Appendix E – Hydrology and Water Quality Supporting Information

Contains:

- 2020 Peer Review of Selected Water Quality and Hydrology Reports (Tetra Tech)
- 2022 Updated Floodplain Storage Analysis for Z-Best Compost Facility (Schaaf & Wheeler)
- 2022 Clarification of Previous Hydrology and Water Supply Analyses (Golder)
- 2022 Further Clarification of Previous Hydrology and Water Supply Analyses (Golder) and 2022 Water Supply Evaluation (Golder)
- 2022 Groundwater Drawdown Evaluation Memorandum (Golder)
- 2023 Detention Basin Evaluation (AECOM)
- 2023 Flood Frequency Evaluation (AECOM)

To: Ron Sissem, EMC Planning

From: Sujoy Roy, Ph.D. and Michael Ungs

Date: 3/13/2020

Subject: Peer Review of Select Hydrology and Water Quality Technical Analyses from the Z-Best Project Applicant

The Z-Best Compositing Facility in Gilroy, CA is in the process of obtaining permits to expand their operations by converting the existing Municipal Solid Waste (MSW) composting system to an Engineered Compost System (ECS) using an aerated floor technology. They are in ongoing negotiations with the Santa Clara County Planning and County Land Development Engineering to address outstanding issues, which include those involving surface and groundwater hydrology and water quality. Tetra Tech has been tasked to assist in reviewing these issues by performing six tasks, listed below, that will be described and addressed in this memorandum.

1. Evaluate the proposed modified holding capacity of Detention Basin #1 based on the proposed as-built dimensions and elevations of the basin and ascertain whether it will be of sufficient volume to accommodate runoff from the project site under design storm conditions pursuant to the 2015 SWQCB Compost Order;

2. Review the proposed ECS CASP composting system specifications/design and proposed increase in feedstock input volume to ascertain whether the project has potential to increase leachate volume or leachate concentration in improved Detention Pond #1 relative to existing operations. Discuss potential environment effects of such increases, if any;

3. Review the project plans/ECS system design to determine adequacy of storm water runoff and leachate collection improvements planned for delivering both from the ECS system pad location to Detention Basin #1 in terms of volume and potential effects on surface and groundwater quality;

4. Qualitatively discuss the change in potential for groundwater contamination under existing Detention Basin #1 conditions (unlined) and under post Detention Pond #1 improvement conditions where the pond will be lined as required by the 2015 Compost Order;

5. Evaluate the future effect of sediment accumulation on the holding capacity of modified Detention Basin #1 and discuss maintenance activities that may be required to maintain holding capacity. Discuss disposal needs/requirements for excavated sediment as needed;

6. Review the applicant's specifications for the proposed new flood water storage facility located at the northern boundary of Area 2. Evaluate the applicant's revised No Net Fill/No Rise Certification to verify the adequacy of the flood storage facility design. Identify any other design issues for the storage facility which should be investigated to assess potential environmental impacts, if any; and

7. Prepare letter report with conclusions of document review and additional analysis. (This letter.)

The following table of acronyms and abbreviations are provided to clarify specific terms and to make the report easier to read by decreasing the repetition of lengthy expressions.

Acronyms and Abbreviations

BAAQMD	Bay Area Air Quality Management District
BGS	Below Ground Surface
Basin 1	Proposed Detention Basin #1 to be constructed with a liner
BFE	Base Flood Elevation based on NAVD88
BOD	Biological Oxygen Demand
CASP	Covered Aerated Static Pile
CCR	California Code of Regulations
CTI	Composite Technology International
eASP	Extended bed Aerated Static Pile
ECS	Engineered Compost Systems
EGWCA	Existing Green Waste Composting Area
Green Material	Defined in 14 CCR §17852(v) as any plant material that is separated at the point of generation, contains no greater than 1 percent of physical contaminants by weight, and meets the requirements of section 17868.5.
MSW	Mixed Solid Waste
NAVD88	North American Vertical Datum of 1988
NOP	Notice Of Preparation
SCCGOV	Santa Clara County *Department* of *Planning* and Development
TDS	Total Dissolved Solids
TPD	Tons Per Day
Z-Best	Z-Best Composting Facility

A description of each task is listed in italicized text, followed by a summary of the conclusions, and a detailed discussion and response to the Task.

Task 1. *Evaluate the proposed modified holding capacity of Detention Basin #1 based on the proposed as-built dimensions and elevations of the basin and ascertain whether it will be of sufficient volume to accommodate runoff from the project site under design storm conditions pursuant to the 2015 SWQCB Compost Order;*

Conclusion-Tetra Tech's volume estimate for new Basin 1 is virtually identical to that given in Golder (2019, Drawing 12), of 12,264,500 gallons. The 100-year and 25-year storm event volume calculations are consistent with estimates reported by Golder, and if the detention basin is empty, storm runoff from both storms can be contained, as required by the 2015 State Board Compost Order.

Detention Basin 1 receives stormwater from Area 1, identified to be 70.2 acres (2016 Golder Technical Report, Appendix B). The 2015 State Board Compost Order requires a "detention pond, containment berm, and drainage conveyance systems to contain a 25-year, 24-hour peak storm event." For the specific location of the facility (36.9520º Latitude; -121.5268º Longitude), NOAA Atlas 14 estimates a 24-hour 25-year rainfall of 4.78 inches, and a 100-year rainfall of 6.3 inches (https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html). The runoff coefficient estimated by Golder (of 0.72) is reasonable for the mix of surfaces in the facility. Based on the rainfall magnitudes and receiving water area of Area 1 and direct precipitation to an area equal to the original Detention Pond 1 (6.5 acres), the stormwater volumes are estimated as follows:

- 100-year event: 9.76 million gallons
- 25-year event: 7.34 million gallons

This is consistent with the 100-year estimate provided in Golder 2018 memorandum titled "Detention Basin 1 Water Balance Calculations-100 year, 24-hour Storm Event."

The proposed Basin 1 is stated in Golder (2019, Drawing 12) to have a holding capacity of 12,264,500 gallons for leachate and stormwater. The bottom elevation is given as 134.5 feet and the upper water level elevation is given as 148.5 feet, which corresponds to the BFE of 148.4 feet. The Basin is also shown to be constructed with an additional 2 feet of freeboard above the BFE value.

Tetra Tech independently estimated the holding capacity of the new Basin 1 by digitizing the one-foot contour lines from the basin diagram shown in Golder (2019, Drawing 12) and re-scaled using the scale bar located in the lower right corner of the drawing. These digitized areas were multiplied by the differences in elevation between each contoured layer and then summed to give the total volume. This estimate was within 2 percent of the 12,264,500-gallon volume listed in the comment field of the drawing. Tetra Tech concludes that the new Basin 1 drawing from in Golder (2019, Drawing 12) has the capacity to hold 12,264,000 gallons.

Based on the above calculations, Tetra Tech independently estimates that the proposed Detention Basin 1, <u>if empty</u>, can store runoff from a 100-year or a 25-year storm event. This is the design basis required in the 2015 State Board Compost Order (https://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2015/wqo2015_0121_dwq.pdf).

However, it is important to confirm that the basin is empty following the proposed lining for this project. Observations from 16 years of archived Google Earth images of the old Basin 1 indicate that the basin surface remained 100 percent covered with liquid during the months of Nov 2002, July 2003, July 2004, Nov 2004, Aug 2005, Dec 2005, Aug 2006, June 2007, Oct 2007, Sept 2010, Nov 2010, Sept 2011, Nov 2016, and Sept 2017. These photographic observations are contrary to the Golder (2016) water balance prediction that the old Basin 1 would be empty in May and remain dry until January of the following year due to the high potential evaporation rate. In part, this discrepancy is attributed not to rainfall but to groundwater seepage, which occurred because of the unlined nature of the historical pond and the relatively high groundwater table. In future, with the lining of Detention Basin 1, it is expected that this seepage will be minimized and that the pond will be dry during several months of the year when minimal rainfall and high potential evaporation rates occur.

Task 2. *Review the proposed ECS CASP composting system specifications/design and proposed increase in feedstock input volume to ascertain whether the project has potential to increase leachate volume or leachate concentration in improved Detention Pond #1 relative to existing operations. Discuss potential environment effects of such increases, if any;*

Conclusion-Tetra Tech concurs there will be substantially less leachate volume entering the new Basin 1 per ton of processed compost. The increased tonnage capacity of the facility will be countered by the lower per ton leachate volume, such that the total leachate generation may not be higher than produced in the present facility. The final effect on leachate concentration in Basin 1 is not very clear but the concentrations will most likely increase over time as the leachate evaporates and is recycled for dust control and compost moisturization. Regardless of change in water quality, the lining of Detention Pond 1 will prevent the release of these liquids into groundwater.

It appears there will be substantially less leachate volume going into the new Basin 1 per ton of compost processed. This is based on the proposed changes listed above for the CASP portion of Area 1. Golder (2016) states that Z-Best is currently permitted to accept a maximum of 1,500 tons/day (TPD) with a total permitted capacity of 576,000 cubic yards. The proposed project seeks to increase the maximum daily throughput from 1,500 to 2,750 TPD. In terms of leachate collection, the ECS system produces a composting process that is more aerated than the current CTI system being used. Golder (2019, Drawing 9) illustrates the design for a negative aeration system along the undersurface of every CASP bunker and below grade floor details of the eASP section in Area 1. Furthermore, Golder (2019, Drawing 7) illustrates the construction of a French drain, storm drain pipelines, collection sumps, drainage pump stations, and concrete curbs throughout the CASP region of Area 1. This will result in the generation of leachate with a lower volume of runoff liquid (from 25 to 75% less). The specific volume of leachate will depend on the total composted materials and the actual gain in efficiency of leachate generation, but assuming an approximate halving of the leachate generation and an approximate doubling of throughput and capacity, it is possible that there is not much net change in the leachate volume produced.

The water quality of the leachate is another aspect to be considered once the new project is implemented. The only known set of leachate samples taken from the old Basin 1 were collected on July 2, 2014, analyzed, and reported by BC LAB (2014). The leachate samples clearly indicate elevated concentrations in water analysis for general chemistry constituents (e.g., BOD, Ca, Cl, K, Na, P, & TDS). It should be obvious that the mass of chemicals leached out from the compost will increase approximately in proportion to the mass of compost being processed by the facility. Leachate is generated during the complex process of adding moisture to the compost, collecting excess moisture generated during the digestion process, capture and adding the stormwater runoff from approximately 45 acres of surface soils, dust, and compost particulate in Area 1, and from the concentration of non-volatile chemicals by atmospheric evaporation from pooled leachate in the new basin. This is further complicated by the addition of rainfall directly into the approximate 3.5-acre surface area of the basin and the mixing of fresh groundwater and recycled leachate pumped from the basin before its use in Area 1 of the facility. There is no simple way to predict the change in leachate concentration over time in the old Basin 1 because the leachate flowing into the basin could become diluted with the addition of direct rainfall over its six acre surface area; recycled when pumped out for plant reuse in dust control and compost moisturization; and become more concentrated when its water content evaporates to the atmosphere. The impact on leachate concentration in Basin 1 is not very clear but it is reasonable to expect that it will increase over time as leachate evaporates and is recycled for dust control and compost moisturization. However, even if the concentrations are higher, the construction of the lined Detention Pond 1 will prevent the release of these liquids into groundwater.

Task 3. *Review the project plans/ECS system design to determine adequacy of storm water runoff and leachate collection improvements planned for delivering both from the ECS system pad location to Detention Basin #1 in terms of volume and potential effects on surface and groundwater quality;*

Conclusion-Stormwater and excess leachate from the project area is intercepted and conveyed to Detention Basin 1. The capacity of this basin is adequate to handle storm flows and minimize the potential of water quality impacts to the Pajaro River. Tetra Tech discovered an oversight issue in the most recent Golder (2019) drawings such that no conveyance or pump system is shown within the EGWCA portion of Area 1 to capture stormwater runoff or leachate and transfer it to the new Basin 1.

Currently, all stormwater runoff from Area 1 is intercepted and routed along ditches its southern boundary and discharged through a culvert into the northwest corner of the old Basin 1. During the wet season, the volumetric capacity of Detention Pond 1 is sufficient to handle large storm flows (25-year and 100-year storms) as well as excess leachate created during the composting process. During the dry season, water may need to be applied to the compost, from Detention Pond 1 or from groundwater. In terms of water quality, additional adverse effects to surface water and groundwater in future are not expected because of the construction of an adequately sized and lined detention basin. (See caveat below for EGWCA area, where no changes are planned, but there is a need for a pump to transfer water to the new Detention Pond 1.) Note that this comment specifically addresses impacts as consequences of future changes to the facility, and not to legacy impacts to groundwater, which are not addressed through this project.

For the future of Basin 1, Golder (2019, Drawings 4 and 7) shows no French drains, storm drains, drainage pipes, or pump stations extending into or within the EGWCA. As a result, all stormwater and leachate runoff from EGWCA will simply flow downgradient along the 20-foot access roads and overland to the southeast corner of the EGWCA. The ground surface in the southeastern corner of the EGWCA is at least five feet below the top of the berm for both the new Basin 1 and the existing Detention Basin 2. Hence, overland stormflow and leachate will bypass both basins and discharge directly into the southern border of the property boundary. Z-Best responded in SCCGOV (2019) to the apparent oversight to intercept stormwater runoff from the Green Waste portion of Area 1. They state that a pump system would be installed to deliver stormwater up and over the proposed berm of the new Basin 1. However, this pump system or any other conveyance system to intercept stormwater in EGWCA are not yet shown in the most recent Golder (2019) drawings.

Task 4. *Qualitatively discuss the change in potential for groundwater contamination under existing Detention Basin #1 conditions (unlined) and under post Detention Pond #1 improvement conditions where the pond will be lined as required by the 2015 Compost Order.;*

Conclusion- The lining of Detention Pond 1 will stop the percolation of leachate into groundwater, and thus minimize future new groundwater quality impacts from the facility. Tetra Tech concludes that simply removing 1/3 the length of the old Basin 1 sediment will have little impact on the legacy concentration of leachate chemicals in the local groundwater and their movement. This project does not address legacy contamination present in groundwater at the site.

Golder (2015, 2016) states "The site is situated on Holocene-age alluvial deposits from modern stream flow and floodplain processes. The site is mapped as underlain by Medium-grained Alluvium [labeled as a type Qham soil] which is described as unconsolidated, moderately sorted, moderately permeable fine sand, silt, and clayey silt with occasional thin beds of sand." However, five test pits in Area 2 reveal soils in the top six feet to be more fine-grained and clay-rich than "Qham" soils.

When the old Basin 1 was first constructed, it had a surface area of approximately 6.3 acres and a capacity to hold approximately 1.34 million gallons (Golder, 2017). The basin has been used to store stormwater runoff, intercepted surface eroded materials, and recycled compost leachate for more than 19 years. As shown in Golder (2017, Drawing 3), Basin 1 was constructed without a liner. The most western end of the basin was dug to an approximate elevation of 134 feet compared to the local ground surface of 145 feet. There is no apparent reference for the sloping sides of Basin 1 having been treated by any special method that would have limited the horizontal flow through those portions of the basin sides that are below the local ground surface. Hence, there always has been the potential for horizontal seepage both out of and back into the basin. According to Golder (2016), the local groundwater table was encountered at depths between 6 and 8 feet BGS in May 2013 and between 5 and 8 feet BGS in May 2016. In comparison, the bottom of Basin 1 lies between 8 and 10 feet BGS. This suggests there has been the potential for leachate to escape horizontally into the water table and that the basin bottom lies below the water table during portions of the year. In confirmation of this hypothesis, it should be noted from the discussion related to Task 2 above that archived Google Earth images clearing indicate the bottom of Basin 1 to be 100% covered with liquid during the May-to-January period for many years despite being subjected to high potential evaporation rates.

In the future, approximately a 1/3 length of the current Basin 1 will be dug up and replaced with a new lined basin that is both deeper and higher. Sediment in the remaining 2/3 length of the current basin will be left in place, the basin filled with dirt to the local ground surface, and the top surface planted with grass. *Going forward,* this will effectively block the percolation of liquid from the pond into the surrounding groundwater.

Legacy contamination in bottom section of the pond to be filled in, and in the groundwater will remain, and not be affected by this project. Because of the long-term exposure to leachate runoff, one should expect the soil sediment along the bottom of the basin to have soil concentrations for non-volatile chemicals that are in equilibrium with the maximum leachate concentrations. These contaminated sediments will leach out their chemical concentrations into the bottom of the old basin and ultimately into the local groundwater if the contaminated sediment is exposed to either rainstorm water or to re-circulating groundwater. There are no published records of groundwater samples having been taken near Basin 1. Because of close proximity of the local water table to the bottom of Basin 1 and the 19-year period in which Basin 1 was used, the potential for two-way flow of liquids into and out of the basin, the large acreage of the source, and small seepage velocity of the groundwater, one would also expect to find shallow groundwater concentrations to approach those of the leachate concentrations in Basin 1.

Task 5. *Evaluate the future effect of sediment accumulation on the holding capacity of modified Detention Basin #1 and discuss maintenance activities that may be required to maintain holding capacity. Discuss disposal needs/requirements for excavated sediment as needed;*

Conclusion-Sediments will accumulate at the bottom of the Detention Pond 1, although a low rate because of the nature of compost leachate (high dissolved solids and organic materials) and because significant changes in water holding capacity in the existing pond have not been reported. However, some sediment may accumulate and will need to be tracked over time. Sediment removal, if needed, must be performed with hand tools to not damage the line. Sediment disposal must be performed after a chemical analysis of the sediment to test the presence of any contaminants at hazardous levels.

The lined Detention Pond 1 will continue to accumulate sediments present in its inflow at the pond bottom. In theory, the accumulated sediment could reduce effective volume of the pond, and thus its capacity for preventing releases during large storm events. Although the specific depth of sediment accumulated has not been documented, the previous unlined pond has operated for several years without loss of notable storage capacity being reported in any of the project documents made available. This fact, and given the nature of compost leachate with high dissolved solids and organic matter (Chatterjee et al., 2013), suggests that inorganic sediment buildup is expected to occur at a gradual rate. Over time, however, it is possible that the buildup is sufficient and that removal is needed. Because of the need to protect the lined bottom, we are in agreement with the Golder approach of using hand tools to excavate sediments. Further, these sediments need to be analyzed for chemical contaminants, especially trace metals, prior to identifying a suitable location for final disposal.

Task 6. *Review the applicant's specifications for the proposed new flood water storage facility located at the northern boundary of Area 2. Evaluate the applicant's revised No Net Fill/No Rise Certification to verify the adequacy of the flood storage facility design. Identify any other design issues for the storage facility which should be investigated to assess potential environmental impacts, if any;*

Conclusion-Tetra Tech verified that the proposed Flood Storage Basin can indeed hold 34 acre-feet of flood water that is mentioned by Golder (2019, Drawing 5B), and that this is adequate to address the change in capacity noted in the updated Schaaf and Wheeler Floodplain Impact Analysis (2018).

The Z-Best facility lies in the floodplain of the Pajaro River, and Santa Clara County has a no-net fill policy in place for construction activities in the floodplain. To mitigate for the loss of floodplain storage on account of grading activities at the site, Schaaf and Wheeler prepared a Floodplain Impact Analysis and estimated the need for 29 acre-feet of new flood storage at a location north of Highway 25 (2017). They revised their calculations for a new location of the flood water storage of 34 acre-feet, south of Highway 25 contiguous to the Z-Best property (to avoid the need for a highway crossing). This amount of storage was shown to have no net change in the water surface elevation of the Pajaro River, computed using the standard Army Corps of Engineers HEC-RAS model. Tetra Tech is in agreement with the general approach and the calculations.

Golder (2019, Drawing 5B) states in a comment field that the Flood Storage Basin capacity is 34 acre-feet. To compute the flood holding capacity, diagrams from the more detailed illustrations of Golder (2019, Drawing 10C) show the bottom of the Flood Basin with an elevation of 138 feet and the top set at 148.48 feet. The Basin is shown to have a simple rectangular shape and its sides drawn with a 1V/2H slope. Tetra Tech digitized the diagram for Basin 2 given in Golder (2019, Drawing 10C), scaled the measurements, and calculated the volume to be within 1.3 percent of the 34 acre-feet value listed in the comment field of Golder (2019, Drawing 5B). Tetra Tech's independent analysis verifies that the proposed Flood Storage Basin illustrated in Golder (2019) can hold 34 acre-feet of floodwater.

References

BAAQMD, 2018, Notice of Preparation on Z-Best Composting Modifications, received by David Rader, Department of Planning and Development, San Jose, CA, dated Nov 15, 2018.

BC Lab, 2014, Doc "Detention Pond WQ Tests 2014.pdf" giving laboratory results for leachate samples collected from Z-Best Products Detention Pond, sampled on 7/2/2014 and reported on 7/14/2014; 22 pages, by BC Laboratories, Inc., Bakersfield CA.

Chatterjee, N., Flury, M., Hinman, C. and Cogger, C.G., 2013. "Chemical and physical characteristics of compost leachates." A Review Report prepared for the Washington State Department of Transportation. Washington State University.

Edgar, 2008, "Drainage Study and Floodplain Analysis for the Z-Best Composting Facility", 97 pages, prepared by Edgar & Associates, Inc, dated August 29, 2008

Golder, 2015, Doc "GW Monitoring Plan - See Appendix_1-27-16.pdf", 26 pages long. Within this document there is a 24-page report titled "Groundwater Protection Monitoring Plan, Z-Best Composting Facility, Gilroy, California"; dated December 2015, by Golder Associates.

