFORNIA**

Dear Mr. Clarkson:

Golder is pleased to submit this summary report of our subsurface characterization of the Feather River Organics compost area (formerly the Yuba-Sutter Composting Facility) located at the Recology's Yuba-Sutter (RYS) facility in Marysville, California. Golder conducted its work for this report in December 2012 and January 2013.

## **1.0 EXECUTIVE SUMMARY**

Golder observed test pit excavations and completed hand auger soil sampling on December 5, 2012 and January 3, 2013 to evaluate the condition of the compost operation pad surface and underlying soil cover. This work was completed to address a portion of Item No. 1 (pg. 4) in the Regional Water Quality Control Board's (RWQCB's) letter dated September 26, 2012.

The composting operations at Feather River Organics are located on a capped portion (LF-1) of the former YSDI landfill, which was closed in 1984 in accordance with the regulations in effect at that time. Golder previously investigated the compost area in May 2001 and provided recommendations for constructing a compost pad surface that would help to minimize infiltration into the underlying landfill. After 2001, the compost operations have been extended to the west and south of the area that was the subject of Golder's 2001 study. The purpose of this current study was to evaluate the subsurface conditions in the extended areas and to evaluate whether there were changes in the original compost pad subsurface conditions since our May 2001 investigation.

As shown in Figure 1 of this report, Golder evaluated four different areas of LF-1:

- The area with a vegetated cover where composting operations do not occur. This area will be referred to as Area 1 (Vegetated LF-1 Cover).
- The composting area with a low-permeability aggregate base pad that was the subject of Golder's 2001 study. This area will be referred to as Area 2 (Original Compost Pad).
- The area where composting operations were extended to the west after the 2001 Golder study. A low-permeability aggregate base pad previously was installed in this area. The pad was constructed to meet the specifications outlined in Golder's 2001 study. This area will be referred to as Area 3 (Compost Extension Pad).
- The area where composting operations were extended to the south after the 2001 Golder study. This area is used for storage of wood feedstocks and finished compost, for curing of compost, and for staging operations. This area will be referred to as Area 4 (Compost Storage Area).

Based on the results of our field and laboratory investigations, Golder reached the following key conclusions:



- The aggregate base surfacing in the original compost pad area (Area 2) was observed to be less than the minimum 0.5 foot thickness that was recommended in Golder's 2001 study. The aggregate base surfacing in the newer compost area to the west (Area 3) was 0.5 feet thick or greater. The measured fines content for the aggregate base in both areas (Areas 2 and 3) is greater than the minimum of 15 percent that Golder recommended in its 2001 study.
- Compaction of the aggregate base in both areas (Areas 2 and 3) meets the minimum specified recommendation of 90 percent relative compaction (ASTM D 1557) stated in Golder's 2001 report. Aggregate base with a minimum of 15 percent fines and compacted to at least 90 percent relative compaction is expected to exhibit low permeabilities based on the results of Golder's May 2001 investigation.
- The moisture content in the soils underlying these areas (Areas 2 and 3) were either similar to or less than the moisture content in the soils underlying Area 1 (Vegetated LF-1 Cover).
- Unlike Areas 2 and 3, the compost storage and staging area (Area 4) is not surfaced with a low-permeability aggregate material. However, Golder found that the moisture content in the soils underlying Area 4 are similar to the moisture content in the soils underlying Area 1 (Vegetated LF-1 Cover), where no composting operations occur.
- These findings show that the moisture content in soils underlying the areas of LF-1 where composting operations occur (Areas 2-4) are similar to or less than the moisture content in the vegetated area of LF-1 where composting operations do not occur (Area 1). These measured moisture contents are consistent with the modeling results provided in Golder's May 2001 Report which predicted that the infiltration performance of the compost pad would exceed that of the vegetated soil cover.
- Given the heavy precipitation that preceded our field investigation (approximately 10 inches of rainfall during the two months prior to the field investigation and testing), the measured moisture contents tend to indicate that the low-permeability aggregate base is effective in helping to minimize water infiltration.

Based on its investigation, Golder recommends the following measures to improve the cover under the composting operations at LF-1:

- Add aggregate base material to the original compost pad area (Area 2) to increase the thickness to a minimum of 0.5 feet. The aggregate base should contain a minimum of 15 percent fines and be compacted to at least 90 percent relative compaction per ASTM D 1557.
- Improve the cover under Area 4 (Compost Storage Area) by installing a low-permeability aggregate base material (minimum of 0.5 feet thick). The aggregate base should contain a minimum of 15 percent fines and be compacted to at least 90 percent relative compaction per ASTM D 1557.
- The aggregate base thickness in Areas 2-4 should be verified periodically and should be restored to a minimum of 0.5 feet as necessary. We recommend conducting this verification every 3 years if the aggregate base or subbase is imported and every 5 years if recycled concrete is used (2-inch minus crushed concrete aggregate with a minimum of 15 percent fines and a minimum of 10 percent between 1 and 2 inches in diameter).
- The pad underlying Areas 2-4 should be re-graded periodically to provide positive drainage.



## 2.0 PROJECT DESCRIPTION

Recology operates the Feather River Organics compost facility over the LF-1 portion of the capped YSDI landfill, which was closed in 1984 in accordance with the regulations at the time. In May 2001, Golder submitted a report that summarized the subsurface conditions beneath the compost area. At that time, the active compost operations were located at the eastern end of LF-1<sup>1</sup>. As explained above, this area is depicted on Figure 1 of this report as Area 2 (Original Compost Pad). Based on the results of the field and laboratory testing and engineering analyses that Golder performed for its May 2001 report, Golder provided material and compaction recommendations for the aggregate base surfacing for purposes of impeding water infiltration into the underlying landfill unit. Following our 2001 report, Recology extended the compost operations to the west and south.

This report responds to the RWQCB's request for an updated investigation of the LF-1 cover. This report specifically addresses the condition of the compost operation pad surface and underlying soil cover.

## 3.0 SUMMARY OF 2001 FIELD AND LABORATORY INVESTIGATION

In 2001, Golder completed a series of test pit excavations to characterize the conditions of the compost pad surface and the underlying soil cover. In addition, Golder conducted Sealed, Single-Ring Infiltrometer tests (SSRI) to measure the in-situ permeability of the upper aggregate base material. The results of this investigation are summarized below.

- The initial compost pad was constructed with an imported ¾-inch minus aggregate base or subbase with a fines content (i.e. less than the U.S. No. 200 sieve) measured at 19 percent in one sample. Corresponding in-situ permeability of this aggregate base was measured at approximately  $3 \times 10^{-7}$  to  $6 \times 10^{-7}$  cm/s.
- At the time of our 2001 investigations, Recology was in the process of extending the compost pad westward using recycled concrete. The measured fines content in one sample of the pad in this area was only 1 percent.
- The measured relative compaction of the aggregate base ranged from 89-95 percent (ASTM D 1557) with a measured moisture content ranging from 9 to 12 percent.
- The upper cover soils of LF-1 consisted of a silty clay with a measured plastic index (PI) of 12 in one sample underlain by a silty sand.

Based on Golder's field observations and subsequent calculations and modeling, Golder recommended surfacing the compost pad with a minimum of 6-inches of silty/clayey aggregate material to provide a firm working surface. Golder further recommended that the aggregate material contain at least 15 percent fines and be compacted to a minimum 90 percent relative compaction at a moisture content 1 to 4 percent above the optimum water content (ASTM D 1557).

## 4.0 CURRENT FIELD AND LABORATORY INVESTIGATION

### 4.1 Investigation Objectives

Subsequent to Golder's investigations in 2001, Recology extended the composting operation to include the following:

- The compost pad was extended westward. As noted above, this extension area is depicted in Figure 1 of this report as Area 3 (Compost Extension Pad). Recology used recycled concrete admixed with clay imported from Recology's Ostrom Road Facility to

<sup>1</sup> Golder Associates Inc., May 18, 2001, Letter Report to Norcal Waste Systems entitled "Results of Field and Engineering Study, Proposed YSDI Compost Area, Marysville, California"

create an aggregate base that met Golder's 2001 recommendations (at least 15 percent fines content and 90% compaction).

- A compost storage and staging area was extended southward. As noted above, this extension area is depicted in Figure 1 of this report as Area 4 (Compost Storage Area). This area was reported surfaced with the recycled concrete aggregate underlain by a geotextile fabric.

The primary objective of Golder's recent field and laboratory investigation was to characterize current subsurface conditions to evaluate the following:

- Evaluate the original compost pad area (Area 2) to see if the subsurface conditions had changed over time and whether this area still meets Golder's 2001 recommendations.
- Evaluate the areas where composting operations were extended subsequent to 2001 (Areas 3 and 4) to see if the surfacing meets Golder's 2001 recommendations.
- Obtain moisture contents of the subsurface materials to determine whether there are any differences in the moisture contents of the soils underneath the composting areas (Areas 2-4) pad in comparison to the area of LF-1 that has a vegetative soil cover and where no composting operations occur (Area 1).

## 4.2 Field Investigations

Golder completed field investigations on December 19, 2012 and January 3, 2013. These investigations were completed during and following significant precipitation that occurred in late November and throughout December of 2012.

Golder observed the excavation of 13 shallow test pits using a mini-excavator to depths typically ranging from approximately 1.5 to 3 feet. The test pits were completed on December 19, 2012 in the following areas:

- Test Pits 1, 2, and 3 were completed within the original compost pad area (Area 2), which Golder investigated in 2001.
- Test Pits 4, 5, and 6 were completed in the extended compost pad to the west (Area 3).
- Test Pits 7, 8, 9, 12, and 13 were completed in the compost storage and staging area (Area 4)
- Test Pits 10 and 11 were completed in a vegetated area where no composting operations occur (Area 1).

In addition to the test pits, Golder completed supplemental hand auger explorations on January 3, 2013 at 10 locations adjacent to the previously excavated test pits (Figure 1) to collect samples for moisture content measurements. The hand augers were completed by advancing a 3-inch diameter auger. Summary test pit logs are included in Appendix A. Figure 2 provides selected photographs of the field excavation program.