Golder, 2016, Doc "2016-10-11_Technical Report_FINAL-Golder.pdf" labeled Technical Report, Z-Best Composting Facility, dated October 2016, 110 pages. The PDF contains a 13-page document with the subject titled: "Detention Basin 1 and 2 Water Balance Calculation, Revision 1", dated 10/11/2016 by Golder Associates.

Golder, 2017, document titled "Aerated Static Pile Composting Permit Drawings, Z-Best Products, Santa Clara County, Gilroy, California, June 2017", 12 pages, prepared by Golder Associates Inc., Sunnyvale, CA.

Drawing 3, titled: "Existing Site Plan".

Golder, 2019, document labeled the “Aerated Static Pile Composting Preliminary Grading Plan, Z-Best Products, Santa Clara County, Gilroy, California, September 2018”, 15 pages, stamped 3/31/2019; prepared by Golder Associates Inc., Sunnyvale, CA.

Drawing 4, titled: “Existing Site Plan”;
Drawing 5B, titled: “Area 2 Flood Storage Basin”;

Drawing 7, titled: “Grading and Drainage Plan”;

Drawing 9, titled: “Details [for both primary CASP bunkers and secondary eASP piles]”;

Drawing 10C, titled: “Area2 Flood Storage Basin Sections”;

Drawing 12, titled: “Proposed Detention Basin 1- Plan and Section”.

SCCGOV, 2018, “Doc 2A ECS Memo Responses to ZBest EIR Questions_R3.PDF”, has the email subject: “Z-Best Use Permit/ASA EIR Data Needs List (6498-16P), dated July 11, 2018”. This document presents on July 25, 2018 the ECS response to question Q3 from Ron Sissem concerning ECS Section 36e-Management of Contact Water, 8 pages.

SCCGOV, 2019, “Z-Best Memo 1, Responses to 12-12-18 email re NOP.pdf”, County of Santa Clara, Department of Planning and Development, dated 4/15/2019, Zbest Input/Responses to NOP Comment Period 12-12-18 email request, 8 pages.

Schaaf and Wheeler, 2017, “Floodplain Impact Analysis for Z-Best Compost Facility Expansion near Gilroy” Memo dated, 2/7/2017.

Schaaf and Wheeler, 2017, “Z-Best Compost Facility Phase 2 Expansion” Memo dated, 9/14/2018.

Schaaf & Wheeler
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MEMORANDUM

TO:	John Doyle Zanker Road Landfill	DATE:	October 25, 2022
FROM:	Charles D. Anderson, PE	JOB#:	ZANK.04.21
SUBJECT:	Updated Floodplain Storage Analysis for Z-Best Compost Facility		

Introduction

The Z-Best Compost Facility Expansion Project (Project) consists of two phases. The first phase of work involved grading to provide a level pad for composting operations and balancing excavation to provide a no net fill below the base flood (100-year) elevation. The first phase of the project was analyzed for impacts to the regulatory floodplain in 2012.[1] FEMA issued a Conditional Letter of Map Revision (CLOMR) for the work based on that analysis on January 17, 2013.[2]

The second phase of work analyzed herein. Phase 2 of the expansion includes additional grading to the west of the Phase 1 area to create a level pad for composting operations (Figure 1). Work also includes, as shown in Figure 2, modifications to the Detention Basin 1 storm water quality basin and berm, the creation of additional floodplain storage between Highway 25 and “Area 1”, and the widening of Highway 25 by the State for safer truck operations at the Z-Best site.

Potential impacts to net 100-year floodplain storage and conveyance are analyzed for the complete Project. That is, the post Phase 2 condition is compared to the pre-existing condition before Phase 1 to be sure that floodplain storage below the base flood elevation is no less than before the Project began and that the net placement of Project fill and excavation has not created blockage to flood flows sufficient to cause a significant rise in the base flood elevation.

This analysis supersedes the *No Net Fill/No Rise Certification* memorandum prepared September 14, 2018 to reflect the then-final permit drawings prepared by Golder Associates.

Base Flood Elevation

The Project site location is mapped as Special Flood Hazard Zone A (base flood elevations undetermined) on the effective Flood Insurance Rate Map (FIRM for unincorporated Santa Clara County that has an effective date of May 18, 2009. The referenced CLOMR approved in January 2013 establishes base flood elevations (BFEs) in the area as detailed in the referenced January 18, 2012 report. An effective Flood Insurance Study (FIS) peak discharge of 30,500 cfs was used to model the 100-year flood event on the Pajaro River. Based on this model, which also the basis for the flood impact analyses documented herein, the BFE at the Project site is 148.5 feet NAVD. The model is based on the NGVD datum. The Santa Clara County FIS adds 2.85 feet to elevations on NGVD to obtain elevations on NAVD.

[1] Schaaf & Wheeler, “Z-Best Compost Facility Expansion Flood Impact Certification, Grading, and Flood Study Summary Report,” January 18, 2012.
[2] Case No. 12-09-62641R

Figure 1. Project Phasing

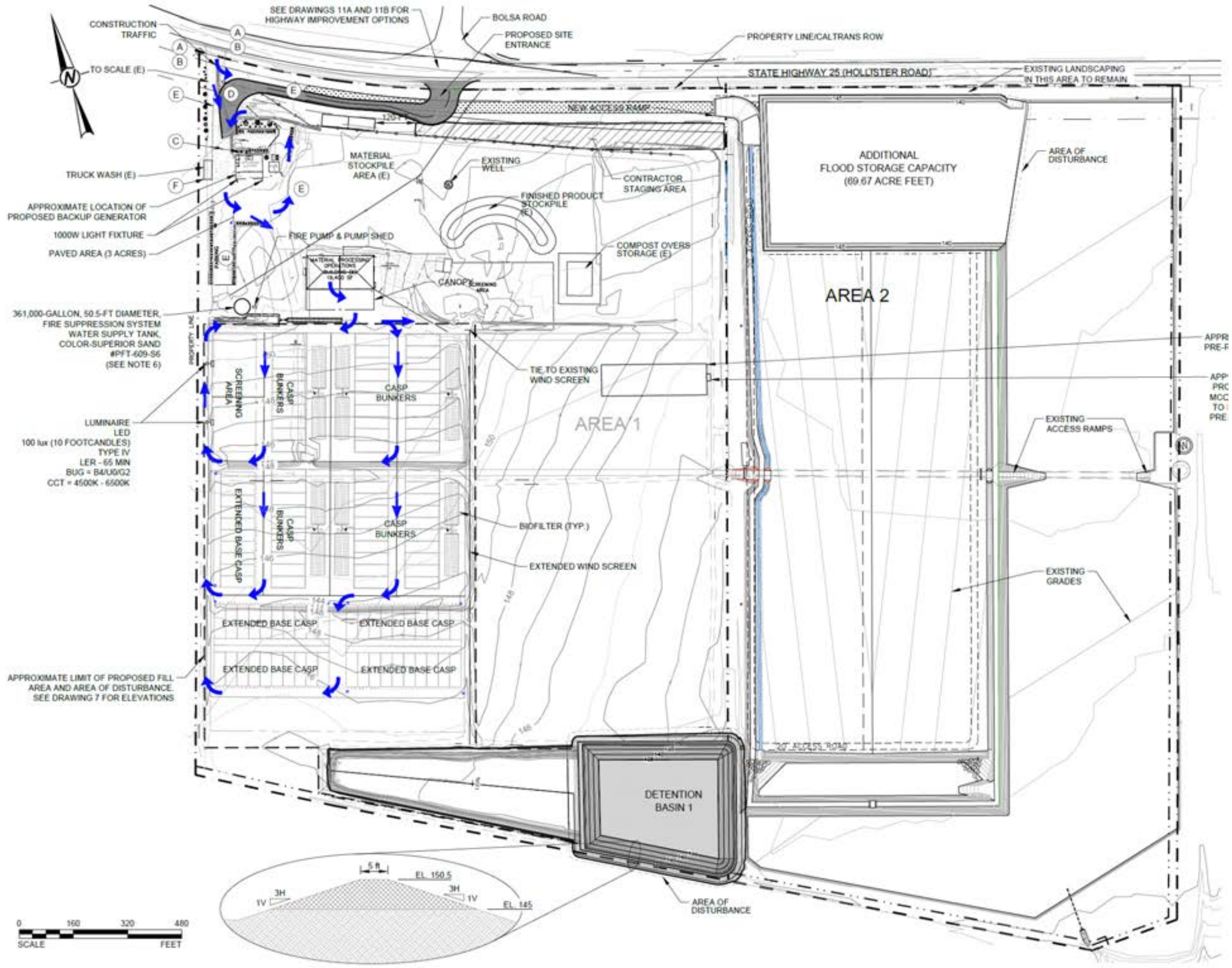


Figure 2. Proposed Site Development Showing Floodplain Storage Areas

Floodplain Storage

Golder Associates used their grading plan and Civil 3D program to calculate the volume of floodplain storage below the base flood elevation displaced by fill or by the bermed area of Detention Basin 1 and the amount of new floodplain storage created below the base flood elevation in Phase 2.

The affected floodplain encompasses both phases of the Z-best facility expansion. In addition, the State of California (Caltrans) will place fill within the same floodplain to complete improvements to California Highway 25 that mitigate for operational changes at the facility. Therefore, volumetric floodplain storage impacts are examined for both phases of the facility expansion and the work on Highway 25 as a net total. That is, the total Project impact with both phases completed compared to the pre-existing floodplain storage. The phasing indicated in Table 1 serves only to describe when the actions are taken.

As indicated by the summary provided as Table 1, there is no net loss of 100-year floodplain storage that would result from the two phases of Project construction and the associated Highway 25 improvements.

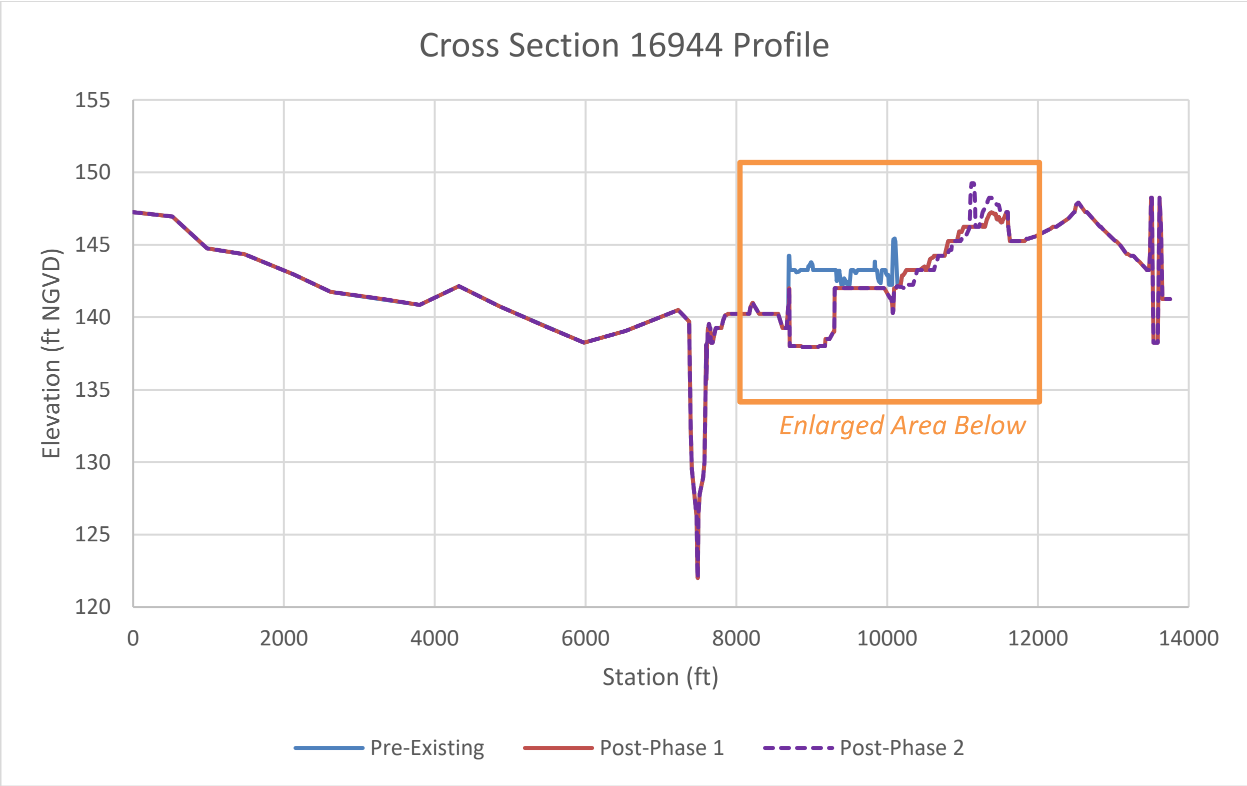
Table 1: Net Impact of Z-Best Project on Floodplain Storage

Floodplain storage below BFE removed by Phase 1 fill[3]	163.3 acre-feet
Fill placed below BFE for Phase 2 compost pad	23.5 acre-feet
Area removed from 100-year floodplain below BFE due to Detention Basin 1 berms constructed in Phase 2	46.0 acre-feet
Highway 25 fill placed below BFE in Phase 2 (2,435 CY)[4]	1.5 acre-feet
Floodplain Storage Lost	**234.3 acre-feet**
On-site excavation below BFE completed in Phase 1[1]	171.2 acre-feet
Additional Phase 2 excavation proposed below BFE in Area 2	69.7 acre-feet
Additional Floodplain Storage Provided	**240.9 acre-feet**
Net Additional Floodplain Storage after Project Complete	**6.6 acre-feet**

Hydraulic Impact Analysis

A steady state hydraulic model of the Pajaro River and its overbanks, representing the pre-existing flood condition was used as the basis for FEMA's Conditional Letter of Map Revision. That same model has been updated to reflect all project changes, both Phase 1 and Phase 2, including modifications to Highway 25 and is used for this updated flood study to evaluate potential floodplain impacts from the Project. Cross sections and ineffective flow areas have been added to the model geometry to capture the changes in topography and flow blockage that results from fill placed below the base flood elevation. Figures 3 through 7 show the changes made to model cross sections caused by the Phase 1 and Phase 2 work, which are taken in combination. Figure 8 shows the ineffective flow areas caused by the placement of previously placed and new fill relative to the pre-existing ground conditions. Area 1, which is ungraded, is the same in both the pre-existing conditions model and post-Project model, noting that some of this cross-sectional flow area is already above the base flood elevation and is effectively blocked in both cases.

[3] Schaaf & Wheeler, "Z-Best Compost Facility Expansion; Floodplain Impact Certification, Grading and Flood Study Summary Report," January 18, 2012.
[4] Email from Richard Haughey, PE, Golder Associates, September 29, 2022.