Golder also measured the in-situ density of the aggregate base at two locations (Figure 1). The results of these field measurements are summarized as follows:

- Test 1 (near Test Pit 5) measured a dry density of 120.3 pcf
- Test 2 (near Test Pit 1) measured a dry density of 117.9 pcf

## 4.3 Laboratory Testing

Laboratory testing consisted of the following:

- Modified Proctor moisture-density relationship (ASTM D 1557) of two samples of the aggregate base
- Grain-size distribution (ASTM D422) of two samples of the aggregate base and three samples of the underlying soil cover
- One Atterberg Limits (ASTM D 4318) on a sample of the underlying soil cover.
- Moisture content (ASTM D 2216) on 39 samples of the aggregate base and underlying soil samples.

Table 1 summarizes the results of the Proctor, grain-size distribution, and Atterberg Limits tests.

**Table 1**  
**Summary of Proctor, Gradation, and Atterberg Limits Tests**

Sample ID	Soil Type	Optimum Dry Density/Moisture Content	Percent Passing No. 200 Sieve	Plasticity Index
TP-1A	Aggregate Base	120.7 pcf/12.4%	18.9%	-
TP-5A	Aggregate Base	131.1 pcf/9.5%	25.9%	-
TP2A-2	Clay Cover Soil	-	76.3%	15
TP9A-3	Sand Cover Soil	-	58.9%	-
TP-13-2	Sand Cover Soil	-	65.7%	-

Table 2 summarizes the moisture content measurements.

**Table 2**  
**Summary of Moisture Content Measurements**

Hand Auger ID	Depth (Ft)	Soil Type	Moisture Content (%)	Hand Auger ID	Depth (Ft)	Soil Type	Moisture Content (%)
1A	1.0	Clay	16.5	10A	0.6	Clay	32.5
1A	1.3	Sand	10.6	10A	1.4	Clay	17.6
1A	2.25	Sand	15.5	10A	1.75	Sand	14.6
2A	0.75	Clay	13.0	11A	0.5	Clay	21.8
2A	1.4	Sandy Silt	18.2	11A	1.0	Clay	27.2
2A	1.8	Sandy Silt	16.7	11A	1.5	Clay	19.3
4A	0.8	Clay	28.6	12A	0.5	AB	6.8
4A	1.1	Sandy Silt	27.8	12A	1.4	Clay	30.1
4A	1.3	Sand	5.5	12A	1.9	Clay	28.5
4A	2.0	Sand	4.4	12A	2.2	Clay	24.6
4A	2.1	Clay	26.7	12A	2.5	Clay	17.7
5A	1.3	Sand	8.4	13A	0.4	AB	23
5A	2.0	Sand	9.2	13A	1.6	Clay	19.6
5A	2.8	Sand	16.8	13A	1.8	Sand	14.3

7A	0.4	AB	12.8
7A	1.9	Sand	9.3
7A	1.5	Sand	14.4
7A	2.1	Sandy Silt	22.3
9A	0.4	AB	5.8
9A	1.2	Clay	26.6
9A	1.6	Clay	20.0
9A	2.2	Sand	14.7
9A	2.6	Sand	13.8

13A	2.5	Sand	19.8
13A	2.7	Sand	13.4

#### 4.4 Summary of Findings

Figure 3 illustrates the various cover system profiles observed during the field investigations. Key findings of our study are summarized below.

- Landfill 1 (LF-1) was closed with a soil cover that appears to be at least 2 to 3 feet thick. The upper soils commonly consist of a silty clay to clayey silt that is 0.5 to 1.5 feet thick underlain by sandy silt to silty sand. However, this upper clay layer was not observed in Test Pits 5 and 7.
- The aggregate base surfacing in the original compost pad area (Area 2) was observed to be less than the recommended 0.5 foot thickness with observed thicknesses ranging from 1-inch to 6 inches. A total of 4 out of the 5 test pit and hand auger explorations were observed to have thicknesses less than 0.5 feet. This is likely due to slow wearing and removal of the aggregate base surface over time as the compost windrows are turned and moved.
- The aggregate base surfacing in the compost extension area to the west (Area 3) was 0.5 feet thick or greater. This may be due in part to the younger age of the compost pad. However, it may also be partially related to the larger concrete particles that may provide more resistance to wear and removal by equipment.
- The fines content of the aggregate base in the original compost pad and the newer pad to the west (Areas 2 and 3) was greater than 15 percent. The fines content of the aggregate in the compost storage and staging area (Area 4) was not tested, but is assumed to be less than 15 percent since this material was not amended with clay.
- The measured compaction of the aggregate base was 98 and 92 percent.
- Measured moisture contents in the underlying cover soils in the vegetated area of LF-1 where no composting occurs (Area 1) range from 17 to 32 percent in the upper clay cover. One measured moisture content in the underlying sand layer was approximately 15 percent. The moisture contents in the underlying clay of the compost storage and staging area (Area 4) are similar to the values for Area 1.
- Moisture contents for three samples of the underlying clay beneath the original and extended compost pad (Areas 2 and 3) were 12, 17, and 28 percent in the clay. The measured moisture content in the underlying sand was typically 5 to 17 percent with one sample at 28 percent. These are generally lower than those measured for Area 1 (Vegetated LF-1 Cover) and Area 4 (Compost Storage Area).

Figure 4 illustrates the comparison of the above moisture content results.

Our field explorations occurred following periods of heavy precipitation. Approximately 9.7 inches of rain occurred in the Marysville area between November 1, 2012 and January 3, 2013. Table 3 summarizes the monthly precipitation totals for last three months 2012 in comparison to average monthly totals.

**Table 3**  
**2012 Monthly Precipitation vs Average Monthly**  
**Precipitation for October Through December**

Month	2012 Actual Monthly Precipitation Total (In.)	Average Monthly Precipitation Total (In.)
Oct	2.8	1.2
Nov	4.8 <sup>1</sup>	2.4
Dec	4.9 <sup>1</sup>	3.8

Notes:

1. November plus December 2012 = 9.7 in.

## 5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our field and laboratory investigations, Golder reached the following key conclusions:

- The aggregate base surfacing in the original compost pad area (Area 2) was observed to be less than the minimum 0.5 foot thickness that was recommended in Golder's 2001 study. The aggregate base surfacing in the newer compost area to the west (Area 3) was 0.5 feet thick or greater. The measured fines content for the aggregate base in both areas (Areas 2 and 3) is greater than the minimum of 15 percent that Golder recommended in its 2001 study.
- Compaction of the aggregate base in both areas (Areas 2 and 3) meets the minimum specified recommendation of 90 percent relative compaction (ASTM D 1557) stated in Golder's 2001 report. Aggregate base with a minimum of 15 percent fines and compacted to at least 90 percent relative compaction is expected to exhibit low permeabilities based on the results of Golder's May 2001 investigation.
- The moisture content in the soils underlying these areas (Areas 2 and 3) were either similar to or less than the moisture content in the soils underlying Area 1 (Vegetated LF-1 Cover).
- Unlike Areas 2 and 3, the compost storage and staging area (Area 4) is not surfaced with a low-permeability aggregate material. However, Golder found that the moisture content in the soils underlying Area 4 are similar to the moisture content in the soils underlying Area 1 (Vegetated LF-1 Cover), where no composting operations occur.
- These findings show that the moisture content in soils underlying the areas of LF-1 where composting operations occur (Areas 2-4) are similar to or less than the moisture content in the vegetated area of LF-1 where composting operations do not occur (Area 1). These measured moisture contents are consistent with the modeling results provided in Golder's May 2001 Report which predicted that the infiltration performance of the compost pad would exceed that of the vegetated soil cover.
- Given the heavy precipitation that preceded our field investigation (approximately 10 inches of rainfall during the two months prior to the field investigation and testing), the measured moisture contents tend to indicate that the low-permeability aggregate base is effective in helping to minimize water infiltration.

Based on its investigation, Golder recommends the following measures to improve the cover under the composting operations at LF-1:

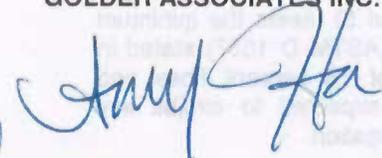
- Add aggregate base material to the original compost pad area (Area 2) to increase the thickness to a minimum of 0.5 feet. The aggregate base should contain a minimum of 15 percent fines and be compacted to at least 90 percent relative compaction per ASTM D 1557.
- Improve the cover under Area 4 (Compost Storage Area) by installing a low-permeability aggregate base material (minimum of 0.5 feet thick). The aggregate base should contain a minimum of 15 percent fines and be compacted to at least 90 percent relative compaction per ASTM D 1557.
- The aggregate base thickness in Areas 2-4 should be verified periodically and should be restored to a minimum of 0.5 feet as necessary. We recommend conducting this verification every 3 years if the aggregate base or subbase is imported and every 5 years if recycled concrete is used (2-inch minus crushed concrete aggregate with a minimum of 15 percent fines and a minimum of 10 percent between 1 and 2 inches in diameter).
- The pad underlying Areas 2-4 should be re-graded periodically to provide positive drainage.

## 6.0 CLOSURE

Golder is available to answer any questions that you or the RWQCB may have regarding the findings of this report.

Sincerely,

**GOLDER ASSOCIATES INC.**

*for*   
Joel T. Kelsey  
Staff Engineer

  
Kenneth G. Haskell, P.E.  
Principal/Practice Leader



KGH/kgh

Attachments: Figures 1 through 4  
Appendix A – Summary Test Pit Logs





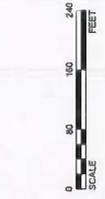


PROJECT: RECOLOGY YUBA-SUTTER FACILITY  
MARYSVILLE, CALIFORNIA

TITLE: COMPOST OPERATIONS AREA AND TEST PIT LOCATIONS

DESIGN	JJR	12/27/12	FILE NO.	12207024-VES2 TP CV
CADD	JJR	01/28/13	SCALE	AS SHOWN
CHECK	JTK	01/28/13		
REVIEW	GSB	01/28/13		

**FIGURE 1**



- LEGEND**
- VEGETATED LF-1 COVER (AREA 1)
  - ORIGINAL COMPOST PAD (AREA 2)
  - COMPOST PAD EXTENSION PAD (AREA 3)
  - COMPOST STORAGE AREA (AREA 4)