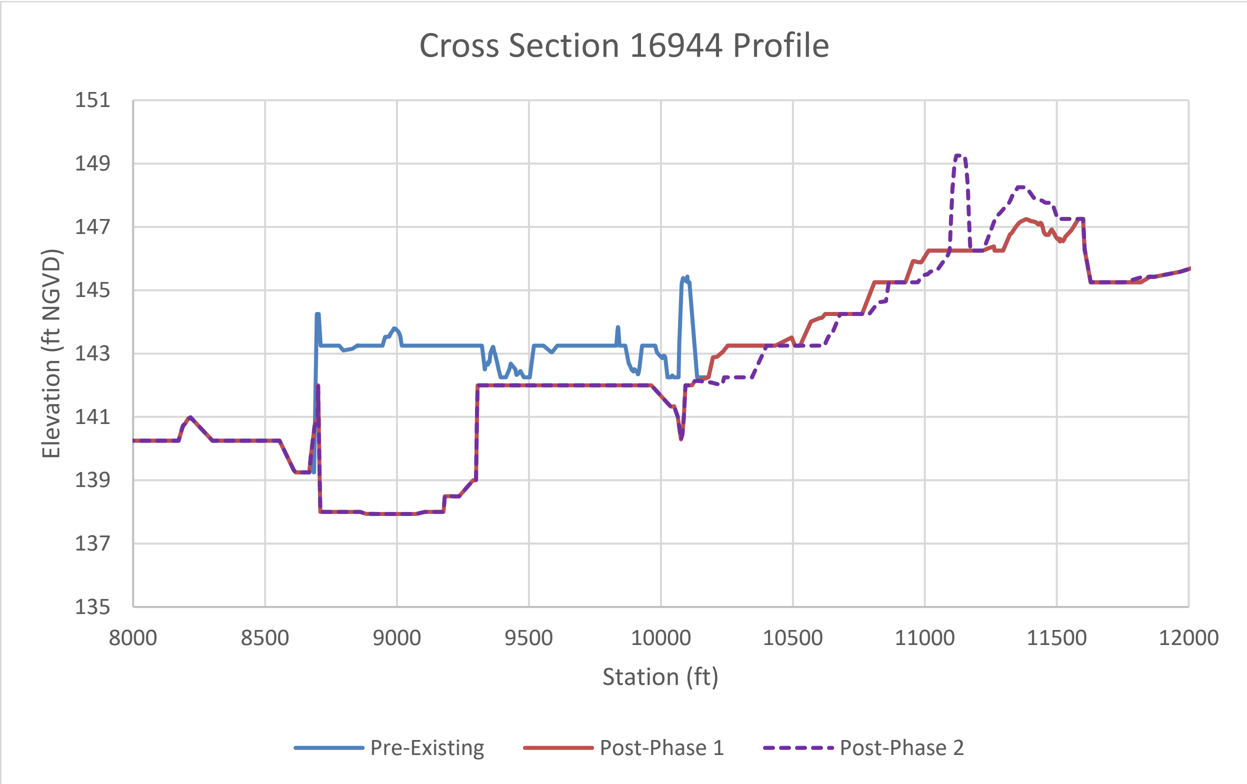


Figure 3. Cross Section Changes to Model Project Improvements

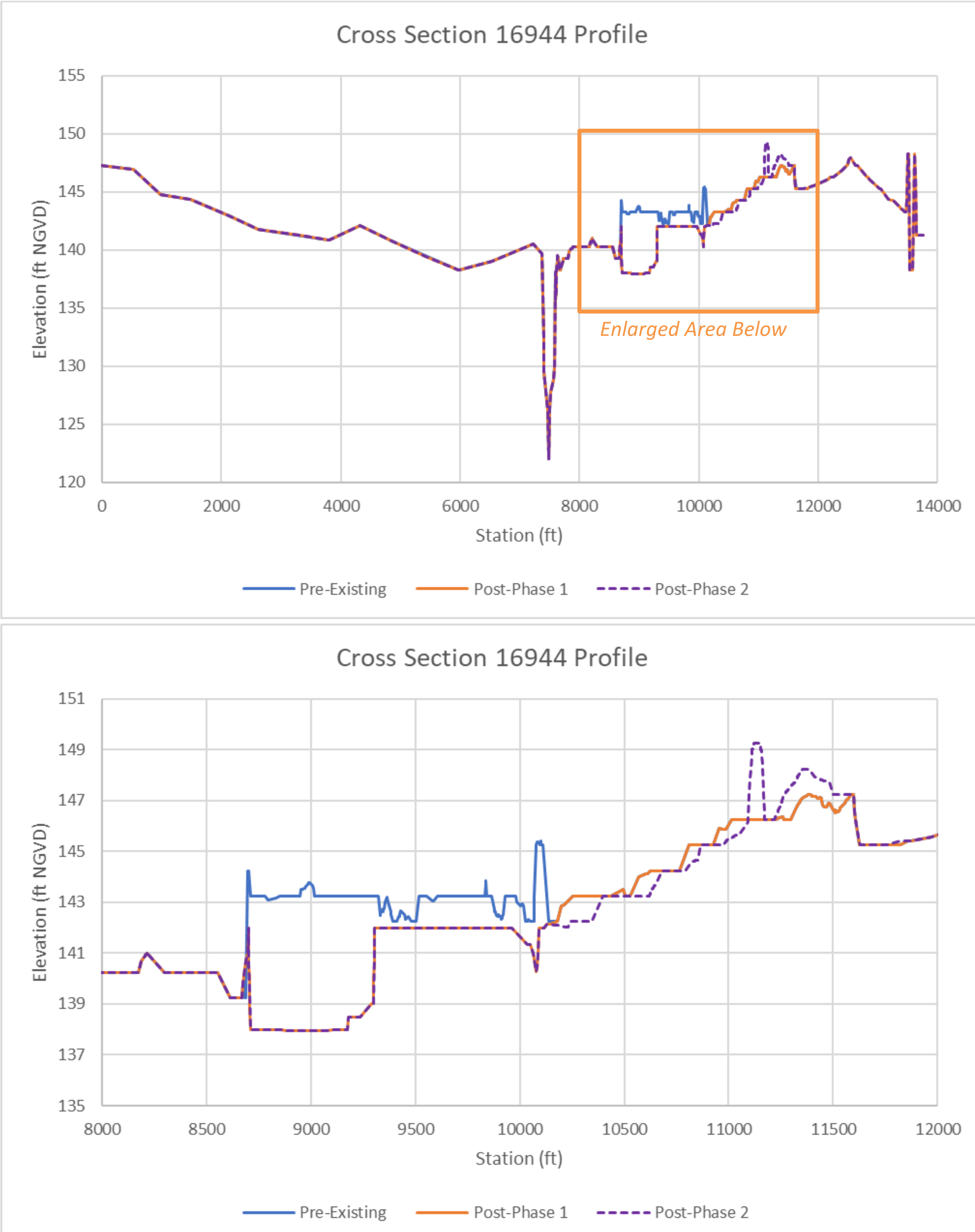


Figure 4. Cross Section Changes to Model Project Improvements

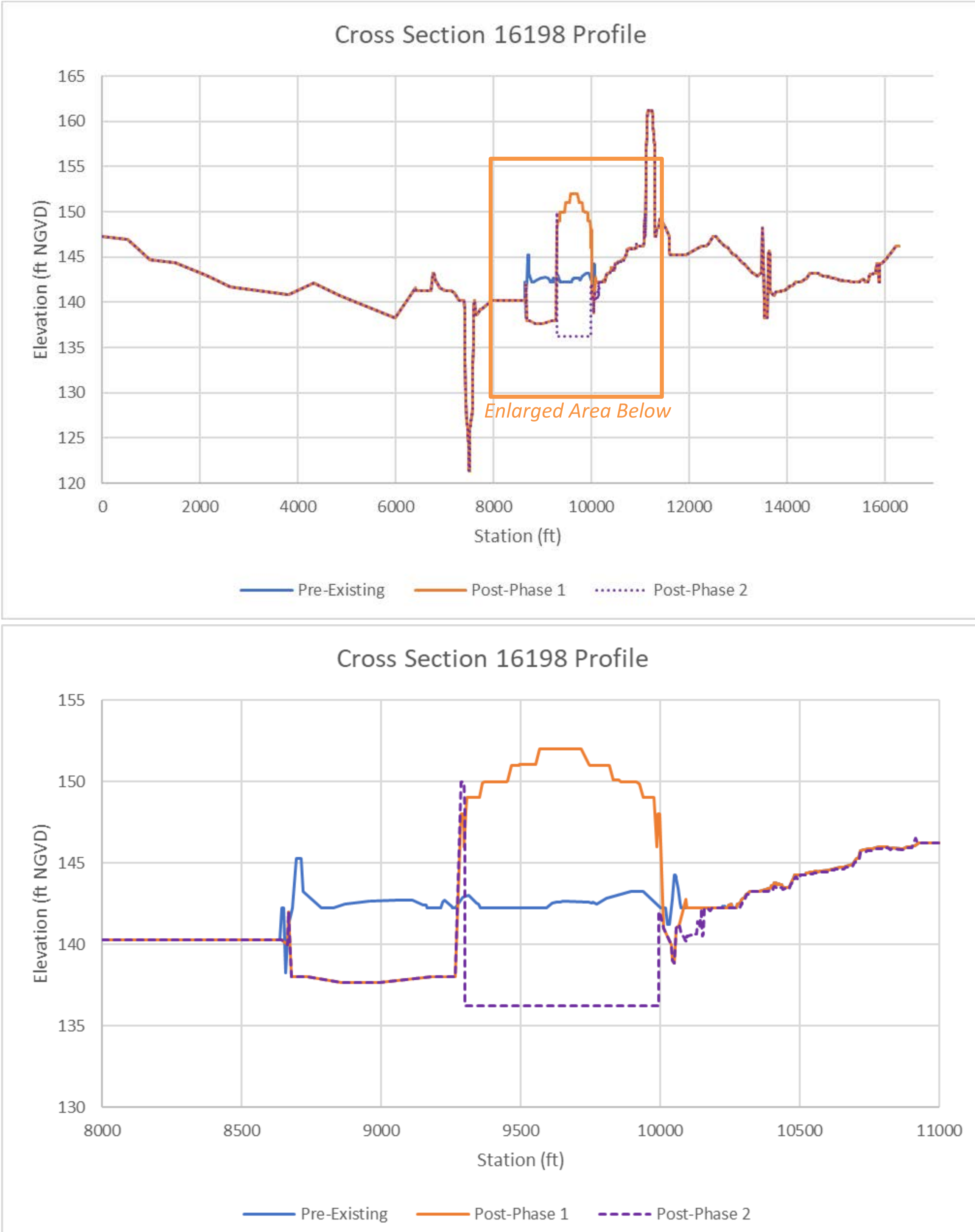
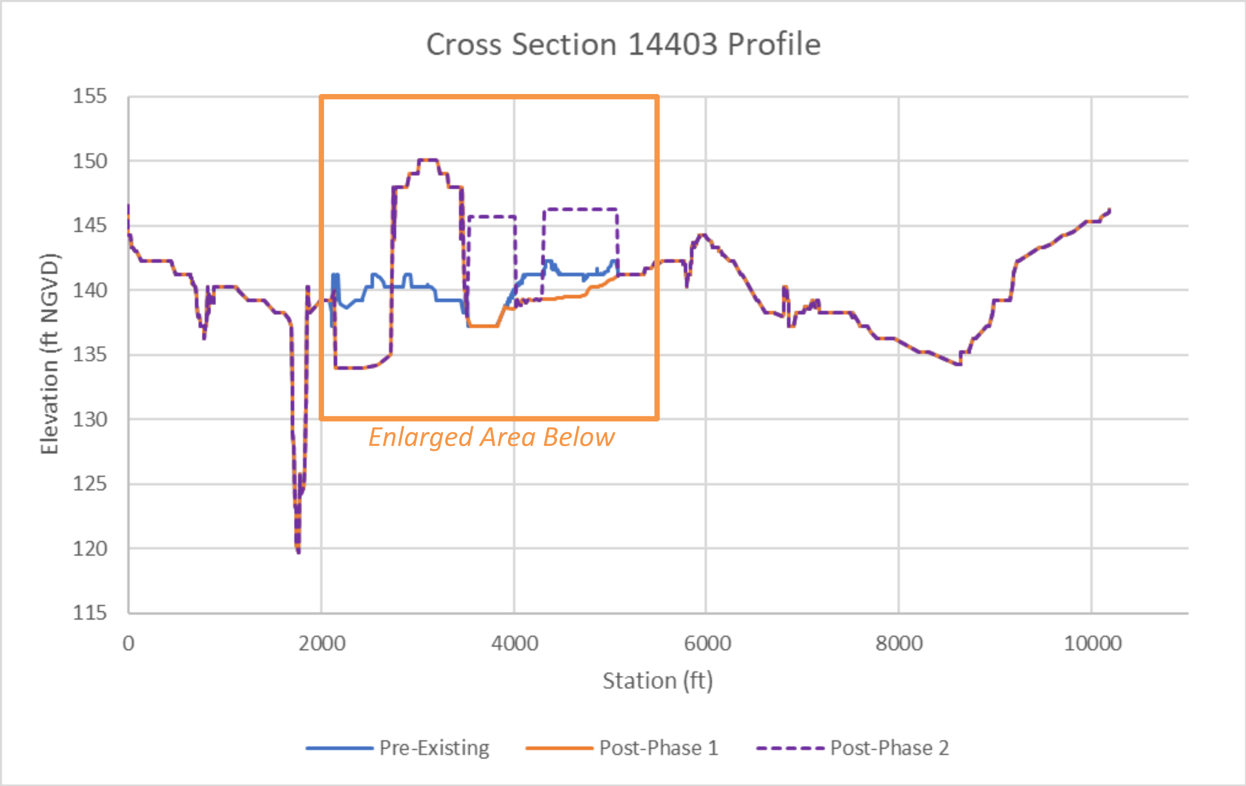


Figure 5. Cross Section Changes to Model Project Improvements



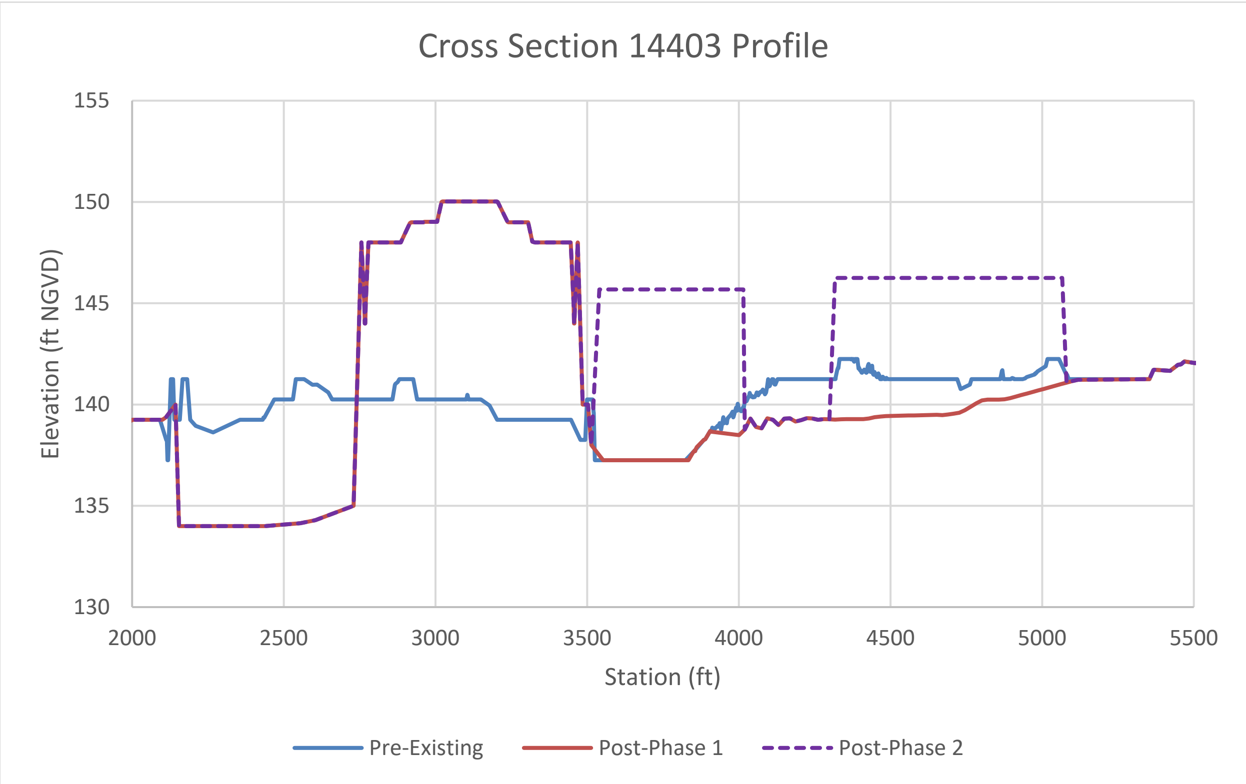
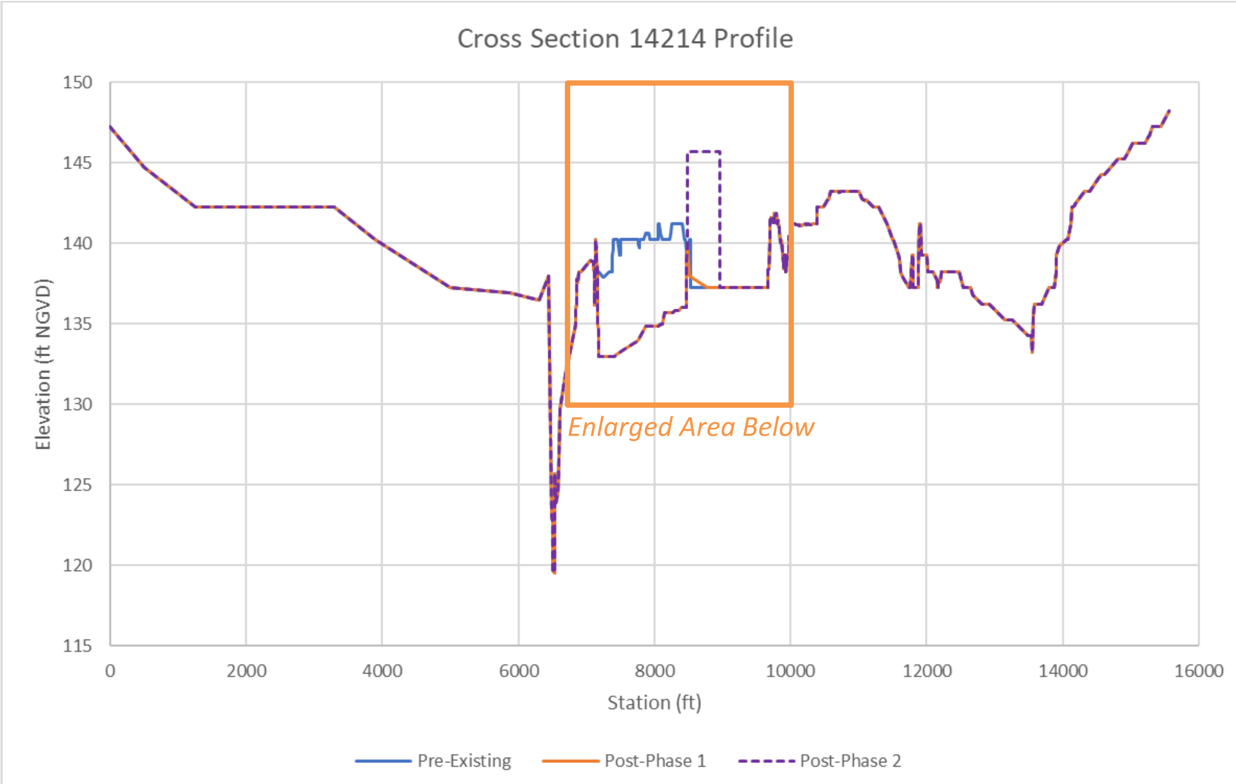


Figure 6. Cross Section Changes to Model Project Improvements



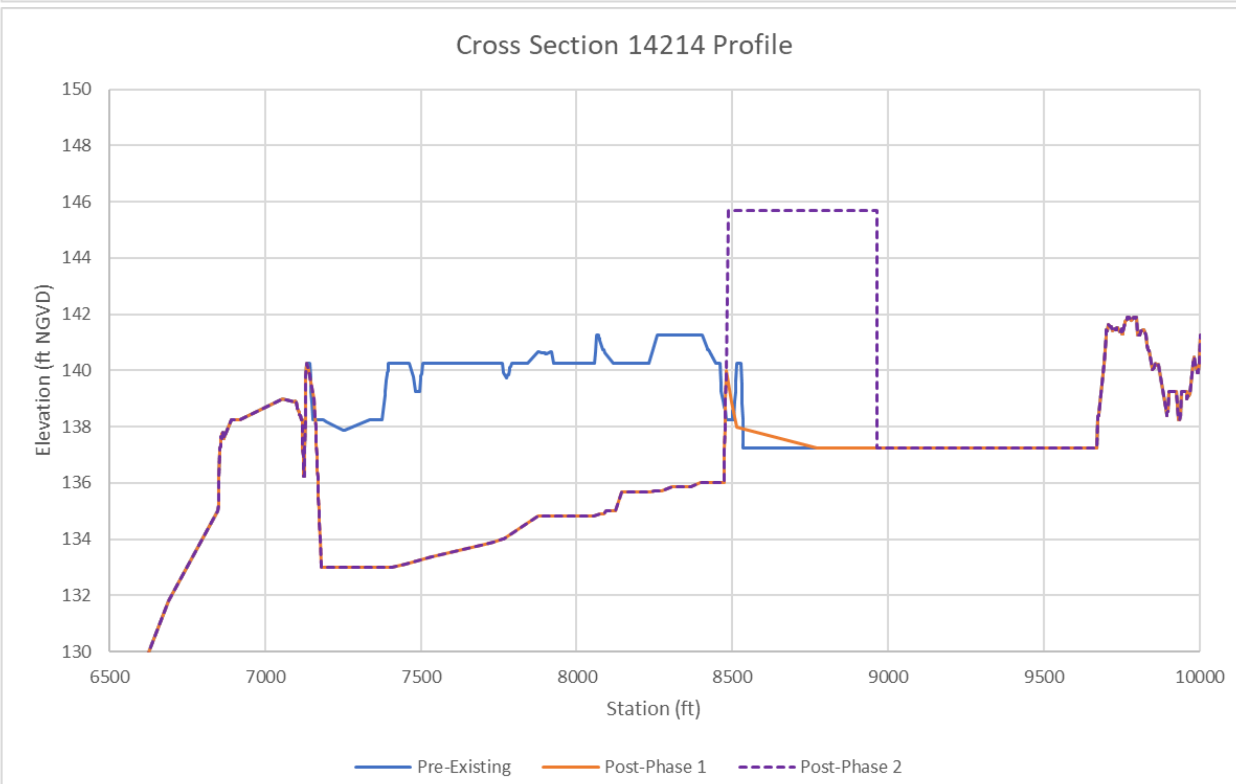


Figure 7. Cross Section Changes to Model Project Improvements

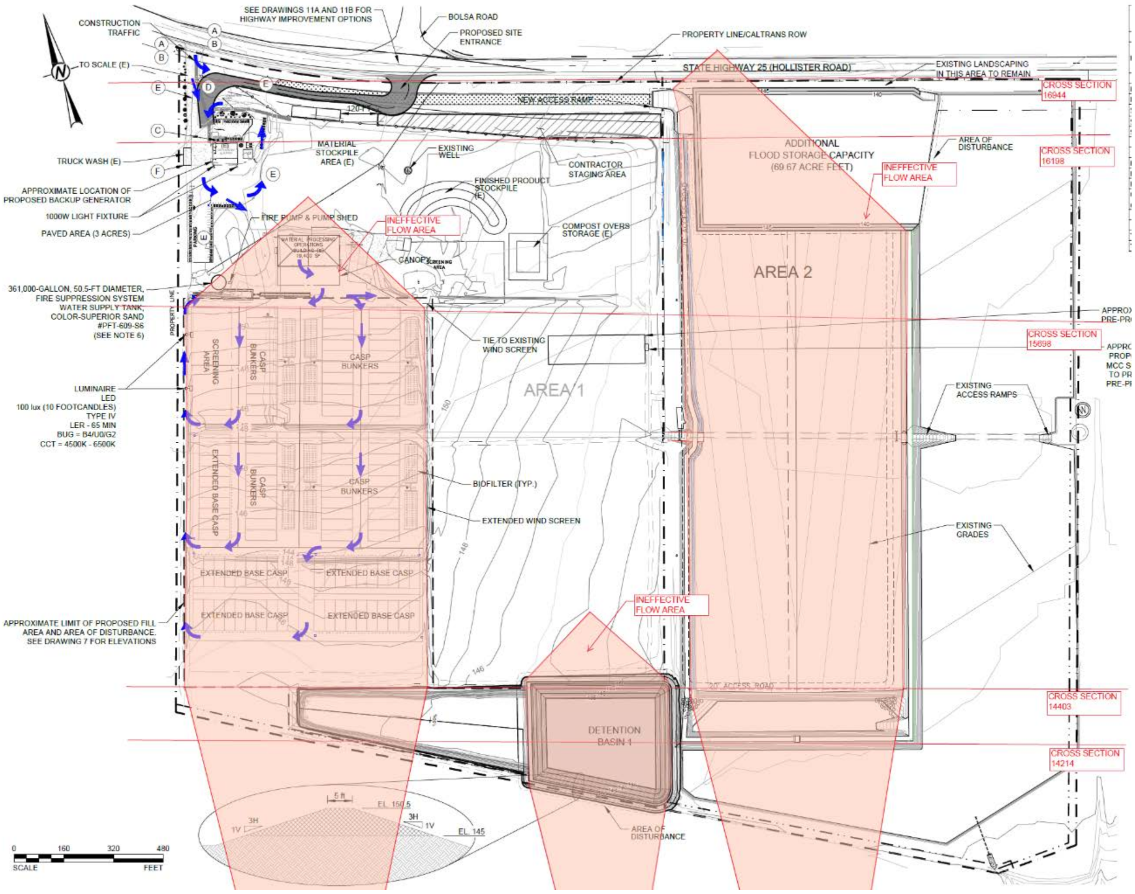


Figure 8. Project Ineffective Flow Area Schematic

Hydraulic Model Results

There is no significant Project impact to the existing water surface elevation. The maximum increase in water surface elevation between the existing and project scenarios is approximately 0.01 foot at a single cross section, which is considered negligible. The local Floodplain Administrator is the County of Santa Clara. The governing floodplain ordinance is Section C12-821:

> "Until a regulatory floodway is adopted, no new construction, substantial development, or other development (including fill) shall be permitted within Zones A1—30 and AE, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other development, will not increase the water surface elevation of the base flood more than one foot at any point within Santa Clara County."

Figure 9 shows the 100-year water surface profile, noting that a 0.01-foot difference cannot be discerned at a reasonable scale. Table 2 summarizes the HEC-RAS model results which compare the pre-project (pre-existing) water surface elevations to post-fill water surface elevations on the NGVD datum.