- TEST PIT LOCATION WITH ID
- HAND AUGER LOCATION WITH ID

1  
2A

**NOTES**  
1. TOPOGRAPHIC INFORMATION PROVIDED BY AERIAL DATA INC. DATE OF TOPOGRAPHY: APRIL 30, 2012.

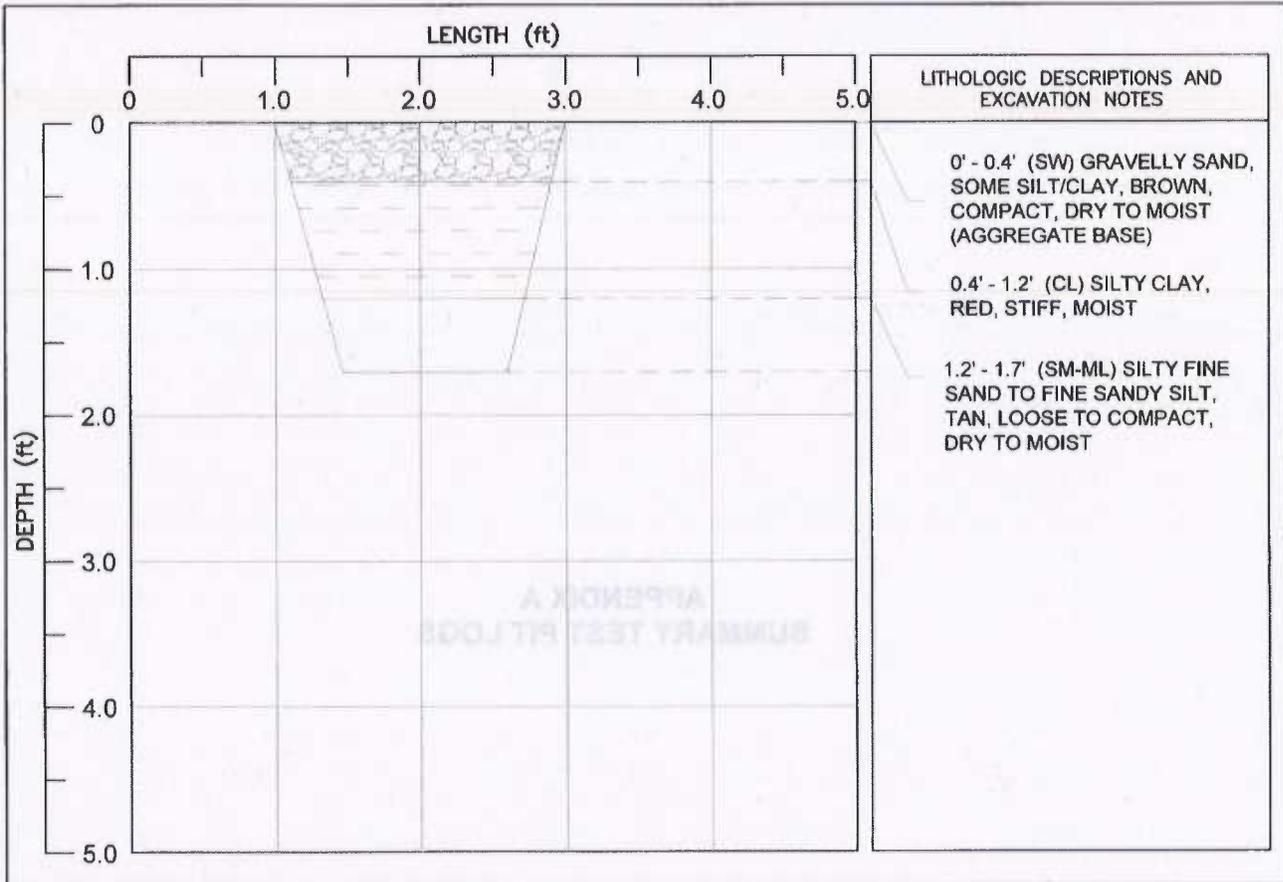




# TEST PIT LOG

No. TP-1

TEMP 40 °F WEATHER SUNNY, CLEAR ENGINEER J. KELSEY OPERATOR -  
 EQUIPMENT YANMAR MINI-EX CONTRACTOR YSDI DATE 12-19-12  
 COORDINATES N - E - ELEV. AT GRADE DATUM - JOB 123-97604  
 LOCATION YSDI TIME -



**SPECIAL NOTES**

DEPTH (in)	IN-PLACE DRY DENSITY (lb/ft³)	MOISTURE CONTENT (%)
-	-	-
<b>SAMPLES</b>		
<b>TYPE</b>		<b>DEPTH (ft)</b>
<b>LEGEND</b>		CHECK: <u>JTK</u> REVIEW: <u>[Signature]</u>

THIS DRAWING HAS BEEN PREPARED BY GOLDBER ASSOCIATES INC. FOR USE BY THE CLIENT NAMED IN THE TITLE BLOCK SOLELY IN RESPECT OF THE CONSTRUCTION OPERATION AND MAINTENANCE OF THE FACILITY NAMED IN THE TITLE BLOCK. GOLDBER ASSOCIATES INC. SHALL NOT BE LIABLE FOR THE USE OF THIS DRAWING ON ANY OTHER FACILITY OR FOR ANY OTHER PURPOSES.

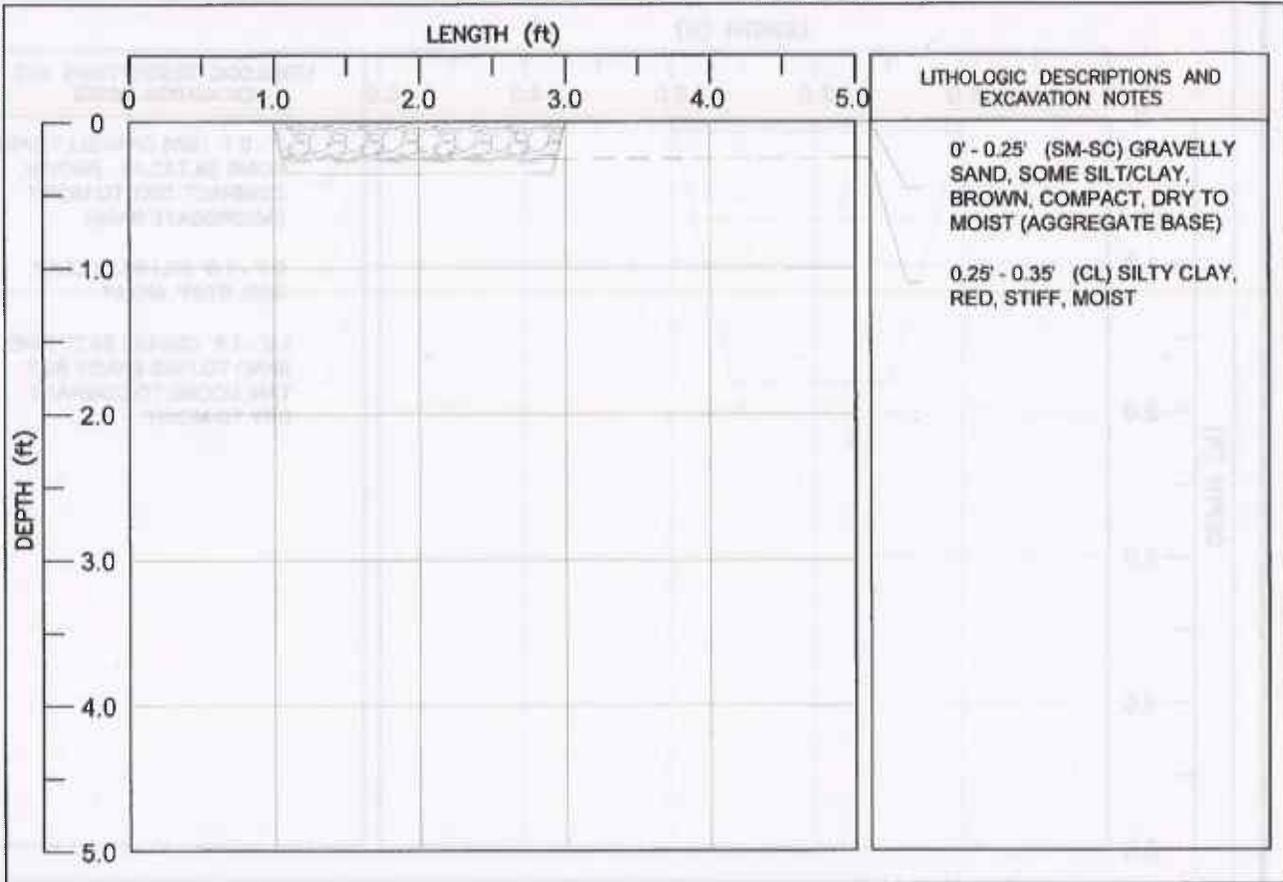




# TEST PIT LOG

No. TP-3

TEMP 40 °F WEATHER SUNNY, CLEAR ENGINEER J. KELSEY OPERATOR -  
 EQUIPMENT YANMAR MINI-EX CONTRACTOR YSDI DATE 12-19-12  
 COORDINATES N - E - ELEV. AT GRADE DATUM - JOB 123-97604  
 LOCATION YSDI TIME -



SPECIAL NOTES		DEPTH (in)	IN-PLACE DRY DENSITY (lb/ft <sup>3</sup> )	MOISTURE CONTENT (%)
		-	-	-
		SAMPLES		
		TYPE		DEPTH (ft)
		LEGEND		CHECK: <u>JTK</u> REVIEW: <u>[Signature]</u>