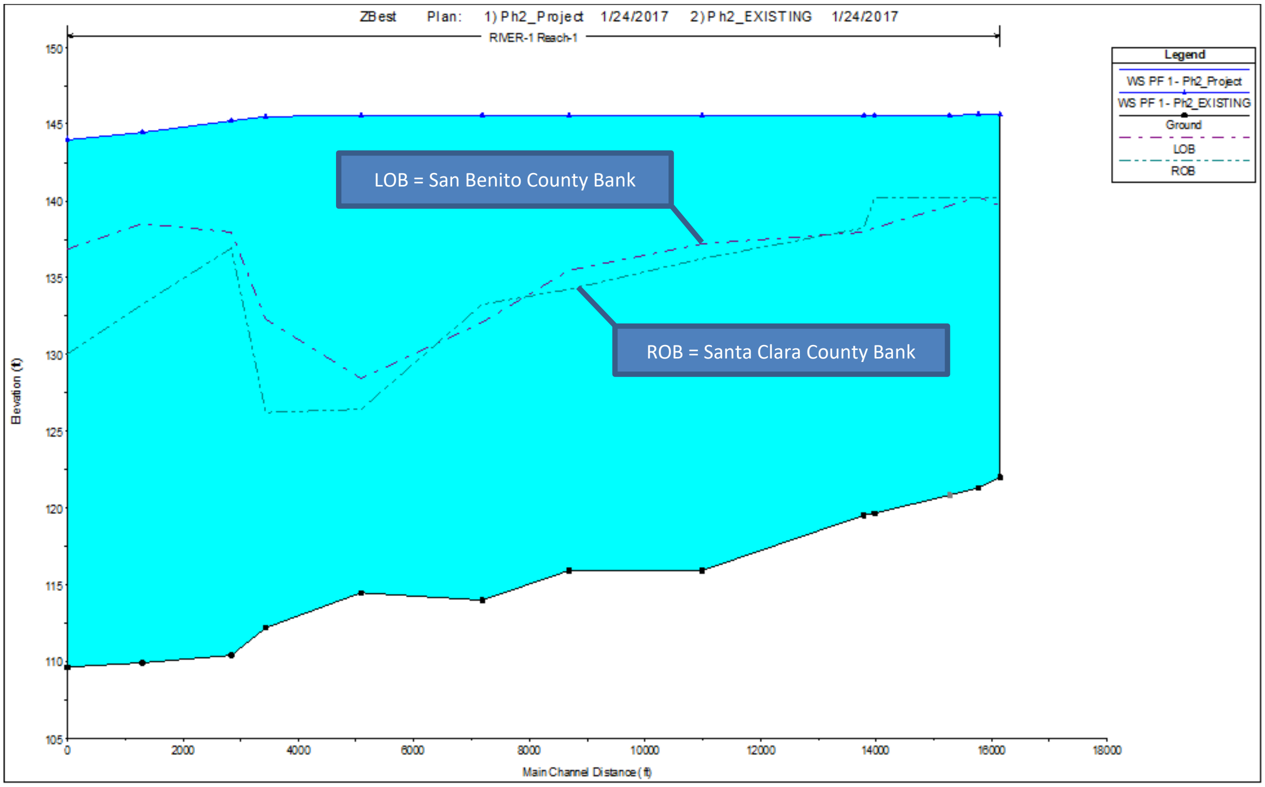


Figure 9. 100-yr WSELs through Soap Lake for the Pre-Existing and Project Scenarios

Table 2. Existing and Post-Project Scenario 100-YR Event WSELs

Model River Station XS	Pre-Existing WSEL (ft NGVD)	Post-Project WSEL (ft NGVD)	Difference
16944*	145.63	145.63	0.00
16198*	145.61	145.62	0.01
15998*	145.61	145.61	0.00
15698*	145.59	145.60	0.00
14403*	145.56	145.56	0.00
14214*	145.56	145.56	0.00
11414	145.55	145.55	0.00
9114	145.55	145.55	0.00
7614	145.55	145.55	0.00
5514	145.54	145.54	0.00
3864	145.50	145.50	0.00
3264	145.24	145.24	0.00
1734	144.45	144.45	0.00
434	144.00	144.00	0.00

**Cross Section thru Project Area*

The floodplain model ends at Highway 25. Comparing proposed contours at the high point of the highway alignment to pre-existing contours (Figure 10), there is no significant difference in roadway elevations and overall, the regraded roadway appears to provide more flow conveyance than under pre-existing conditions. In other words, the slight decrease in grade is greater in volume than the slight increase in grade. This suggests that the impact analysis need not be carried further upstream. Flooding will not be deeper with increased flow conveyance over the highway.

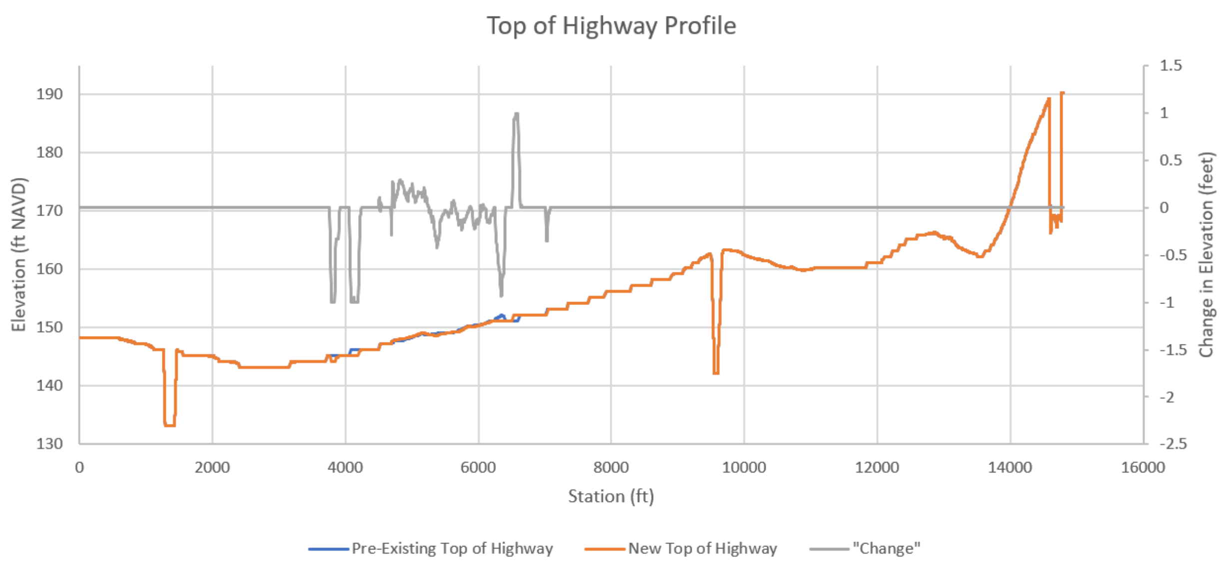


Figure 10. Nominal Grading Changes at Highway 25

Conclusion

Based on the hydraulic analysis documented herein, the Z-Best Expansion Project has no adverse impact on flood storage volumes or 100-yr water surface elevations.

TECHNICAL MEMORANDUM

DATE July 5, 2022 **Project No.** GL13397640

TO John Doyle
Z-Best Products

CC

FROM Richard Haughey

RE: CLARIFICATON OF PREVIOUS HYDROLOGY AND WATER SUPPLY ANALYSES, Z-BEST COMPOST FACILITY

This memorandum responds to comments/questions contained in the memorandum from AECOM to the County of Santa Clara, dated June 8, 2022, regarding existing hydrology and water supply analyses contained in the Draft Environmental Impact Report for the Z-Best Composting Project.

AECOM's comments and questions are primarily focused on the use of Golder's three memoranda (October 28, 2016, March 26, 2019, June 7, 2019) to satisfy CEQA requirements and on future groundwater use. As such, we are providing an overall response and not responding to each individual comment or question. The response below is being provided to estimate the anticipated change in groundwater usage at the site related to the proposed project.

We acknowledge that there are actual and perceived inconsistencies between the three memoranda, and the three memoranda contain information determined to be incorrect. The information contained this memorandum supersedes the three memoranda.

The purpose of Golder's water balances was to comply with the requirements of the State Water Resources Control Board Order WQ 2015-0121-DWQ, General Waste Discharge Requirements for Composting Operations. The water balances review the current project and proposed project currently under design in terms of verifying adequate onsite storage for compost run-off based on average water usage at the site and a specified design storm event. As domestic water use does not affect the water balance, domestic water was not included in any of the water balances. Additionally, the water balances were not intended to comply with CEQA Guidelines or to evaluate the potential impact on nearby water supply wells.

As the project design has evolved, it was determined to not fill the western portion of Detention Basin 1 (DB-1). A drainage ditch will be constructed along the north side of the western portion of DB-1 to intercept storm runoff from the area between the ECS compost pad and DB-1 to prevent the storm runoff from flowing into the western portion of DB-1. The runoff will be conveyed to the redesigned DB-1 and used for the compost operation or for dust control. The unfilled western portion of DB-1 can be dredged, although, after the proposed project is constructed, the water collected in the unfilled western portion of DB-1 will be direct precipitation, which will be pumped out and used for the compost operation or for dust control.

Any sediments within the footprint of the redesigned DB-1 will be removed during grading and can be re-composted.

Although the relocated site entrance is not specifically discussed in Schaaf and Wheeler's January 19, 2022, memorandum, the relocated site entrance is clearly shown on Figure 1. Schaaf & Wheeler has reviewed its work and confirmed that the estimated floodplain loss stated in their January 19, 2022, memorandum includes the earthfill associated with the relocated site entrance. Additionally, Schaaf and Wheeler's January 19, 2022 memorandum considered the impacts of proposed work within the State Route 25 right-of-way.

After reviewing AECOM's comments, we revisited our water balances. To simplify comparison of the water balances, we worked backwards from the quantity of groundwater currently used to supplement surface water.

The existing compost operation is comprised of three activities:

- CTI MSW composting
- Yard waste (green waste) composting
- Storage and blending of cured compost

The CTI MSW composting is an in-vessel composting method and does not require moisture conditioning or make-up water. The yard waste composting requires moisture conditioning and make-up water for both the primary and secondary composting phases. The storage and blending operation does not require moisture condition or make-up water. In addition to moisture conditioning and make-up water for the yard waste composting operation, water is used for dust control. Water for moisture conditioning, make-up water, and dust control is obtained from two sources, the two on-site detention basins and groundwater.

The detention basins typically run dry by summer. As the water requirements for the composting operation and dust control exceed the water available from the detention basins, groundwater is used to make up the difference. Based on flow data reported to the Valley Water from 2015 to 2020, annual groundwater usage at the site varied from approximately 15.4 million gallons to approximately 38.7 million gallons. The lower groundwater usage was associated with periods of maintenance or repairs to the well pump. Because of this, approximately 31.6 million to 38.8 million gallons is more representative of typical annual groundwater usage.

Surface runoff flows to the two detention basins. Water is pumped from the detention basins for use in the composting operation and dust control. Water is also lost from the basins due to evaporation.

Based on the average rainfall, the annual inflow to the two detention basins is approximately 43.8 million gallons. The annual evaporation loss is approximately 11.1 million gallons. The resulting net available surface water is approximately 32.7 million gallons.

The annual water usage for the existing composting operation is the total of the net available surface water and the groundwater, approximately 64.3 million to 71.4 million gallons.

The proposed project will replace the CTI MSW composting with an Engineered Compost Systems (ECS) composting system, which includes a concrete compost pad. The Area 1 detention basin, DB-1, is being reconfigured with less surface area resulting in a reduction in water loss due to evaporation. There is also an additional small area south of the compost pad that will drain to DB-1.

The ECS composting will require moisture conditioning and make-up water. The yard waste composting operation and cured compost storage and blending operation will be unchanged as will dust control. As a result, the annual water usage will increase by the water required for the ECS composting.

The increased water required by the ECS composting will be partially offset by a minor increase in the runoff from the ECS compost pad and the reduction in evaporation loss. The annual inflow to the two detention basins will be approximately 45.2 million gallons. The annual evaporation loss is approximately 8.4 million gallons. The resulting net available surface water is approximately 36.8 million gallons.

Based on information from ECS, the primary composting will require 20,000 gallons of water per day and the secondary composting will require 40,000 gallons of water per day, or an additional 21.9 million gallons per year.

The total annual water usage for the proposed project is 86.2 million to 93.3 million gallons. Subtracting the net available surface water, the annual quantity of groundwater required to supplement the surface water is 49.4 million to 56.5 million gallons, an increase of approximately 17.8 million gallons compared to the existing project.

Golder Associates USA Inc.

Richard D. Haughey

Richard D. Haughey, PE
Director, Civil Engineer

g:\projects\z-best\133-97640 (grading plan)\ecs\environmental impact report\aecom response_07052022.docx

WSP GOLDER

TECHNICAL MEMORANDUM

DATE October 25, 2022 **Project No.** GL13397640

TO John Doyle
Z-Best Products

CC Lindsey Angell

FROM Richard Haughey **EMAIL** rhaughey@golder.com

RE: RESPONSE TO "MEMORANDUM: FURTHER CLARIFICATION OF HYDROLOGY AND SUPPLY ANALYSES AND THE GROUNDWATGER DRAWDOWN EVALUATION"

This memorandum was prepared by WSP Golder to respond to the comment noted in AECOM's October 21, 2022 email to you.

Comment: The table of monthly domestic water use from 2018 through 2021 within bullet 1 of Golder's memo dated August 22, 2022 (revised Oct 11, 2022) was modified to include the previously missing April values, as requested. However, the total sum of all 12 months does not match the total annual value shown in the table (the difference for each year ranges from approximately 4,000 to 18,000). It is noted that the April values that were added to the table match exactly to the May values, therefore it is suspected that values from the wrong month were added to the table by mistake. I have attached a copy of Golder's memo with the inconsistent values highlighted.

Response: Golder has revised its August 22, 2022 memorandum to correct the domestic water use table. When the April domestic water use quantities were omitted, the domestic water use quantities for following months were moved forward. The total domestic usage shown in the August 22, 2022 memorandum was correct.

Golder Associates USA Inc.

Richard D. Haughey, PE
Director, Civil Engineering

Distribution: Lindsey Angell

Attachment: August 22, 2022 Memorandum (Revised 10/25/2022)

https://golderassociates.sharepoint.com/sites/129941/project files/5 technical work/permitting/memo_10252022.docx

TECHNICAL MEMORANDUM

DATE August 22, 2022
(Rev. 10/25/2022)

Project No. GL13397640

TO John Doyle
Z-Best Products

CC Lindsey Angell, WSP Golder

FROM Richard Haughey

EMAIL rhaughey@golder.ccom

RE: FURTHER CLARIFICATION OF PREVIOUS HYDROLOGY AND WATER SUPPLY ANALYSES, Z-BEST COMPOST FACILITY

This memorandum responds to comments/questions contained in the memorandum from AECOM to the County of Santa Clara, dated July 20, 2022, regarding responses by Z-Best and Golder to AECOM's June 8, 2022, memorandum as well as other requested clarifications in AECOM's July 20, 2022, memorandum.

The comments/questions are repeated in italics below followed by the response.

1. *As stated in Golder's response memo (July 5, 2022), their water balance equations do not account for domestic water use.* ***Please provide site-specific data on existing domestic water usage.*** *If site-specific data is not provided by Z-Best, AECOM will need to research average per employee water use rates to determine an appropriate rate to apply in order to calculate the anticipated increase in domestic water use as a result of the Project.*

   All water for domestic use is obtained from the shop domestic well. Based on groundwater quantities reported to Valley Water, domestic groundwater usage for the last 4 years is shown in the following table.

	2018	2019	2020	2021
January	30,720	14,290	12,450	57,090
February	15,390	25,320	12,240	17,530
March	44,710	15,280	10,520	17,570
April	20,420	10,720	37,500	24,430
May	21,040	19,220	57,200	33,230
June	48,310	14,880	40,690	32,140
July	83,480	79,140	82,520	65,510
August	76,300	79,270	57,480	37,590

September	51,180	72,590	149,300	65,510
October	35,520	84,427	55,000	37,590
November	57,300	60,311	122,900	27,510
December	24,750	18,512	56,110	12,860
Total	509,120	493,960	693,910	428,560

2. *The Golder response memo also does not evaluate the potential impact on nearby water supply wells. If such an evaluation is not provided by Z-Best or their consultants, AECOM hydrologists will need to model the anticipated radius of influence for the Z-Best on-site wells and amount of drawdown anticipated at the neighboring agricultural wells using Theis's method for unsteady flow for a well (Kruseman and de Ridder 1991). The model can be run using conservative assumptions; however, the following information is requested (if available) to refine the model inputs:*
    a. *Details of the 3 existing Z-Best on-site wells and typical operation (e.g., depth to water, screening intervals, well logs, existing pump rates, typical distribution of pumping between the wells under existing and anticipated proposed use, if known—i.e., are the 3 wells pumped equally or is one used more than the others).*

Golder initiated work on evaluating the potential impact on nearby water supply wells based on comments from the July 15, 2022, meeting with the County and AECOM. It is anticipated that the evaluation will be completed within 1 week.

3. *The Golder response memo states that Schaaf and Wheeler has confirmed that the estimated floodplain loss stated in their January 19, 2022 memorandum accounted for the earthfill associated with the relocated site entrance and associated work within the State Route (SR) 25 right-of-way (ROW). However, Table 1 in Schaaf and Wheeler's memo, which summarizes the various components of the project and the associated volume of floodplain storage, only lists the following components:*
    a. *Fill above [sic1] BFE for compost pad*
    b. *Area removed from 100-yr floodplain due to Detention Basin 1 berms*
    c. *Excavation below BFE in Area 2*

The latest design plans (April 2022) for the project state that 2,960 cubic yards of fill is proposed within the SR-25 ROW (Drawing 7) and indicate that at least a portion of that fill would be placed below the Base Flood Elevation (BFE) of 148.5 feet (Drawing 12D). However, the Schaaf & Wheeler reports do not include any mention of how many acre-feet of floodplain storage would be removed due to this fill.

Please ask Schaaf & Wheeler to revise their memo to correct the typographical error in Table 1 (see footnote 1) and to clarify how many acre-feet of floodplain storage would be lost due to fill in the SR-25 ROW and whether the proposed floodplain storage in Area 2 would be sufficient to account for this additional fill. A site map showing the various areas of flood storage gain and flood storage loss (and associated volumes) would also be helpful.

Please also ask Schaaf & Wheeler to provide backup data and calculations that are consistent with and support the updated floodplain storage analysis provided in their January 19, 2022 memorandum and that reflect the latest April 2022 project plans.

Schaaf & Wheeler have been requested to revise their memorandum and it will be submitted seperately.

4. *The Golder memo states that the information contained in their July 5 memorandum supersedes the three previous memoranda which contained inconsistencies and errors. Please ask Golder to provide backup data and calculations that are consistent with and support the summary water balance information provided in the July 5, 2022 memorandum.*

   A memorandum providing the requested information is attached.

5. *The Golder memo mentions a drainage ditch to be constructed along the north side of the western portion of Detention Basin #1, which does not appear to be shown on the project plans. Please provide an updated Drawing 13 showing the location and contours of the proposed drainage ditch and provide north-south sections through the western and eastern portions of the detention basin showing both existing and proposed ground surfaces. Please also update Proposed Basin Section A on Drawing 13 to show the proposed ground surface on the outer slopes of the Detention Basin #1 berms, which are currently missing from the section.*

   A revised drawing 13 is attached.

6. *The 2016 Golder memo (Section 4.2) mentions a 300,000-gallon leachate storage tank. Please confirm that this leachate storage tank is no longer part of current or proposed operations.*

   A 300,000-gallon leachate storage tank has never been part of the current or proposed project.

7. *The original Draft EIR (page 3-22) states that stormwater from the CTI processing area is considered leachate and is directed to unlined ditches that deliver the stormwater/leachate to Detention Basin #1. It also states that "leachate is also produced as a by-product of the composting process." Please provide clarification of how this "by-product leachate" is currently managed.*

   In its General Compost Order, the State Water Resources Control Board defines runoff from a compost area as wastewater. Leachate is often used to describe runoff from a compost area. The MSW material received is high moisture content feedstock and thus produces leachate during composting. The excess moisture mixes with other surface runoff and flows to drainage ditches that convey the runoff to Detention Basin #1 where it is detained for on-site use. This leachate will continue to be produced with the proposed ECS system and will be managed in the same way.

8. *Valley Water requested additional information in their comment letter on the original Draft EIR that does not appear to have been addressed/provided within the revised Golder or Schaaf & Wheeler memorandums. Please provide a copy of Schaaf & Wheeler's "Grading and Flood Study Summary Report" dated April 26, 2011 (Item 6 from Valley Water comment letter) or a more updated version detailing development of the hydraulic model used as the basis for Schaaf & Wheeler's January 2022 memo (see bullet point 3, above).*

   Schaaf & Wheeler have been asked to respond to Valley Water's comment. Their response will be submitted separately.

If you have any questions or need additional information, contact the undersigned.

Golder Associates USA Inc.

Richard D. Haughey
Director, Civil Engineering

Attachments: Water Supply Evaluation Memorandum
Revised Drawing 13

https://golderassociates.sharepoint.com/sites/129941/project files/5 technical work/permitting/aecom responses_08182022.docx

ATTACHMENT 1

Water Supply Evaluation Memorandum

ATTACHMENT 2

Revised Drawing 13

ATTACHMENT 1

Water Supply Evaluation Memorandum

Date:	August 15, 2022	**Made by:**	AB
Project No.:	GL13397640	**Checked by:**	HSG
Subject:	Water Supply Evaluation	**Reviewed by:**	LMA
Project Short Title:	Z-Best Compost Facility		

1.0 OBJECTIVE:

Evaluate water supply sources for existing and proposed compost facility operations.

2.0 METHODOLOGY:

Estimate monthly inflows and outflows for Detention Basin 1 and Detention Basin 2 (DB-1 and DB-2). Inflows consist of direct precipitation into DB-1 and DB-2 and facility runoff. Outflows include DB-1 and DB-2 evaporation and use of water for compost moisture conditioning and dust control. If compost operations water requirements exceed available water from DB-1 and DB-2, estimate the volume of groundwater required to make-up the difference.

Separate reports have been previously prepared presenting detailed water balances for the existing and proposed compost facility operations. This memorandum presents a conservative overview of water requirements and water supply sources.

3.0 ASSUMPTIONS/GIVENS:

The existing compost operation is comprised of three activities:

- CTI MSW composting
- Yard waste (green waste) composting
- Storage and blending of cured compost

The CTI MSW composting is an in-vessel composting method and does not require moisture conditioning or make-up water. The yard waste composting requires moisture conditioning and make-up water for both the primary and secondary composting phases. The storage and blending operation do not require moisture conditioning or make-up water. In addition to moisture conditioning and make-up water for the yard waste composting operation, water is used for dust control. Water for moisture conditioning, make-up water, and dust control is obtained from two sources, the two on-site detention basins and groundwater.