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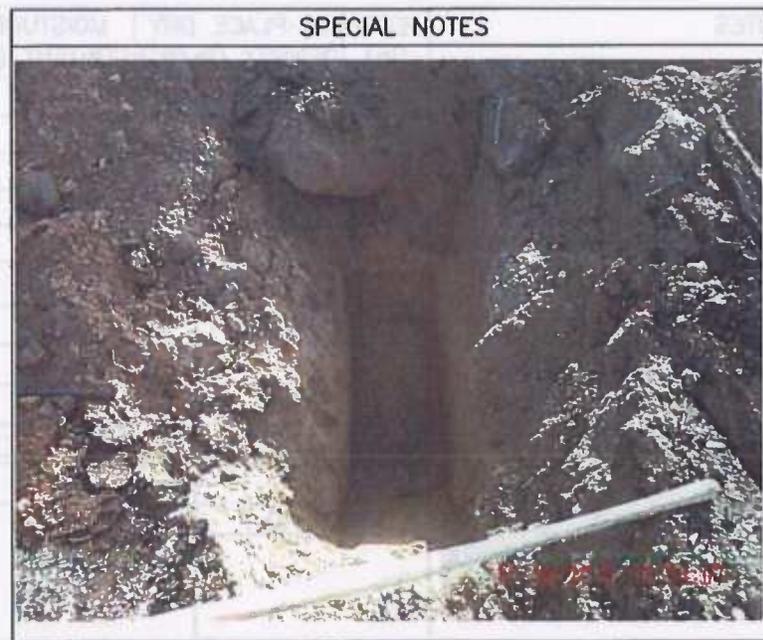
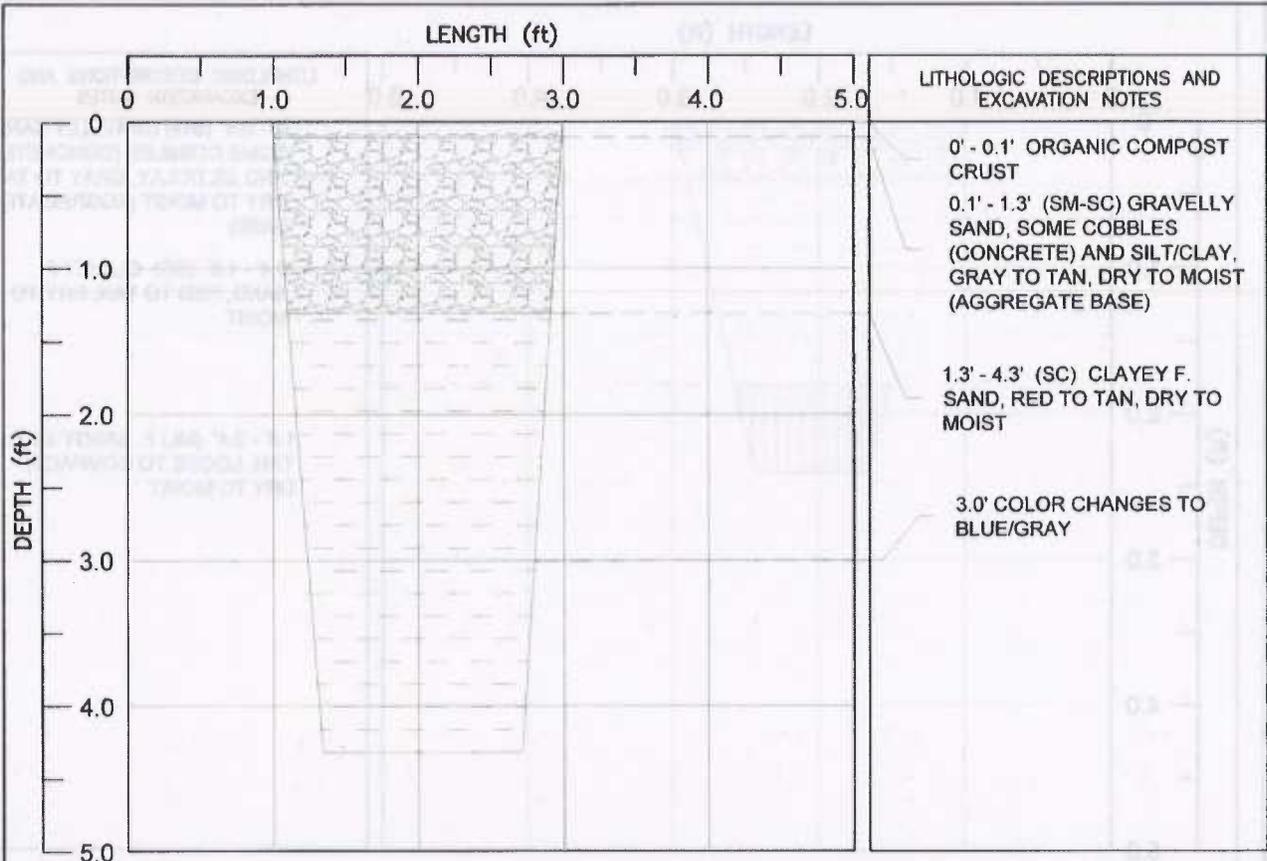




# TEST PIT LOG

No. TP-5

TEMP 40 °F WEATHER SUNNY, CLEAR ENGINEER J. KELSEY OPERATOR -  
 EQUIPMENT YANMAR MINI-EX CONTRACTOR YSDI DATE 12-19-12  
 COORDINATES N - E - ELEV. AT GRADE DATUM - JOB 123-97604  
 LOCATION YSDI TIME -