As part of proposed modifications to the compost operation, the CTI MSW composting will be replaced with an Engineered Compost Systems (ECS) composting system, which includes a concrete compost pad. The ECS composting will require moisture conditioning and make-up water. The existing yard waste composting operation and cured compost storage and blending operation will be unchanged as will dust control. As a result, the annual water usage will increase by the water required for the ECS composting.

For purposes of this evaluation, the composting system is assumed to operate in a steady-state condition, i.e., the quantity of feedstock entering the system is equivalent to the quantity of finished compost removed from the system. A detailed breakdown of each water use has not been prepared. The amount of water required for the compost facility operation is based on the available surface water and groundwater production records.

3.1 Stage-Storage Relationship

The stage-storage relationships for Detention Basins 1 and 2 at the Z-Best Compost Facility provide information relating the water elevation, surface area, and volume of the basins. These relationships were determined using the design grades for the existing detention basins. Tables 1 and 2 show Detention Basins 1 and 2 stage-storage relationship data.

Table 1: Existing Detention Basin 1 Stage-Storage Data

Elevation (ft)	Water Surface Area (sq ft)	Incremental Water Volume (gal)	Cumulative Water Volume (Acre-ft)
139	274,324	1,989,192	9,138,789
138	262,958	1,905,503	7,149,598
137	251,722	1,822,772	5,244,095
136	240,615	1,740,997	3,421,322
135	229,637	1,680,326	1,680,326
134	224,197	0	0

Table 2: Existing Detention Basin 2 Stage-Storage Data

Elevation (ft)	Water Surface Area (sq ft)	Incremental Water Volume (gal)	Cumulative Water Volume (Acre-ft)
145	85,340	614,939	3,240,686
144	80,764	583,891	2,625,747
143	76,949	555,552	2,041,855
142	73,111	526,297	1,486,304
141	69,051	495,813	960,006
140	64,880	464,194	464,194
139	60,515	0	0

4.0 EXISTING OPERATION WATER USAGE

The average annual conditions over a period of several years were used to estimate inflows and outflows for the existing operation. Each of the inflows and outflows are described in detail in the following sections.

4.1 Inflows

Inflows include direct precipitation to the detention basins and stormwater runoff from the operational areas as described below. It is assumed that the quantity of water used for the composting operations and dust control is the minimum required and, as a result, there is no runoff from the compost pad to the detention basins from the application of water for compost operations or dust control.

4.1.1 Direct Precipitation in Detention Basins

The Isohyetal Map of Santa Clara County Mean Annual Precipitation, included in the Santa Clara County Hydrology Manual (October 2007), shows a mean annual precipitation for the site of approximately 21 inches. Monthly precipitation data was obtained from the Western Regional Climate Center (WRCC) website. Precipitation data was also obtained from records for Weather Station 043417 in Gilroy, CA. This station is located at 37° 0' 24 N and 121° 33' 48 W at elevation 190 feet approximately 8 miles northwest from the site. The data range is March 1, 1906, to June 10, 2016. The mean annual precipitation for this range of data is 20.83 inches. Therefore, with over 100 years of precipitation data, the monthly precipitation data based on Gilroy Station 043417 with an annual mean precipitation of 20.83 inches was used.

Table 3: Average Monthly Precipitation

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual Total [1]
Average Precipitation (in)	4.70	3.74	3.24	1.40	0.39	0.10	0.05	0.05	0.32	0.90	2.21	3.72	20.83

[1] Precipitation values may not add to 20.83 inches due to rounding.

To apply the monthly precipitation as an inflow to the water balance model, the area of DB-1 footprint (274,324 sq ft) and DB-2 footprint (85,340 sq ft) is multiplied by the amount of rainfall in the particular month and converted to gallons, according to the equation below. The basin is always subject to precipitation inflow, regardless of whether the other operational inflows are occurring.

$$P = \frac{R \times A}{12} \times 7.481\ gal/cf$$

Where:

P = monthly precipitation volume (gallons)
R = monthly rainfall from historical data (inches)
A = area of the Detention Basin footprint (ft^2)

Table 4: Average Monthly Direct Precipitation

Month	Existing Detention Basin 1 (gal)	Existing Detention Basin 2 (gal)
January	803,785	250,051
February	639,608	198,977
March	554,099	172,367
April	239,425	74,483
May	66,697	20,749
June	17,102	5,320
July	8,551	2,660
August	8,551	2,660
September	54,726	17,025
October	153,916	47,882
November	377,950	117,577
December	636,188	197,913
Totals	3,560,598	1,107,674

4.1.2 Existing Compost Facility Stormwater Runoff

The compost facility pad stormwater runoff was calculated by multiplying the average monthly precipitation, the drainage area for each basin (sq ft), and the runoff coefficient. Area 1 will drain to DB-1 and Area 2 will drain to DB-2. The average runoff coefficient of 0.72 for DB-1 and DB-2 was estimated based on calculated coefficients at similar composting facilities. Tables 5 and 6 show the average monthly compost facility stormwater runoff.

Table 5: Existing Compost Facility Stormwater Runoff Calculation – DB-1

Month	Drainage Area (sq ft)	Runoff Coefficient C	Precipitation (inches)	Monthly Facility Direct Precipitation (gallons)	Stormwater Runoff (gallons)
January	3,057,780	0.72	4.70	7,253,744	6,449,959
February	3,057,780	0.72	3.74	5,772,128	5,132,520
March	3,057,780	0.72	3.24	5,000,453	4,446,355
April	3,057,780	0.72	1.40	2,160,690	1,921,264
May	3,057,780	0.72	0.39	601,906	535,209
June	3,057,780	0.72	0.10	154,335	137,233
July	3,057,780	0.72	0.05	77,167	68,617
August	3,057,780	0.72	0.05	77,167	68,617
September	3,057,780	0.72	0.32	493,872	439,146
October	3,057,780	0.72	0.90	1,389,015	1,235,098
November	3,057,780	0.72	2.21	3,410,803	3,032,853
December	3,057,780	0.72	3.72	5,741,261	5,105,074
Totals			20.83	32,132,543	28,571,945

Notes:

[1] The compost pad runoff volume was calculated by multiplying the monthly precipitation volume by the runoff coefficient.

[2] The monthly precipitation may not add to 20.83 inches due to rounding.

Table 6: Existing Compost Facility Runoff Calculation – DB-2

Month	Drainage Area (sq ft)	Runoff Coefficient C	Precipitation (inches)	Monthly Facility Direct Precipitation (gallons)	Stormwater Runoff (gallons)
January	1,132,560	0.72	4.70	3,318,023	2,388,977
February	1,132,560	0.72	3.74	2,640,299	1,901,016
March	1,132,560	0.72	3.24	2,287,318	1,646,869
April	1,132,560	0.72	1.40	988,347	711,610
May	1,132,560	0.72	0.39	275,325	198,234
June	1,132,560	0.72	0.10	70,596	50,829
July	1,132,560	0.72	0.05	35,298	25,415
August	1,132,560	0.72	0.05	35,298	25,415
September	1,132,560	0.72	0.32	225,908	162,654
October	1,132,560	0.72	0.90	635,366	457,464
November	1,132,560	0.72	2.21	1,560,177	1,123,327
December	1,132,560	0.72	3.72	2,626,180	1,890,850
Totals	26 acres	-	20.83 [3]	14,698,137	10,582,659

Notes:

[1] The compost pad runoff volume was calculated by multiplying the monthly precipitation volume by the runoff coefficient.

[2] Monthly precipitation may not add to 20.83 inches due to rounding.

4.2 Outflows

Outflows include basin evaporation and water usage for compost operations and dust control, as described below.

4.2.1 Monthly Evaporation

Evapotranspiration (ETo) data was obtained from the CIMIS website from records for Station 211 in Gilroy, California. ETo values are considered equal to evaporation from a large body of water, such as a basin or lake. The data range retrieved is September 1, 2009, to June 10, 2016. The mean annual evaporation for this range of data is 49.56 inches.

Table 7: Average Monthly Evaporation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Evaporation (in)	1.55	2.00	3.55	4.71	6.08	6.65	6.99	6.32	4.93	3.50	1.89	1.39	49.56

The monthly evaporation for the basins is calculated using the following equation:

$$E = \frac{R \times SA}{12} \times 7.481\, gal\ / cf$$

where:

E = monthly evaporation (gallons)
R = evaporation rate from historical data (inches)
SA = surface area of basin at the beginning of month (ft^2)

As conservative assumptions, for the purposes of estimating evaporation from DB-1 and DB-2, it is assumed both DB-1 and DB-2 are full, which will maximize the evaporation quantity. Monthly evaporation quantities are shown in Table 8.

Table 8: Average Monthly Evaporation Quantity

Month	Existing DB-1 (gal)	Existing DB-2 (gal)
January	265,078	82,464
February	342,036	106,405
March	607,114	188,868
April	805,496	250,583
May	1,039,790	323,470
June	1,137,271	353,796
July	1,195,417	371,885
August	1,080,835	336,239
September	843,119	262,288
October	598,564	186,208
November	323,224	100,552
December	237,715	73,951
Total	8,475,680	2,636,710

Notes:

[1] Evaporation was estimated by multiplying the average monthly evaporation from Table 8 by the maximum surface area.

[2] DB-1 and DB-2 were assumed to be full with a surface area of 274,324 sq ft and 85,340 sq ft, respectively.

4.2.2 Current Water Usage for Compost Operations

Current water usage for compost operations, including dust control, can be estimated based on the available water from DB-1 and DB-2 and groundwater production. Currently, DB-1 and DB-2 run dry during the summer months will all water either evaporating or being used for compost operations. The water requirements for the compost operations exceed the available water from DB-1 and DB-2. Groundwater is used to offset the shortfall. All groundwater for compost operations is provided by a well located at the eastern boundary of the site.

Groundwater production is metered as required by Valley Water for purposes of paying a pump tax. Based on metered data reported to Valley Water from 2015 to 2020, annual groundwater production for compost operations varied from approximately 15.4 million gallons to 38.7 million gallons. The lower groundwater production years were associated with periods of maintenance or repairs to the well pump. Because of this, approximately 31.6 million to 38.7 million gallons is likely more representative of typical annual groundwater production for compost operations.

Table 9: Historic Groundwater Production

Year	Groundwater Production (gal)
2015	31,611,000
2016	22,603,050
2017	15,433,255
2018	38,658,124
2019	17,762,000
2020	24,437,245

Notes:

[1] During times when the well pump was being maintained or repaired, the shared well was used. During those times, there is not available records of how much of the groundwater production was used for compost operations.

[2] A new well was installed in 2021 and there is not yet a full year groundwater production data available.

The total water requirement can be estimated by adding the available water from DB-1 and DB-2 and the groundwater production as summarized in Table 10.

Table 10: Existing Compost Operations Water Requirement (gallons)

Inflow	DB-1	32,132,543	
	DB-2	11,690,332	
	Subtotal	43,822,875	
Evaporation	DB-1	8,475,660	
	DB-2	2,636,710	
	Subtotal	11,112,370	
	Net Available Surface Water	32,710,505	
Groundwater Production		31,600,000	38,700,000
	Total Water Requirement	64,310,505	71,410,505

Note: Inflow includes direct precipitation and compost facility stormwater runoff.

5.0 PROPOSED COMPOST OPERATION WATER USAGE

5.1 Estimated Inflows and Outflows for Proposed Compost Operation

The proposed project will replace the CTI MSW composting with an ECS composting system, which includes a concrete compost pad. The stormwater runoff from the compost pad will increase slightly due to the higher runoff coefficient (0.76) of the concrete compost pad compared to the existing composting area (0.72). Stormwater runoff from an approximately 2.6-acre area south of the compost pad, which currently does not flow to Area 1 detention basin, DB-1, will be intercepted and conveyed to DB-1. DB-1 is being reconfigured with less surface area (185,388 sq ft) resulting in a reduction in direct precipitation and in water loss due to evaporation. Direct precipitation, runoff, and evaporation for the reconfigured DB-1 are shown in the following tables.

Table 11: Reconfigured DB-1 Direct Precipitation and Evaporation

Month	Direct Precipitation (gal)	Evaporation (gal)
January	543,198	768,567
February	432,247	807,862
March	374,460	730,427
April	161,804	569,780
May	45,074	404,509
June	11,557	218,435
July	5,779	160,648
August	5,779	179,140
September	36,984	231,148
October	104,017	410,288
November	255,418	544,353
December	429,935	702,690
Total	2,406,250	5,727,846

Table 12: Proposed Compost Operation Stormwater Runoff

Month	Drainage Area (sq ft)	Runoff Coefficient C	Precipitation (inches)	Monthly Facility Direct Precipitation (gallons)	Stormwater Runoff (gallons)
January	3,170,560	0.76	4.70	9,289,925	7,022,213
February	3,170,560	0.76	3.74	7,392,408	5,587,889
March	3,170,560	0.76	3.24	6,404,118	4,840,845
April	3,170,560	0.76	1.40	2,767,212	2,091,723
May	3,170,560	0.76	0.39	770,866	582,694
June	3,170,560	0.76	0.10	197,658	149,409
July	3,170,560	0.76	0.05	98,829	74,704
August	3,170,560	0.76	0.05	98,829	74,704
September	3,170,560	0.76	0.32	632,506	478,108
October	3,170,560	0.76	0.90	1,778,922	1,344,679
November	3,170,560	0.76	2.21	4,368,241	3,301,934
December	3,170,560	0.76	3.72	7,352,877	5,558,007
Total			20.83 [3]	41,152,390	31,106,911

Notes:

[1] The drainage area includes an approximately 2.2.6-acre area south of the compost pad.

[2] The compost pad stormwater runoff volume was calculated by multiplying the monthly precipitation volume by the runoff coefficient.

[3] Monthly precipitation may not add to 20.83 inches due to rounding.

The ECS composting will require moisture conditioning and make-up water. The existing yard waste composting operation and cured compost storage and blending operation will be unchanged as will dust control. As a result, the annual water usage will increase by the water required for the ECS composting.

Based on information from ECS, the primary composting phase will require an average 20,000 gallons of water per day and the secondary composting phase will require an average 40,000 gallons of water per day, or an additional 21.9 million gallons per year.

The total water requirement for the proposed compost operation can be estimated by adding the existing water requirement and additional water required by the ECS compost system as summarized in Table 13.

Table 13: Proposed Compost Operations Water Requirement (gallons)

Inflow	DB-1	33,513,161	
	DB-2	11,690,332	
	Subtotal	45,203,493	
Evaporation	DB-1	5,727,846	
	DB-2	2,636,710	
	Subtotal	8,364,556	
	Existing Water Usage	64,310,506	71,410,506
	ECS Compost System	21,900,000	21,900,000
	Total Water Usage	86,210,506	93,310,506
	Available Surface Water	36,838,938	36,838,938
	Required Groundwater	49,371,568	56,471,568
	Additional Groundwater	17,771,568	17,771,568

Note: Inflow includes direct precipitation and compost facility stormwater runoff.

The total annual water requirement for the proposed project is 86.2 million to 93.3 million gallons. Subtracting the net available surface water, the annual quantity of groundwater required to supplement the surface water is 49.4 million to 56.5 million gallons, an increase of approximately 17.8 million gallons compared to the existing project.

6.0 SUMMARY

Based on the average rainfall, the annual inflow to the two detention basins is approximately 43.8 million gallons for the current compost operation and approximately 45.2 million gallons for the proposed compost operation. The annual evaporation loss is approximately 11.1 million gallons for the current compost operation and approximately 8.4 million gallons for the proposed compost operation. The resulting net available surface water is approximately 32.7 million gallons for the current compost operation and approximately 36.8 million gallons for the proposed compost operation.

Groundwater well meter records from the site indicate that annual groundwater usage is between 31.6 and 38.7 million gallons. Therefore, the total annual water usage for the current composting operation is approximately 64.3 million to 71.4 million gallons.

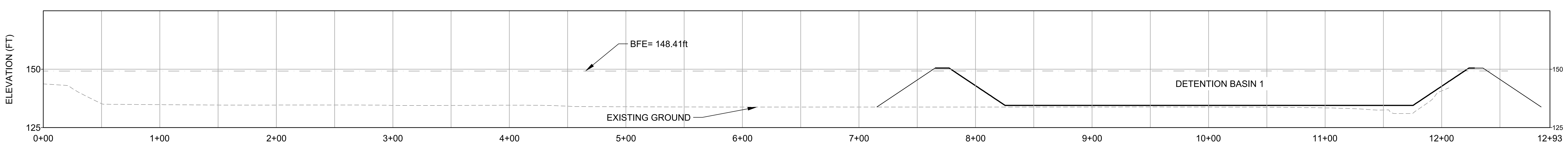
The proposed compost operation will increase the total annual water requirement by 21.9 million gallons to between approximately 86.2 and 93.3 million gallons. Additional groundwater production will be required to meet the increased annual water requirement. The annual groundwater usage will increase to between approximately 49.4 million gallons and 56.5 million gallons.

https://golderassociates.sharepoint.com/sites/129941/project files/5 technical work/permitting/ceqa water balance calc 2022-08-15 existing operations.docx

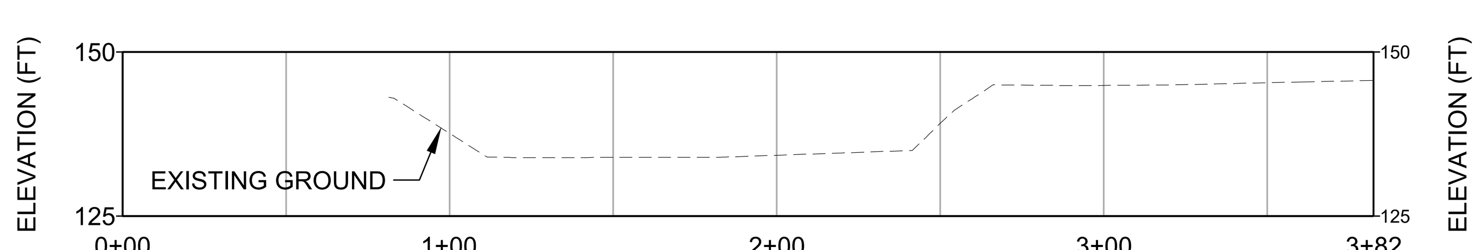
ATTACHMENT 2

Revised Drawing 13

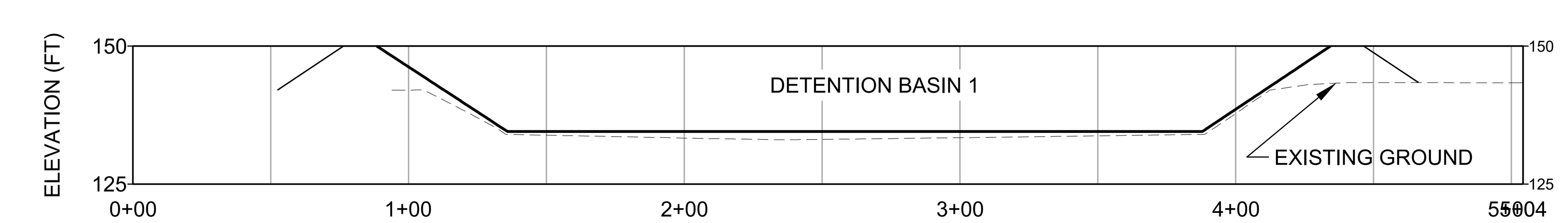
CUT/FILL SUMMARY			
AREA	CUT (CY)	FILL (CY)	NET (CY)
PROPOSED DETENTION BASIN	2	30,557	30,555 (FILL)
TOTAL	2	30,557	30,555 (FILL)



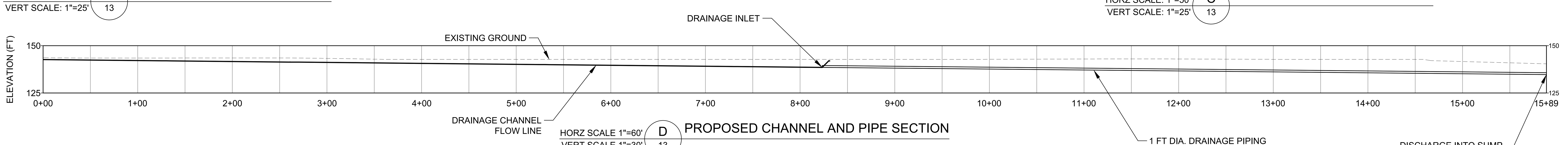
HORZ SCALE: 1"=50'
VERT SCALE: 1"=25'
A 13 PROPOSED BASIN SECTION A



HORZ SCALE: 1"=50'
VERT SCALE: 1"=25'
B 13 PROPOSED BASIN SECTION B



HORZ SCALE: 1"=50'
VERT SCALE: 1"=25'
C 13 PROPOSED BASIN SECTION C



HORZ SCALE 1"=60'
VERT SCALE 1"=30'
D 13 PROPOSED CHANNEL AND PIPE SECTION

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
6	2022-08-22	REVISED PER CEQA REVIEW COMMENTS	RDH	HSG	LMA	
5	2022-02-07	REVISED PER COUNTY COMMENTS	RDH	HSG	RDH	
4	2018-04-01	ISSUED FOR PERMIT	RDH	MAG	RDH	
3	2018-08-28	ISSUED FOR PERMIT	RDH	JMH	RDH	
2	2018-07-17	ISSUED FOR PERMIT	RDH	JDR	RDH	
1	2018-06-29	ISSUED FOR PERMIT	RDH	MAL	RDH	
0	2018-04-20	ISSUED FOR PERMIT	RDH	MAL	RDH	

CLIENT
Z-BEST COMPOST PRODUCTS
COMPOSTING FACILTY
GILROY, CALIFORNIA

CONSULTANT
GOLDER
MEMBER OF WSP

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PROJECT
AERATED STATIC PILE COMPOSTING PERMIT PACKAGE

TITLE
PROPOSED DETENTION BASIN 1 - PLAN AND SECTION

PROJECT NO.	COUNTY FILE NO.	REV.		DRAWING
133-97640	6498-81-11-09G 08P 08A 08EA	6	25 of 25	13

TECHNICAL MEMORANDUM

DATE August 26, 2022
(Rev. 10/5/2022)

Project No. GL13397640

TO John Doyle
Z-Best Composting Facility

CC Richard Haughey

FROM George Wegmann, PG, CHG; Michael Bombard, PG, CHG

EMAIL **george.wegmann@wsp.com**

GROUNDWATER DRAWDOWN EVALUATION, Z-BEST COMPOSTING FACILITY, GILROY, CALIFORNIA

1.0 INTRODUCTION

Golder Associates USA Inc. (Golder), a member of WSP, prepared this technical memorandum (memo) to address comments from the County of Santa Clara Department of Planning and Development regarding the potential impacts on nearby supply wells from the proposed project at the Z-Best Composting Facility in Gilroy, California.[1] Information requested by the County is stated below:

> *The Golder response memo also does not evaluate the potential impact on nearby water supply wells. If such an evaluation is not provided by Z-Best or their consultants, AECOM hydrologists will need to model the anticipated radius of influence for the Z-Best on-site wells and amount of drawdown anticipated at the neighboring agricultural wells using Theis's method for unsteady flow for a well (Kruseman and de Ridder 1991). The model can be run using conservative assumptions; however, the following information is requested (if available) to refine the model inputs:*
>
> > *o Details of the 3 existing Z-Best on-site wells and typical operation (e.g., depth to water, screening intervals, well logs, existing pump rates, typical distribution of pumping between the wells under existing and anticipated proposed use, if known—i.e., are the 3 wells pumped equally or is one used more than the others).*

A Golder California Certified Hydrogeologist modeled the potential effects on neighboring wells from increasing the groundwater extraction rate from the existing onsite production well based on established hydrogeological principles as noted herein. Golder revised this memo based on AECOM's *Memorandum: Further clarification of Hydrology and Supply Analyses and the groundwater drawdown evaluation, dated September 28, 2022.* Golder's response to comments is attached to this memo.