**SPECIAL NOTES**

DEPTH (in)	IN-PLACE DRY DENSITY (lb/ft <sup>3</sup> )	MOISTURE CONTENT (%)
-	-	-
<b>SAMPLES</b>		
TYPE		DEPTH (ft)
<b>LEGEND</b>		CHECK: <u>JTK</u> REVIEW: <u>[Signature]</u>

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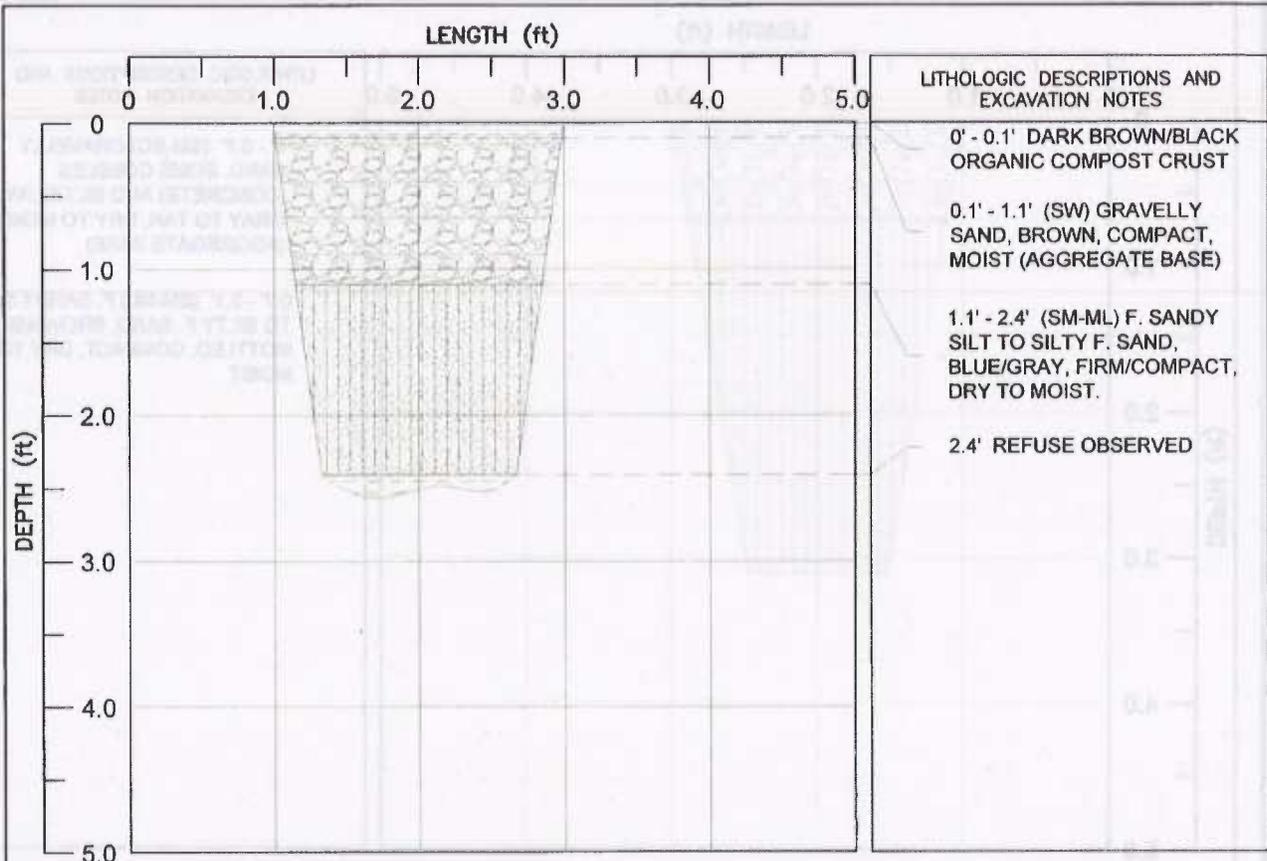




# TEST PIT LOG

No. TP-7

TEMP 40 °F WEATHER SUNNY, CLEAR ENGINEER J. KELSEY OPERATOR -  
 EQUIPMENT YANMAR MINI-EX CONTRACTOR YSDI DATE 12-19-12  
 COORDINATES N - E - ELEV. AT GRADE DATUM - JOB 123-97604  
 LOCATION YSDI TIME -



**LITHOLOGIC DESCRIPTIONS AND EXCAVATION NOTES**

0' - 0.1' DARK BROWN/BLACK ORGANIC COMPOST CRUST

0.1' - 1.1' (SW) GRAVELLY SAND, BROWN, COMPACT, MOIST (AGGREGATE BASE)

1.1' - 2.4' (SM-ML) F. SANDY SILT TO SILTY F. SAND, BLUE/GRAY, FIRM/COMPACT, DRY TO MOIST.

2.4' REFUSE OBSERVED

**SPECIAL NOTES**



DEPTH (in)	IN-PLACE DRY DENSITY (lb/ft <sup>3</sup> )	MOISTURE CONTENT (%)
-	-	-
<b>SAMPLES</b>		
TYPE		DEPTH (ft)
<b>LEGEND</b>		CHECK: <u>JTK</u> REVIEW: <u>Kort</u>

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