1.1 Background

The site is in the Llagas Subbasin (DWR Basin Number 3-3.01), which is part of the Gilroy-Hollister Valley Groundwater Basin (DWR Basin Number Basin 3-3), and encompasses approximately 87 square miles (CGB, 2004). The Llagas Subbasin is comprised of unconsolidated alluvial sediments with discontinuous layers of gravel and sand (aquifer materials) and clay and silt (confining units) at various depths beneath the ground surface (Valley Water, 2021). Groundwater generally flows from north to south following the topography. The

[1] AECOM, July 20, 2022 Memorandum: Further Clarification of Previous Hydrology and Water Supply Analyses, Z-Best Composting Facility – CEQA Services, addressed to Mr. Bharat Singh, County of Santa Clara Department of Planning and Development, 70 West Hedding Street, 7th Floor East Wing San Jose, CA 95110

subbasin ranges in thickness from about 500 feet at the northern boundary to over 1,000 feet thick beneath the Pajaro River while principal aquifer zones generally occur at depths below 150 feet.

Groundwater in the groundwater basin is primarily used for public and domestic water supply and for irrigation purposes. Long-term groundwater levels are stable and demonstrate sustainable groundwater conditions where the subbasin has not been identified as being critically overdrafted (Valley Water, 2021). Operational storage capacity of the Llagas Subbasin is estimated to be 150,000 acre-feet with natural recharge is estimated to be 44,300 acre-feet per year or 14,400 million gallons per year (MGPY) (CGB, 2004).

1.2 Water Usage

There are three wells located onsite that are currently used to provide water for site operations as shown on Attachment A, Figure 1 and listed on Table 1. Golder calculated usage rates based on information provided by Z-Best, including Valley Water well meter records since 2018, as summarized below. Also included in the table is the anticipated change in production rate of 21.9 MGPY from the primary extraction well (Main Agriculture Well) as part of the proposed project. The production rates from the other onsite wells remain the same. Two other production wells, referred to as Old Well A and Well 1, are located on site; however, these wells are not currently in use.

Table 1: Groundwater Usage

Well ID	Existing Baseline Production Rate	Change in Production Rate	Anticipated Future Production Rate
Well Y (Domestic Well)	0.5 MGPY	0	0.5 MGPY
Well Z (Shared Well)	14.3 MGPY	0	14.1 MGPY
Main Agriculture Well (Primary Extraction Well)	39 MGPY	21.9 MGPY	60.7 MGPY

Main Agriculture Well is operated at an average flow rate of 381 gallons per minute (gpm), and the desired average flow rate will be 590 gpm. Well Z is operated at an average flow rate of 277 gpm and Well Y is operated at an average flow rate of 5 gpm. According to Z-Best, the wells are operated for about 33 hours per week.

1.3 Offsite Wells

Golder completed a review of California's State Water Resources Control Board Division of Water Quality Groundwater Ambient Monitoring & Assessment Program (GAMA) database to identify offsite wells within the vicinity of the site. Production and domestic wells identified within a one-mile radius of the agriculture extraction well are shown in Figure 1 and listed in Section 2. It has not been confirmed if any of the identified wells are still in use or their production rates.

2.0 EVALUATION METHOD

Golder evaluated the potential impact of the increased pumping on water levels within one mile from the primary extraction well (referred to as Main Agriculture Well on Attachment A, Figure 1). A review of publicly available documents was completed to obtain basin-specific groundwater parameter data to calculate aquifer drawdown using the Theis solution for evaluating drawdown in a confined aquifer (Freeze and Cherry, 1979); however, specific information for the site vicinity was not identified. Z-Best provided pump test reports prepared by Integrated Water Management that provided well flow, pumping, and standing water level data. Golder was also able to obtain well logs for Well Y (domestic well), Well Z (shared well) and the Main Agriculture Well from the California Department of Water Resources Well Completion Reports Database. Copies of the well completion reports are included as Attachment B.

The well flow, and water level data was used to estimate the transmissivity (T) using Driscoll's approximation (Groundwater and Wells, Driscoll, 1986):

$$T = 2{,}000 \times Q/s_w$$

Where: T = transmissivity in gallons per day per foot (gpd/ft)
Q = flow in gallons per minute (gpm)
S_w = drawdown (feet)

Note: Driscoll's calculation assumes t = 1 day, r = 0.5 ft, T = 30,000 gpd/ft; S = 0.001 for a confined aquifer to calculate the factor of 2000. Using the assumed T and S to calculate the factor, errors of less than 7% were reported by Driscoll (Driscoll, 1986).

Golder used the 0.001 storativity value for our calculations. Additionally, Golder derived the average flow rate used in the calculations based on water use and operational data supplied by Z-Best. The annual usage rate of the domestic well (0.5 MGPY) is insignificant; therefore, this well was excluded from the analysis. Because the wells are operated approximately 33 hours per week or about 19.6 percent of the available hours and the model assumes continuous operation for the selected time period, use of the average flow rates listed in Section 1.2 as model values would greatly overstate the drawdown experienced at nearby wells. Therefore, proportional flow rates for Well Z's and Main Agriculture Well's current average flow rates and Main Agricultural Well's proposed average flow rate were calculated as follows:

Average Well Flow Rate (gpm) × 0.196 = Model Continuous Flow Rate

For Well Z, the calculation is:

277 gpm ×0.196 = 54 gpm

Performing the same calculations for the current and proposed average flow rates for Main Agricutlure Well, results in model continuous flow rates of 75 gpm and 116 gpm, respectively. Table 2 below lists the parameters used in the calculation of potential drawdown associated with the current production rates from Well Z and Main Agriculture Well and the proposed increased production rate from Main Agriculture Well.

Table 2: Parameters Used in Drawdown Calculations

Aquifer Parameters		Well Parameters		
Main Agriculture Well (Primary Extraction Well)				
K	26 ft/dy	Q (current)	75 gpm	14,439 ft^3/dy
S[1]	0.001	Q (proposed)	116 gpm	20,984 ft^3/dy
b[2]	497 ft	t	1, 6, 12, 60, and 120 months	
T[1]	12,707 ft^2/dy			
Well Z (Shared Well)				
K	140 ft/dy	Q (current)	54 gpm	10,396 ft^3/dy
S[1]	2.03E-02	t	1, 6, 12, 60, and 120 months	
b[3]	328 ft			
T[1]	45,875 ft^2/dy			
Well Operating Parameters				
Hours/Week	33	Weeks/Year	52	

Source: 1: Calculated using Driscoll's method from Groundwater and Wells, Driscoll 1986
2: Integrated Water Management Pump Test 7/20/2022
3: Integrated Water Management Pump Test 8/5/2022
K = hydraulic conductivity (calculated using the equation K=T/b)
S = Storativity
b = saturated thickness
T = Transmissivity
Q = average flow rate (adjusted in the model to be 19.6 percent of average flow rate based on well operating parameters)
t = time

The calculation of the drawdown in terms of radius and time is performed by first calculating *u* (a dimensionless variable necessary to performing the analytical drawdown solution), using the following equation:

$$u = \frac{r^2 S}{4Tt}$$

where:
r = radius (feet (ft)), S = storativity (dimensionless), T = Transmissivity (ft^2/dy), and t = time (days)

The resultant value of *u* is used to derive the well function (*W(u)) term* using a table such as Table 3 below:

Table 3: Values of *W(u)* for Various Values of *u*

u	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
$\times 1$	0.219	0.049	0.013	0.0038	0.0011	0.00036	0.00012	0.000038	0.000012
$\times 10^{-1}$	1.82	1.22	0.91	0.70	0.56	0.45	0.37	0.31	0.26
$\times 10^{-2}$	4.04	3.35	2.96	2.68	2.47	2.30	2.15	2.03	1.92
$\times 10^{-3}$	6.33	5.64	5.23	4.95	4.73	4.54	4.39	4.26	4.14
$\times 10^{-4}$	8.63	7.94	7.53	7.25	7.02	6.84	6.69	6.55	6.44
$\times 10^{-5}$	10.94	10.24	9.84	9.55	9.33	9.14	8.99	8.86	8.74
$\times 10^{-6}$	13.24	12.55	12.14	11.85	11.63	11.45	11.29	11.16	11.04
$\times 10^{-7}$	15.54	14.85	14.44	14.15	13.93	13.75	13.60	13.46	13.34
$\times 10^{-8}$	17.84	17.15	16.74	16.46	16.23	16.05	15.90	15.76	15.65
$\times 10^{-9}$	20.15	19.45	19.05	18.76	18.54	18.35	18.20	18.07	17.95
$\times 10^{-10}$	22.45	21.76	21.35	21.06	20.84	20.66	20.50	20.37	20.25
$\times 10^{-11}$	24.75	24.06	23.65	23.36	23.14	22.96	22.81	22.67	22.55
$\times 10^{-12}$	27.05	26.36	25.96	25.67	25.44	25.26	25.11	24.97	24.86
$\times 10^{-13}$	29.36	28.66	28.26	27.97	27.75	27.56	27.41	27.28	27.16
$\times 10^{-14}$	31.66	30.97	30.56	30.27	30.05	29.87	29.71	29.58	29.46
$\times 10^{-15}$	33.96	33.27	32.86	32.58	32.35	32.17	32.02	31.88	31.76

Source: Wenzel (1942).

The W(u) term is inserted into the following equation:

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

where:
h_o-h = initial head – pumping head or drawdown (ft) at specified radius or time, Q = pumping rate (ft^3/dy), T = Transmissivity (ft^2/dy), W(u) = dimensionless parameter derived from Table 3. Note, any system of units can be use to calculate the drawdown as long as consistent units are are used between the terms. The analysis assumes the following simplifying assumptions for the aquifer:

- horizontal
- infinite in horizontal extent
- constant thickness
- homogeneous and isotropic with respect to its hydrogeological parameters

Additional simplifying assumptions for using the anaylical method are:

- there is only a single pumping well in the aquifer
- the pumping rate is constant over time
- the well diameter is infinitesimally small
- the well penetrates the entire aquifer
- the hydraulic head in the aquifer prior to pumping is uniform throughout the aquifer

Because the method assumes only one pumping well and two primary pumping wells (Main Agriculture Well and Well Z) are in use simultaneously at the site, Golder separately modelled the drawdown from the Main Agriculture Well and Well Z using the same eleven wells located within one mile of Main Agriculture Well. As noted previously, Well Y (domestic well) is excluded from the evaluation based on its minimal extraction rate and estimated drawdown. The parameters in Table 2 were then inserted into an analytical model to determine the drawdown at each off-site well based on transmissivity, pumping duration, and pumping flow rate. To model current conditions (both wells pumping simultaneously), the results of the modelled drawdown at each off-site well were summed to simulate the contribution of drawdown at the well from the simultaneous pumping at Main Agriculture Well and Well Z. The models were used to simulate drawdown for the following scenarios:

- Current drawdown based on existing baseline conditions
- Future drawdown based on proposed site operations

The model results for the above scenarios are included in Attachment C. Baseline conditions were calculated by adding the drawdown for the Main Agriculture Well and the Well Z under various timelines. The potential changes in drawdown from the project were determined by calculating an increased pumping rate of 21.9 MGPY for the Main Agriculture Well.

Table 4 below lists the offsite wells well within one mile of the Main Agriculture Well (Attachment A, Figure 1).

Table 4: Location Data for Wells Located within One-Mile Radius of Main Agricultural Well

Well ID	Distance from Main Agriculture Well (feet)	Distance from Well Z (feet)
Offsite Well No. 1	1,729	2,795
Offsite Well No. 6	2,184	2,259
Offsite Well No. 7	2,799	1,473
Offsite Well No. 5	3,012	5,743
Offsite Well No. 2	3,374	1,422
Offsite Well No. 4	3,443	4,465
Offsite Well No. 10	3,865	3,952

Well ID	Distance from Main Agriculture Well (feet)	Distance from Well Z (feet)
Offsite Well No. 8	4,025	6,910
Offsite Well No. 9	4,195	1,557
Offsite Well No. 9A	4,261	1,612
Offsite Well No. 3	5,109	4,669

For the purposes of this analysis, it is assumed that the offsite wells are screened at the same intervals and within the same units as the primary extraction well that is being modeled.

3.0 EVALUATION RESULTS

The results of the drawdown evaluation are presented in Table 5 below:

Table 5: Results of Drawdown Evaluation

Well ID	Distance from Main Agriculture Well (feet)	Calculated Change in Drawdown Over Time (feet)				
		1 month	6 months	1 year	5 years	10 years
Offsite Well No. 1	1,729	-0.23	-0.31	-0.34	-0.40	-0.43
Offsite Well No. 6	2,184	-0.21	-0.29	-0.32	-0.38	-0.41
Offsite Well No. 7	2,799	-0.19	-0.27	-0.30	-0.36	-0.39
Offsite Well No. 5	3,012	-0.19	-0.26	-0.29	-0.35	-0.38
Offsite Well No. 2	3,374	-0.18	-0.25	-0.28	-0.35	-0.37
Offsite Well No. 4	3,443	-0.18	-0.25	-0.28	-0.35	-0.37
Offsite Well No. 10	3,865	-0.17	-0.24	-0.27	-0.34	-0.36
Offsite Well No. 8	4,025	-0.16	-0.24	-0.27	-0.33	-0.36
Offsite Well No. 9	4,195	-0.16	-0.23	-0.26	-0.33	-0.36
Offsite Well No. 9A	4,261	-0.16	-0.23	-0.26	-0.33	-0.35
Offsite Well No. 3	5,109	-0.15	-0.22	-0.25	-0.31	-0.34

Notes:
Negative value indicates decreasing water level.

The additional drawdown was modeled from the increased production rate from each simulated well over five intervals: one month, 6 months, 12 months, 60 months, and 120 months. The closest offsite well (Offsite Well No. 1) is estimated to have an additional 0.23 feet of drawdown after 1 month and 0.43 feet of drawdown after 10 years. The drawdown rate decreases with time as steady state is approached.

Recharge to the groundwater system from precipitation is not considered with this evaluation. Additionally, the drawdown values calculated are based on literature-derived aquifer parameters and limited site-specific data. The use of published values, rather than site-specific data, coupled with the simplifying assumptions for the method, suggest that the calculated values represent an idealized drawdown and are likely conservative, worst-case estimates.

4.0 SUMMARY

The calculated drawdown values indicate minimal excess drawdown risk to existing offsite wells based on the increased pumping rate of 21.9 MGPY from the Main Agriculture Well.

Attachments:

A: Figure 1
B: Well Completion Reports
C: Drawdown Results
D: Response to Comments Memorandum

References:

CGB, 2004. California's Groundwater Bulletin 118, Gilroy-Hollister Groundwater Basin, Llagas Subbasin, updated February 27, 2004.

Driscoll, F.G., 1986. Ground Water and Wells. 2nd Edition, Johnson Division, St. Paul.

Freeze and Cherry, 1979. Groundwater. Englewood Cliffs, N.J., Prentice-Hall.

Valley Water, 2021. Santa Clara Valley Water District 2021 Groundwater Management Plan for the Santa Clara and Llagas Subbasins. November 2021.

mb/gw

https://golderassociates.sharepoint.com/sites/112344/project files/5 technical work/drawdown evaluation/revised memo/
zbest_drawdown_tm_09292022.docx

ATTACHMENT A

Figure 1

LEGEND

- Well Location
- Well Location - Not in Use
- Parcel Line

Note: Wells within one mile of Main Agriculture Well are shown.

600 0 600 Feet

REFERENCE

COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA III FIPS 0403 FEET

CLIENT
Z-BEST COMPOSTING FACILITY
GILROY, CALIFORNIA

PROJECT
Z-BEST

TITLE
ON-SITE AND OFF-SITE WELL LOCATIONS

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-08-25
PREPARED	SHL
DESIGN	SHL
REVIEW	GW
APPROVED	

PROJECT No.	CONTROL	Rev.	FIGURE
GL13397640	---	---	1

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

ATTACHMENT B

Well Completion Reports

State of California

Well Completion Report

Form DWR 188 Auto-Completed 9/13/2021

WCR2021-008568

Owner's Well Number		Date Work Began 04/21/2021	Date Work Ended 05/30/2021
Local Permit Agency	Santa Clara Valley Water District		
Secondary Permit Agency	County of Santa Clara DEH	Permit Number C20210317001	Permit Date 03/17/2021

Well Owner (must remain confidential pursuant to Water Code 13752)

Name XXXXXXXXXXXXXXXXXXXX

Mailing Address XXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXX

City XXXXXXXXXXXXXXXXXXXX State XX Zip XXXXX

Planned Use and Activity

Activity New Well

Planned Use Water Supply Irrigation - Agriculture

Well Location

Address 980 State 25 HWY

City Gilroy Zip 95020 County Santa Clara

Latitude 36 Deg. 56 Min. 47 Sec. N Longitude -121 Deg. 31 Min. 1 Sec. W

Dec. Lat. 36.9463889 Dec. Long. -121.5169444

Vertical Datum Horizontal Datum WGS84

Location Accuracy 5 Ft Location Determination Method GPS

APN 841-37-029

Township 11 S

Range 04 E

Section 27

Baseline Meridian Mount Diablo

Ground Surface Elevation 140

Elevation Accuracy 1 Ft

Elevation Determination Method GPS

Borehole Information

Orientation Vertical Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite

Total Depth of Boring 560 Feet

Total Depth of Completed Well 551 Feet

Water Level and Yield of Completed Well

Depth to first water 48 (Feet below surface)

Depth to Static Water Level 17 (Feet) Date Measured 05/24/2021

Estimated Yield* 1000 (GPM) Test Type Air Lift

Test Length 50 (Hours) Total Drawdown 523 (feet)

*May not be representative of a well's long term yield.

Geologic Log - Free Form

Depth from Surface Feet to Feet		Description
0	3	Mended topsoil
3	13	Black adobe clay
13	48	Gray clay
48	67	Large gravel with cobbles
67	75	Gray sticky clay
75	90	Large gravel
90	110	Gray clay
110	135	Medium gravel
135	148	Gray clay
148	184	Small gravel
184	195	Gray swelling clay
195	210	Medium gravel
210	217	Gray clay
217	235	Rounded gravel
235	275	Gray sticky clay

275	310	Small gravel
310	327	Gray clay
327	375	Medium gravel
375	385	Gray clay
385	405	Small gravel with coarse sand
405	412	Gray clay
412	435	Medium gravel
435	443	Gray sandy clay
443	485	Tight gravel
485	505	Gray clay
505	525	Small gravel
525	530	Gray clay
530	550	Tight gravel
550	560	Cemented gray clay

Casings

Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	19	Conductor or Fill Pipe	Low Carbon Steel	Grade: ASTM A53	0.25	30			
2	0	160	Blank	Low Carbon Steel	Grade: ASTM A53	0.25	16			
2	160	200	Screen	Low Carbon Steel	Grade: ASTM A53	0.25	16	Milled Slots	0.06	
2	200	351	Blank	Low Carbon Steel	Grade: ASTM A53	0.25	16			
2	351	551	Screen	Low Carbon Steel	Grade: ASTM A53	0.25	16	Milled Slots	0.06	

Annular Material

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	19	Cement	10.3 Sack Mix		sand slurry
0	110	Cement	10.3 Sack Mix		
110	560	Filter Pack	8 x 16		washed sand

Other Observations:

Borehole Specifications

Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	19	38
19	560	26

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name: GUARDINO WELL DRILLING INC
Person, Firm or Corporation

Address	City	State	Zip
4825 CROY ROAD	MORGAN HILL	CA	95037

Signed: *electronic signature received* (C-57 Licensed Water Well Contractor)
Date Signed: 07/13/2021
C-57 License Number: 664960

Attachments

0448ELOG-5.pdf - Geophysical Log

Water well construction diagram.xlsx - Well Construction Diagram

DWR Use Only

CSG #	State Well Number	Site Code	Local Well Number
	10S04E34H004		

			N					W

Latitude Deg/Min/Sec   Longitude Deg/Min/Sec

TRS: 10S04E34H004M

APN:

1 of 2

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California
Well Completion Report
Refer to Instruction Pamphlet

No. e0087944

DWR Use Only – Do Not Fill In
11S04E27E006
State Well Number/Site Number
N Latitude / W Longitude
APN/TRS/Other

Page ______ of ______

[redacted]er's Well Number ______

Date Work Began 3/16/09 Date Work Ended 5/13/09

Local Permit Agency SCVWD

Permit Number 09W00151 Permit Date 3-10-09

Geologic Log

Orientation ☑ Vertical ○ Horizontal ○ Angle Specify ______

Drilling Method ROTARY Drilling Fluid MUD

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc.)
0	2	BASE ROCK
2	10	SANDY CLAY
10	15	SAND
15	28	BLUE CLAY
28	35	SANDY SILT
35	40	BLUE CLAY
40	44	SAND
44	68	GRAVEL
68	83	BLUE CLAY
83	84	SAND
84	93	BLUE CLAY W/SAND STKS
93	98	SAND
98	110	BLUE CLAY
110	122	SAND
122	130	SAND W/CLAY STKS
130	140	SAND W/GRAVEL & CLAY STKS
140	157	SAND & GRAVEL
[redacted]157	168	YELLOW CLAY
[redacted]8	190	SANDY CLAY
190	195	CORSE SAND
195	245	BLUE CLAY
245	263	SAND & BLUE CLAY
263	277	SAND & GRAVEL
277	318	BLUE CLAY
318	370	GRAVEL
370	377	GRAVELY SAND
377	403	GRAVEL
403	410	GRAY CLAY

Total Depth of Boring 410 Feet

Total Depth of Completed Well 408 Feet

Well Location

Address 980 STATE HWY 25

City GILROY County SANTA CLARA

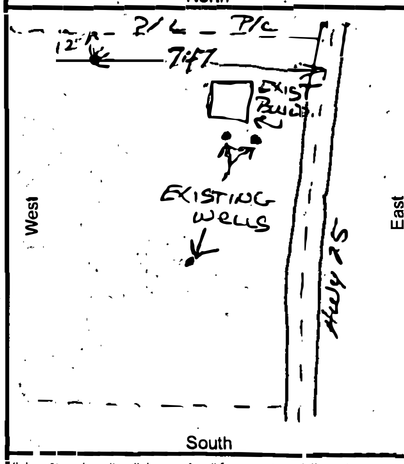
Latitude ___ ___ ___ N Longitude ___ ___ ___ W (Deg. Min. Sec.)

Datum ______ Decimal Lat. ______ Decimal Long. ______

APN Book 841 Page 37 Parcel 028

Township ______ Range ______ Section ______

Location Sketch
(Sketch must be drawn by hand after form is printed.)



Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

☑ New Well
○ Modification/Repair
○ Deepen
○ Other ______
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other ______

Water Level and Yield of Completed Well

Depth to first water ______ (Feet below surface)

Depth to Static Water Level 8 (Feet) Date Measured 5/13/09

Estimated Yield * 2,500 (GPM) Test Type AIR

Test Length 6 HRS (Hours) Total Drawdown ______ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	138	24	BLANK	SCH 40 PVC	.5	15		
138	158	"	PERF	"	"	"	.032	.032
158	258	"	BLANK	"	"	"		
258	278	"	PERF	"	"	"		.032
278	318	"	BLANK	"	"	"		
318	398	"	PERF	"	"	"		.032

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	118	CEMENT	10 SACK
118	408	SAND	6X8

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☑ Other 2 in [illegible]

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name RANDY DOUGHERTY DOUGHERTY PUMPS
(Person, Firm or Corporation)

P.O. BOX 1519 SAN MARTIN CA 95046
Address City State Zip

Signed [signature] 6/4/09 733914
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

147

TRIPLICATE
Owner's Copy

Page ____ of ____

Owner's Well No. ____________

Date Work Began ____________, Ended ____________

Local Permit Agency ____________

Permit No. ____________ Permit Date ____________

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. ~~768881~~ E0087944

DWR USE ONLY — DO NOT FILL IN 2012

11S04E27E006

STATE WELL NO./STATION NO.

LATITUDE | LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ____ VERTICAL ____ HORIZONTAL ____ ANGLE ____ (SPECIFY)

DRILLING METHOD ____________ FLUID ____________

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*

TOTAL DEPTH OF BORING ________ (Feet)

TOTAL DEPTH OF COMPLETED WELL ________ (Feet)

WELL OWNER

Name ____________

Mailing Address ____________

CITY ____________ STATE ____ ZIP ____

WELL LOCATION

Address ____________

City ____________

County ____________

APN Book ______ Page ______ Parcel ______

Township ______ Range ______ Section ______

Latitude ____ DEG. ____ MIN. ____ SEC. NORTH Longitude ____ DEG. ____ MIN. ____ SEC. WEST

LOCATION SKETCH

NORTH

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

____ NEW WELL

MODIFICATION/REPAIR
____ Deepen
____ Other (Specify)

____ DESTROY (*Describe Procedures and Materials Under "GEOLOGIC LOG"*)

PLANNED USES (✓)

WATER SUPPLY
____ Domestic ____ Public
____ Irrigation ____ Industrial

MONITORING ____
TEST WELL ____
CATHODIC PROTECTION ____
HEAT EXCHANGE ____
DIRECT PUSH ____
INJECTION ____
VAPOR EXTRACTION ____
SPARGING ____
REMEDIATION ____
OTHER (SPECIFY) ____

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ______ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ______ (Ft.) & DATE MEASURED ______

ESTIMATED YIELD * ______ (GPM) & TEST TYPE ______

TEST LENGTH ______ (Hrs.) TOTAL DRAWDOWN ______ (Ft.)

* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
398 to 408		X				Sch 40 PVC	14"	1/2"	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)

ATTACHMENTS (✓)

____ Geologic Log
____ Well Construction Diagram
____ Geophysical Log(s)
____ Soil/Water Chemical Analyses
____ Other ____________

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME ____________ (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS ____________ CITY ______ STATE ______ ZIP ______

Signed ____________ WELL DRILLER/AUTHORIZED REPRESENTATIVE ______ DATE SIGNED ______ C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

*This Adobe Acrobat Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

Page 1 of 1

Owner's Well Number

Date Work Began 12/15

Local Permit Agency SCVWD

Permit Number 08W00960

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0082938

Date Work Ended 12/20

Permit Date 11-19-08

DWR Use Only – Do Not Fill In

11S04E27E005

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify

Drilling Method

Drilling Fluid

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc.)
0	5	GRAY GRAVELY CLAY
5	13	GRAY SANDY CLAY
13	17	GRAY SILTY SAND
17	23	BLUE CLAY
23	30	BLUE CLAY WITH GRAVEL STRKS
30	40	CORSE GRAY SAND
40	45	SANDY CLAY
45	63	GRAVEL
63	75	SAND & GRAVEL
75	90	BLUE CLAY
90	100	BLUE SANDY CLAY
100	105	SAND
105	112	GRAVELY CLAY
112	125	SAND & GRAVEL
125	163	SAND & GRAVEL
163	185	YELLOW CLAY
185	200	GRAY SAND WITH GRAVEL
200	217	GRAVELY CLAY
217	220	SANDY CLAY
220	250	GRAY CLAY
250	264	GRAY CLAY WITH SAND STRKS
264	274	BLUE CLAY WITH SAND STRKS
274	277	GRAY GRAVELY CLAY
277	285	GRAVEL
285	294	YELLOW GRAVELY CLAY
294	320	BLUE CLAY
320	330	YELLOW CLAY WITH SAND STKS
330	359	GRAVEL
359	370	BLUE CLAY W STRKS of GRAVEL

Total Depth of Boring 370 Feet

Total Depth of Completed Well 367 Feet

Na

Ma

Ci

Well Location

Address 980 STATE Highway 25

City GILROY County SANTA CLARA

Latitude ___ Deg. ___ Min. ___ Sec. N Longitude ___ Deg. ___ Min. ___ Sec. W

Datum ___ Decimal Lat. ___ Decimal Long. ___

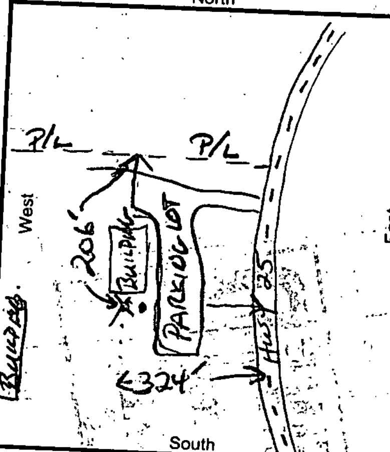
APN Book 841 Page 37 Parcel 028

Township ___ Range ___ Section ___

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North



Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

◉ New Well

○ Modification/Repair

○ Deepen

○ Other

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

◉ Water Supply

☒ Domestic ☐ Public

☐ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

○ Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other

Water Level and Yield of Completed Well

Depth to first water ___ (Feet below surface)

Depth to Static Water Level 10 (Feet) Date Measured 12/20/08

Estimated Yield * 100 (GPM) Test Type AIR LIFT

Test Length 1 (Hours) Total Drawdown ___ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	327	10	BLANK	PVC	.200			
327	367	10	SCREEN	PVC	.200		FACTORY	.032

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	250	CEMENT	
250	367		6X8 SAND

Attachments

☐ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name DOUGHERTY PUMP SERVICE

Person, Firm or Corporation

P.O. BOX 1519 SAN MARTIN CA 95046

Address City State Zip

Signed [signature] 1/8/08 733914

C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ATTACHMENT C

Drawdown Results

Drawdown Evaluation Calculations
1 Month of Operation

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters

K (ft/dy)		26
S	1.00E-03	
b (ft)	497	
T (ft^2/dy)		12707

Well Parameters

	gpm	f^3/d
Flow Rate	75	14439
Duration (months)	1	

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

Ag Well Existing Pumping Rate

Point ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	30	12707	6.468E-10	20.58512	1.86129484	20.66	20.50	0.47	0.07488	20.59
	50	30	12707	1.617E-06	12.81427	1.158659003	13.24	12.55	0.617	0.42573	12.81
	100	30	12707	6.468E-06	11.37512	1.028531879	11.45	11.29	0.47	0.07488	11.38
	500	30	12707	0.000162	8.2022	0.741638258	8.63	7.94	0.62	0.4278	8.20
	1000	30	12707	0.000647	6.76950	0.612094339	6.84	6.69	0.47	0.0705	6.77
	1500	30	12707	0.001455	6.01605	0.543967819	6.33	5.64	0.455	0.31395	6.02
Offsite Well No. 1	1729	30	12707	0.001933	5.69	0.514145682	6.33	5.64	0.933	0.64377	5.69
	2000	30	12707	0.002587	5.39933	0.488204347	5.64	5.23	0.587	0.24067	5.40
Offsite Well No. 6	2184	30	12707	0.003085	5.2062	0.470741642	5.23	4.95	0.085	0.0238	5.21
	2500	30	12707	0.004043	4.94054	0.446720816	4.95	4.73	0.043	0.00946	4.94
Offsite Well No. 7	2799	30	12707	0.005069	4.71689	0.42649851	4.73	4.54	0.069	0.01311	4.72
	3000	30	12707	0.005821	4.5740	0.413579382	4.73	4.54	0.821	0.15599	4.57
Offsite Well No. 5	3012	30	12707	0.005869	4.56489	0.412754757	4.73	4.54	0.869	0.16511	4.56
Offsite Well No. 2	3374	30	12707	0.007363	4.34281	0.39267441	4.39	4.26	0.363	0.04719	4.34
Offsite Well No. 4	3443	30	12707	0.007667	4.30329	0.389101034	4.39	4.26	0.667	0.08671	4.30
	3500	30	12707	0.007923	4.27001	0.386091875	4.39	4.26	0.923	0.11999	4.27
Offsite Well No. 10	3865	30	12707	0.009664	4.0736	0.368332595	4.14	4.04	0.664	0.0664	4.07
	4000	30	12707	0.010349	4.015919	0.363117111	4.04	3.35	0.0349	0.024081	4.02
OffSite Well No. 8	4025	30	12707	0.010479	4.006949	0.362306049	4.04	3.35	0.0479	0.033051	4.01
Offsite Well No. 9	4195	30	12707	0.011384	3.944504	0.356659808	4.04	3.35	0.1384	0.095496	3.94
Offsite Well No. 9A	4261	30	12707	0.011745	3.919595	0.35440755	4.04	3.35	0.1745	0.120405	3.92
	4500	30	12707	0.013098	3.826238	0.345966263	4.04	3.35	0.3098	0.213762	3.83
	5000	30	12707	0.016170	3.61427	0.326800237	4.04	3.35	0.617	0.42573	3.61
Offsite Well No. 3	5109	30	12707	0.016883	3.565073	0.322351873	4.04	3.35	0.6883	0.474927	3.57
	5280	30	12707	0.018032	3.485792	0.31518333	4.04	3.35	0.8032	0.554208	3.49

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters

K (ft/dy)		140
S	1.00E-03	
b (ft)	328	
T (ft^2/dy)		45875

Well Parameters

	gpm	f^3/d
Flow Rate	54	10396
Duration (months)	1	

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 8/5/2022

Well Z

Point ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	30	45875	1.792E-10	21.90352	0.394989	22.45	21.76	0.79	0.54648	21.90
	50	30	45875	4.479E-07	14.04462	0.253269	14.15	13.93	0.479	0.10538	14.04
	100	30	45875	1.792E-06	12.69352	0.228904	13.24	12.55	0.79	0.54648	12.69
	500	30	45875	0.00004479	9.44462	0.170316	9.55	9.33	0.479	0.10538	9.44
	1000	30	45875	0.0001792	8.08352	0.145771	8.63	7.94	0.79	0.54648	8.08
Offsite Well No. 2	1422	30	45875	0.000362	7.3564	0.132659	7.53	7.25	0.62	0.1736	7.36
Offsite Well No. 7	1473	30	45875	0.000389	7.2808	0.131296	7.53	7.25	0.89	0.2492	7.28
	1500	30	45875	0.000403	7.2431	0.130616	7.25	7.02	0.030	0.0069	7.24
Offsite Well No. 9	1557	30	45875	0.000434	7.1718	0.12933	7.25	7.02	0.34	0.0782	7.17
Offsite Well No. 9A	1612	30	45875	0.000466	7.0982	0.128003	7.25	7.02	0.66	0.1518	7.10
	2000	30	45875	0.000717	6.6662	0.120213	6.69	6.55	0.170	0.0238	6.67
Offsite Well No. 6	2259	30	45875	0.000914	6.4246	0.115856	6.44	6.33	0.140	0.0154	6.42
	2500	30	45875	0.001120	6.2472	0.112657	6.33	5.64	0.12	0.0828	6.25
Offsite Well No. 1	2795	30	45875	0.001400	6.05	0.109173	6.33	5.64	0.400	0.276	6.05
	3000	30	45875	0.001612	5.9077	0.106535	6.33	5.64	0.612	0.42228	5.91
	3500	30	45875	0.002195	5.56005	0.100265	5.64	5.23	0.195	0.07995	5.56
Offsite Well No. 10	3952	30	45875	0.002799	5.31241	0.095799	5.64	5.23	0.799	0.32759	5.31
	4000	30	45875	0.002867	5.28453	0.095297	5.64	5.23	0.867	0.35547	5.28
Offsite Well No. 4	4465	30	45875	0.003573	5.06956	0.09142	5.23	4.95	0.573	0.16044	5.07
	4500	30	45875	0.003628	5.05416	0.091142	5.23	4.95	0.628	0.17584	5.05
Offsite Well No. 3	4669	30	45875	0.003905	4.9766	0.089744	5.23	4.95	0.905	0.2534	4.98
	5000	30	45875	0.004479	4.84462	0.087364	4.95	4.73	0.479	0.10538	4.84
	5280	30	45875	0.004995	4.7311	0.085317	4.95	4.73	0.995	0.2189	4.73
Offsite Well No. 5	5743	30	45875	0.005909	3.515186	0.06339	4.04	3.35	0.7606	0.524814	3.52
OffSite Well No. 8	6910	30	45875	0.008554	2.919764	0.052653	2.96	2.68	0.1437	0.040236	2.92

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters

K (ft/dy)		26
S	1.00E-03	
b (ft)	497	
T (ft^2/dy)		12707

Well Parameters

	gpm	f^3/d
Flow Rate	116	22332
Duration (months)	1	

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

Ag Well Proposed Pumping Rate

Point ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	30	12707	6.468E-10	20.58512	2.878802685	20.66	20.50	0.47	0.07488	20.59
	50	30	12707	1.617E-06	12.81427	1.792059259	13.24	12.55	0.617	0.42573	12.81
	100	30	12707	6.468E-06	11.37512	1.590795973	11.45	11.29	0.47	0.07488	11.38
	500	30	12707	0.000162	8.2022	1.147067172	8.63	7.94	0.62	0.4278	8.20
	1000	30	12707	0.000647	6.76950	0.946705911	6.84	6.69	0.47	0.0705	6.77
	1500	30	12707	0.001455	6.01605	0.841336893	6.33	5.64	0.455	0.31395	6.02
Offsite Well No. 1	1729	30	12707	0.001933	5.69	0.795211988	6.33	5.64	0.933	0.64377	5.69
	2000	30	12707	0.002587	5.39933	0.75508939	5.64	5.23	0.587	0.24067	5.40
Offsite Well No. 6	2184	30	12707	0.003085	5.2062	0.728080407	5.23	4.95	0.085	0.0238	5.21
	2500	30	12707	0.004043	4.94054	0.690928196	4.95	4.73	0.043	0.00946	4.94
Offsite Well No. 7	2799	30	12707	0.005069	4.71689	0.659651029	4.73	4.54	0.069	0.01311	4.72
	3000	30	12707	0.005821	4.5740	0.639669444	4.73	4.54	0.821	0.15599	4.57
Offsite Well No. 5	3012	30	12707	0.005869	4.56489	0.638394024	4.73	4.54	0.869	0.16511	4.56
Offsite Well No. 2	3374	30	12707	0.007363	4.34281	0.60733642	4.39	4.26	0.363	0.04719	4.34
Offsite Well No. 4	3443	30	12707	0.007667	4.30329	0.601809599	4.39	4.26	0.667	0.08671	4.30
	3500	30	12707	0.007923	4.27001	0.597155433	4.39	4.26	0.923	0.11999	4.27
Offsite Well No. 10	3865	30	12707	0.009664	4.0736	0.569687746	4.14	4.04	0.664	0.0664	4.07
	4000	30	12707	0.010349	4.015919	0.561621132	4.04	3.35	0.0349	0.024081	4.02
OffSite Well No. 8	4025	30	12707	0.010479	4.006949	0.560366689	4.04	3.35	0.0479	0.033051	4.01
Offsite Well No. 9	4195	30	12707	0.011384	3.944504	0.551633836	4.04	3.35	0.1384	0.095496	3.94
Offsite Well No. 9A	4261	30	12707	0.011745	3.919595	0.548150344	4.04	3.35	0.1745	0.120405	3.92
	4500	30	12707	0.013098	3.826238	0.535094487	4.04	3.35	0.3098	0.213762	3.83
	5000	30	12707	0.016170	3.61427	0.505451034	4.04	3.35	0.617	0.42573	3.61
Offsite Well No. 3	5109	30	12707	0.016883	3.565073	0.498570896	4.04	3.35	0.6883	0.474927	3.57
	5280	30	12707	0.018032	3.485792	0.48748355	4.04	3.35	0.8032	0.554208	3.49

Current Operation

Point ID	Distance (ft)	Combined h_o-h (ft)
	1	1.41
	50	1.26
	100	0.91
	500	0.76
	1000	0.68
	1500	0.67
Offsite Well No. 1	1729	0.62
	2000	0.61
Offsite Well No. 6	2184	0.59
	2500	0.56
Offsite Well No. 7	2799	0.56
	3000	0.52
Offsite Well No. 5	3012	0.48
Offsite Well No. 2	3374	0.53
Offsite Well No. 4	3443	0.48
	3500	0.49
Offsite Well No. 10	3865	0.46
	4000	0.46
OffSite Well No. 8	4025	0.41
Offsite Well No. 9	4195	0.49
Offsite Well No. 9A	4261	0.48
	4500	0.44
	5000	0.41
Offsite Well No. 3	5109	0.41
	5280	0.40

Additional Main Ag Well Pumping

Point ID	Distance (ft)	Combined h_o-h (ft)	Change in Drawdown
	1	3.27	
	50	2.05	
	100	1.82	
	500	1.32	
	1000	1.09	
	1500	0.97	
Offsite Well No. 1	1729	0.90	-0.28
	2000	0.88	
Offsite Well No. 6	2184	0.84	-0.26
	2500	0.84	
Offsite Well No. 7	2799	0.79	-0.23
	3000	0.75	
Offsite Well No. 5	3012	0.70	-0.23
Offsite Well No. 2	3374	0.74	-0.21
Offsite Well No. 4	3443	0.69	-0.21
	3500	4.37	
Offsite Well No. 10	3865	0.67	-0.20
	4000	0.66	
OffSite Well No. 8	4025	0.61	-0.20
Offsite Well No. 9	4195	0.68	-0.19
Offsite Well No. 9A	4261	0.68	-0.19
	4500	0.63	
	5000	0.59	
Offsite Well No. 3	5109	0.59	-0.18
	5280	0.57	

Drawdown Evaluation Calculations
6 Months of Operation

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
				gpm	f^3/d
K (ft/dy)		26	Flow Rate	75	14439
S	1.00E-03		Duration (months)	6	
b (ft)	497				
T (ft^2/dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
				gpm	f^3/d
K (ft/dy)		140	Flow Rate	54	10396
S	1.00E-03		Duration (months)	6	
b (ft)	328				
T (ft^2/dy)		45875			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 8/5/2022

Ag Well Existing Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	183	12707	1.078E-10	22.39618	2.025049855	22.45	21.76	0.08	0.05382	22.40
	50	183	12707	2.695E-07	14.56505	1.316963535	14.85	14.44	0.695	0.28495	14.57
	100	183	12707	1.078E-06	13.18618	1.192286894	13.24	12.55	0.08	0.05382	13.19
	500	183	12707	0.000027	9.962	0.900758373	10.24	9.84	0.695	0.278	9.96
	1000	183	12707	0.000108	8.57480	0.775328538	8.63	7.94	0.08	0.0552	8.57
	1500	183	12707	0.000243	7.7637	0.701989337	7.94	7.53	0.430	0.1763	7.76
Offsite Well No. 1	1729	183	12707	0.000322	7.47	0.675288479	7.53	7.25	0.220	0.0616	7.47
	2000	183	12707	0.000431	7.1787	0.64909397	7.25	7.02	0.310	0.0713	7.18
Offsite Well No. 6	2184	183	12707	0.000514	6.9948	0.632465837	7.02	6.84	0.140	0.0252	6.99
	2500	183	12707	0.000674	6.729	0.608432352	6.84	6.69	0.74	0.111	6.73
Offsite Well No. 7	2799	183	12707	0.000845	6.50105	0.587821243	6.55	6.44	0.445	0.04895	6.50
	3000	183	12707	0.000970	6.3630	0.57533884	6.44	6.33	0.7	0.077	6.36
Offsite Well No. 5	3012	183	12707	0.000978	6.3542	0.574543149	6.44	6.33	0.78	0.0858	6.35
Offsite Well No. 2	3374	183	12707	0.001227	6.17337	0.558192603	6.33	5.64	0.227	0.15663	6.17
Offsite Well No. 4	3443	183	12707	0.001278	6.13818	0.555010744	6.33	5.64	0.278	0.19182	6.14
	3500	183	12707	0.001321	6.10851	0.552327999	6.33	5.64	0.321	0.22149	6.11
Offsite Well No. 10	3865	183	12707	0.001611	5.90841	0.534235071	6.33	5.64	0.611	0.42159	5.91
	4000	183	12707	0.001725	5.82975	0.527122679	6.33	5.64	0.725	0.50025	5.83
OffSite Well No. 8	4025	183	12707	0.001746	5.81526	0.525812501	6.33	5.64	0.746	0.51474	5.82
Offsite Well No. 9	4195	183	12707	0.001897	5.71107	0.5163917	6.33	5.64	0.897	0.61893	5.71
Offsite Well No. 9A	4261	183	12707	0.001957	5.66967	0.512648336	6.33	5.64	0.957	0.66033	5.67
	4500	183	12707	0.002183	5.56497	0.503181422	5.64	5.23	0.183	0.07503	5.56
	5000	183	12707	0.002695	5.35505	0.484200575	5.64	5.23	0.695	0.28495	5.36
Offsite Well No. 3	5109	183	12707	0.002814	5.30626	0.479789011	5.64	5.23	0.814	0.33374	5.31
	5280	183	12707	0.003005	5.2286	0.472767037	5.23	4.95	0.005	0.0014	5.23

Well Z

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	183	45875	2.986E-11	21.90352	0.394989	22.45	21.76	0.79	0.54648	21.90
	50	183	45875	7.465E-08	14.04462	0.253269	14.15	13.93	0.479	0.10538	14.04
	100	183	45875	2.986E-07	12.69352	0.228904	13.24	12.55	0.79	0.54648	12.69
	500	183	45875	0.00000747	9.44462	0.170316	9.55	9.33	0.479	0.10538	9.44
	1000	183	45875	0.0000299	8.08352	0.145771	8.63	7.94	0.79	0.54648	8.08
Offsite Well No. 2	1422	183	45875	0.000060	7.3564	0.132659	7.53	7.25	0.62	0.1736	7.36
Offsite Well No. 7	1473	183	45875	0.000065	7.2808	0.131296	7.53	7.25	0.89	0.2492	7.28
	1500	183	45875	0.000067	7.2431	0.130616	7.25	7.02	0.030	0.0069	7.24
Offsite Well No. 9	1557	183	45875	0.000072	7.1718	0.12933	7.25	7.02	0.34	0.0782	7.17
Offsite Well No. 9A	1612	183	45875	0.000078	7.0982	0.128003	7.25	7.02	0.66	0.1518	7.10
	2000	183	45875	0.000119	6.6662	0.120213	6.69	6.55	0.170	0.0238	6.67
Offsite Well No. 6	2259	183	45875	0.000152	6.4246	0.115856	6.44	6.33	0.140	0.0154	6.42
	2500	183	45875	0.000187	6.2472	0.112657	6.33	5.64	0.12	0.0828	6.25
Offsite Well No. 1	2795	183	45875	0.000233	6.05	0.109173	6.33	5.64	0.400	0.276	6.05
	3000	183	45875	0.000269	5.9077	0.106535	6.33	5.64	0.612	0.42228	5.91
	3500	183	45875	0.000366	5.56005	0.100265	5.64	5.23	0.195	0.07995	5.56
Offsite Well No. 10	3952	183	45875	0.000466	5.31241	0.095799	5.64	5.23	0.799	0.32759	5.31
	4000	183	45875	0.000478	5.28453	0.095297	5.64	5.23	0.867	0.35547	5.28
Offsite Well No. 4	4465	183	45875	0.000595	5.06956	0.09142	5.23	4.95	0.573	0.16044	5.07
	4500	183	45875	0.000605	5.05416	0.091142	5.23	4.95	0.628	0.17584	5.05
Offsite Well No. 3	4669	183	45875	0.000651	4.9766	0.089744	5.23	4.95	0.905	0.2534	4.98
	5000	183	45875	0.000747	4.84462	0.087364	4.95	4.73	0.479	0.10538	4.84
	5280	183	45875	0.000832	4.7311	0.085317	4.95	4.73	0.995	0.2189	4.73
Offsite Well No. 5	5743	183	45875	0.000985	3.515186	0.06339	4.04	3.35	0.7606	0.524814	3.52
OffSite Well No. 8	6910	183	45875	0.001426	2.919764	0.052653	2.96	2.68	0.1437	0.040236	2.92

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
				gpm	f^3/d
K (ft/dy)		26	Flow Rate	116	22332
S	1.00E-03		Duration (months)	6	
b (ft)	497				
T (ft^2/dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

Ag Well Proposed Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	183	12707	1.078E-10	22.39618	3.132077108	22.45	21.76	0.08	0.05382	22.40
	50	183	12707	2.695E-07	14.56505	2.036903601	14.85	14.44	0.695	0.28495	14.57
	100	183	12707	1.078E-06	13.18618	1.844070396	13.24	12.55	0.08	0.05382	13.19
	500	183	12707	0.000027	9.962	1.39317295	10.24	9.84	0.695	0.278	9.96
	1000	183	12707	0.000108	8.57480	1.199174805	8.63	7.94	0.08	0.0552	8.57
	1500	183	12707	0.000243	7.7637	1.085743508	7.94	7.53	0.430	0.1763	7.76
Offsite Well No. 1	1729	183	12707	0.000322	7.47	1.044446181	7.53	7.25	0.220	0.0616	7.47
	2000	183	12707	0.000431	7.1787	1.003932007	7.25	7.02	0.310	0.0713	7.18
Offsite Well No. 6	2184	183	12707	0.000514	6.9948	0.978213827	7.02	6.84	0.140	0.0252	6.99
	2500	183	12707	0.000674	6.729	0.941042038	6.84	6.69	0.74	0.111	6.73
Offsite Well No. 7	2799	183	12707	0.000845	6.50105	0.909163522	6.55	6.44	0.445	0.04895	6.50
	3000	183	12707	0.000970	6.3630	0.889857406	6.44	6.33	0.7	0.077	6.36
Offsite Well No. 5	3012	183	12707	0.000978	6.3542	0.888626737	6.44	6.33	0.78	0.0858	6.35
Offsite Well No. 2	3374	183	12707	0.001227	6.17337	0.863337893	6.33	5.64	0.227	0.15663	6.17
Offsite Well No. 4	3443	183	12707	0.001278	6.13818	0.858416617	6.33	5.64	0.278	0.19182	6.14
	3500	183	12707	0.001321	6.10851	0.854267305	6.33	5.64	0.321	0.22149	6.11
Offsite Well No. 10	3865	183	12707	0.001611	5.90841	0.826283576	6.33	5.64	0.611	0.42159	5.91
	4000	183	12707	0.001725	5.82975	0.815283076	6.33	5.64	0.725	0.50025	5.83
OffSite Well No. 8	4025	183	12707	0.001746	5.81526	0.813256668	6.33	5.64	0.746	0.51474	5.82
Offsite Well No. 9	4195	183	12707	0.001897	5.71107	0.79868583	6.33	5.64	0.897	0.61893	5.71
Offsite Well No. 9A	4261	183	12707	0.001957	5.66967	0.792896093	6.33	5.64	0.957	0.66033	5.67
	4500	183	12707	0.002183	5.56497	0.778253932	5.64	5.23	0.183	0.07503	5.56
	5000	183	12707	0.002695	5.35505	0.748896889	5.64	5.23	0.695	0.28495	5.36
Offsite Well No. 3	5109	183	12707	0.002814	5.30626	0.74207367	5.64	5.23	0.814	0.33374	5.31
	5280	183	12707	0.003005	5.2286	0.731213018	5.23	4.95	0.005	0.0014	5.23

Current Operation

Well ID	Distance (ft)	Combined h_o-h (ft)
	1	2.42
	50	1.57
	100	1.42
	500	1.07
	1000	0.92
	1500	0.83
Offsite Well No. 1	1729	0.78
	2000	0.77
Offsite Well No. 6	2184	0.75
	2500	0.72
Offsite Well No. 7	2799	0.72
	3000	0.68
Offsite Well No. 5	3012	0.64
Offsite Well No. 2	3374	0.69
Offsite Well No. 4	3443	0.65
	3500	0.65
Offsite Well No. 10	3865	0.63
	4000	0.62
OffSite Well No. 8	4025	0.58
Offsite Well No. 9	4195	0.65
Offsite Well No. 9A	4261	0.64
	4500	0.59
	5000	0.57
Offsite Well No. 3	5109	0.57
	5280	0.56

Additional Main Ag Well Pumping

Well ID	Distance (ft)	Combined h_o-h (ft)	Change in Drawdown
	1	3.53	
	50	2.29	
	100	2.07	
	500	1.56	
	1000	1.34	
	1500	1.22	
Offsite Well No.	1729	1.15	-0.37
	2000	1.12	
Offsite Well No.	2184	1.09	-0.35
	2500	1.05	
Offsite Well No.	2799	1.04	-0.32
	3000	1.00	
Offsite Well No.	3012	0.95	-0.31
Offsite Well No.	3374	1.00	-0.31
Offsite Well No.	3443	0.95	-0.30
	3500	6.21	
Offsite Well No.	3865	0.92	-0.29
	4000	0.91	
OffSite Well No.	4025	0.87	-0.29
Offsite Well No.	4195	0.93	-0.28
Offsite Well No.	4261	0.92	-0.28
	4500	0.87	
	5000	0.84	
Offsite Well No.	5109	0.83	-0.26
	5280	0.82	

Drawdown Evaluation Calculations
12 Months of Operation

$$u = \frac{r^2 S}{4Tt}$$

$$ho\text{-}h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters / **Well Parameters**

				gpm	f^3/d
K (ft/dy)		26	Flow Rate	75	14439
S	1.00E-03		Duration (months)	12	
b (ft)	497				
T (ft^2/dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

$$u = \frac{r^2 S}{4Tt}$$

$$ho\text{-}h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters / **Well Parameters**

				gpm	f^3/d
K (ft/dy)		140	Flow Rate	54	10396
S	1.00E-03		Duration (months)	12	
b (ft)	328				
T (ft^2/dy)		45875			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 8/5/2022

Ag Well Existing Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	365	12707	5.390E-11	23.0698	2.085958192	23.14	22.96	0.39	0.0702	23.07
	50	365	12707	1.348E-07	15.29988	1.383406446	15.54	14.85	0.348	0.24012	15.30
	100	365	12707	5.390E-07	13.8598	1.253195231	13.93	13.75	0.39	0.0702	13.86
	500	365	12707	0.000013	10.73	0.970200496	10.94	10.24	0.3	0.21	10.73
	1000	365	12707	0.000054	9.25400	0.836741415	9.33	9.14	0.4	0.076	9.25
	1500	365	12707	0.000121	8.4851	0.767217915	8.63	7.94	0.210	0.1449	8.49
Offsite Well No. 1	1729	30	12707	0.001933	8.21	0.742262152	8.63	7.94	0.610	0.4209	8.21
	2000	30	12707	0.002587	7.8744	0.711998768	7.94	7.53	0.160	0.0656	7.87
Offsite Well No. 6	2184	30	12707	0.003085	7.7063	0.696799262	7.94	7.53	0.570	0.2337	7.71
	2500	30	12707	0.004043	7.4264	0.671490863	7.53	7.25	0.37	0.1036	7.43
Offsite Well No. 7	2799	30	12707	0.005069	7.1994	0.650965652	7.25	7.02	0.22	0.0506	7.20
	3000	365	12707	0.000485	7.0545	0.637863877	7.25	7.02	0.85	0.1955	7.05
Offsite Well No. 5	3012	30	12707	0.005869	7.0453	0.637032018	7.25	7.02	0.89	0.2047	7.05
Offsite Well No. 2	3374	30	12707	0.007363	6.819	0.616570101	6.84	6.69	0.14	0.021	6.82
Offsite Well No. 4	3443	30	12707	0.007667	6.7815	0.613179372	6.84	6.69	0.39	0.0585	6.78
	3500	30	12707	0.007923	6.75	0.61033116	6.84	6.69	0.6	0.09	6.75
Offsite Well No. 10	3865	30	12707	0.009664	6.5445	0.591749967	6.55	6.44	0.05	0.0055	6.54
	4000	30	12707	0.010349	6.4818	0.586080669	6.55	6.44	0.62	0.0682	6.48
OffSite Well No. 8	4025	30	12707	0.010479	6.4697	0.584986593	6.55	6.44	0.73	0.0803	6.47
Offsite Well No. 9	4195	30	12707	0.011384	6.3861	0.577427529	6.44	6.33	0.49	0.0539	6.39
Offsite Well No. 9A	4261	30	12707	0.011745	6.3531	0.574443688	6.44	6.33	0.79	0.0869	6.35
	4500	30	12707	0.013098	6.26721	0.566677563	6.33	5.64	0.091	0.06279	6.27
	5000	30	12707	0.016170	6.08988	0.550643485	6.33	5.64	0.348	0.24012	6.09
Offsite Well No. 3	5109	30	12707	0.016883	6.04917	0.54696251	6.33	5.64	0.407	0.28083	6.05
	5280	30	12707	0.018032	5.98293	0.540973127	6.33	5.64	0.503	0.34707	5.98

Well Z

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	365	45875	1.493E-11	24.40983	0.440186	24.75	24.06	0.49	0.34017	24.41
	50	365	45875	3.733E-08	16.53476	0.298174	16.74	16.46	0.733	0.20524	16.53
	100	365	45875	1.493E-07	15.19983	0.274101	15.54	14.85	0.49	0.34017	15.20
	500	365	45875	0.00000373	11.92743	0.215089	12.14	11.85	0.733	0.21257	11.93
	1000	365	45875	0.0000149	10.59490	0.191059	10.94	10.24	0.49	0.3451	10.59
Offsite Well No. 2	1422	365	45875	0.000030	9.84	0.177446	9.84	9.55	0	0	9.84
Offsite Well No. 7	1473	365	45875	0.000032	9.782	0.1764	9.84	9.55	0.2	0.058	9.78
	1500	365	45875	0.000034	9.724	0.175354	9.84	9.55	0.400	0.116	9.72
Offsite Well No. 9	1557	365	45875	0.000036	9.666	0.174308	9.84	9.55	0.6	0.174	9.67
Offsite Well No. 9A	1612	365	45875	0.000039	9.579	0.172739	9.84	9.55	0.9	0.261	9.58
	2000	365	45875	0.000060	9.14	0.164823	9.14	8.99	0.000	0	9.14
Offsite Well No. 6	2259	365	45875	0.000076	8.912	0.160711	8.99	8.86	0.6	0.078	8.91
	2500	365	45875	0.000093	8.707	0.157015	8.74	8.63	0.3	0.033	8.71
Offsite Well No. 1	2795	365	45875	0.000117	8.51	0.153511	8.63	7.94	0.170	0.1173	8.51
	3000	365	45875	0.000134	8.3954	0.151395	8.63	7.94	0.34	0.2346	8.40
	3500	365	45875	0.000183	8.0573	0.145298	8.63	7.94	0.83	0.5727	8.06
Offsite Well No. 10	3952	365	45875	0.000233	7.8047	0.140743	7.94	7.53	0.33	0.1353	7.80
	4000	365	45875	0.000239	7.7801	0.1403	7.94	7.53	0.39	0.1599	7.78
Offsite Well No. 4	4465	365	45875	0.000298	7.5382	0.135937	7.94	7.53	0.98	0.4018	7.54
	4500	365	45875	0.000302	7.5244	0.135689	7.53	7.25	0.02	0.0056	7.52
Offsite Well No. 3	4669	365	45875	0.000325	7.46	0.134527	7.53	7.25	0.25	0.07	7.46
	5000	365	45875	0.000373	7.3256	0.132104	7.53	7.25	0.73	0.2044	7.33
	5280	365	45875	0.000416	7.2132	0.130077	7.25	7.02	0.16	0.0368	7.21
Offsite Well No. 5	5743	365	45875	0.000492	7.0384	0.126924	7.25	7.02	0.92	0.2116	7.04
OffSite Well No. 8	6910	365	45875	0.000713	6.6718	0.120314	6.69	6.55	0.13	0.0182	6.67

$$u = \frac{r^2 S}{4Tt}$$

$$ho\text{-}h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters / **Well Parameters**

				gpm	f^3/d
K (ft/dy)		26	Flow Rate	116	22332
S	1.00E-03		Duration (months)	12	
b (ft)	497				
T (ft^2/dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

Ag Well Proposed Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	365	12707	5.390E-11	23.0698	3.226282003	23.14	22.96	0.39	0.0702	23.07
	50	365	12707	1.348E-07	15.29988	2.139668636	15.54	14.85	0.348	0.24012	15.30
	100	365	12707	5.390E-07	13.8598	1.938275291	13.93	13.75	0.39	0.0702	13.86
	500	365	12707	0.000013	10.73	1.500576767	10.94	10.24	0.3	0.21	10.73
	1000	365	12707	0.000054	9.25400	1.294160056	9.33	9.14	0.4	0.076	9.25
	1500	365	12707	0.000121	8.4851	1.186630375	8.63	7.94	0.210	0.1449	8.49
Offsite Well No. 1	1729	365	12707	0.000161	8.21	1.148032128	8.63	7.94	0.610	0.4209	8.21
	2000	365	12707	0.000216	7.8744	1.101224762	7.94	7.53	0.160	0.0656	7.87
Offsite Well No. 6	2184	365	12707	0.000257	7.7063	1.077716192	7.94	7.53	0.570	0.2337	7.71
	2500	365	12707	0.000337	7.4264	1.038572535	7.53	7.25	0.37	0.1036	7.43
Offsite Well No. 7	2799	365	12707	0.000422	7.1994	1.006826876	7.25	7.02	0.22	0.0506	7.20
	3000	365	12707	0.000485	7.0545	0.986562796	7.25	7.02	0.85	0.1955	7.05
Offsite Well No. 5	3012	365	12707	0.000489	7.0453	0.985276188	7.25	7.02	0.89	0.2047	7.05
Offsite Well No. 2	3374	365	12707	0.000614	6.819	0.953628422	6.84	6.69	0.14	0.021	6.82
Offsite Well No. 4	3443	365	12707	0.000639	6.7815	0.948384095	6.84	6.69	0.39	0.0585	6.78
	3500	365	12707	0.000660	6.75	0.943978861	6.84	6.69	0.6	0.09	6.75
Offsite Well No. 10	3865	365	12707	0.000805	6.5445	0.915239949	6.55	6.44	0.05	0.0055	6.54
	4000	365	12707	0.000862	6.4818	0.906471434	6.55	6.44	0.62	0.0682	6.48
OffSite Well No. 8	4025	365	12707	0.000873	6.4697	0.904779265	6.55	6.44	0.73	0.0803	6.47
Offsite Well No. 9	4195	365	12707	0.000949	6.3861	0.893087912	6.44	6.33	0.49	0.0539	6.39
Offsite Well No. 9A	4261	365	12707	0.000979	6.3531	0.888472904	6.44	6.33	0.79	0.0869	6.35
	4500	365	12707	0.001091	6.26721	0.876461297	6.33	5.64	0.091	0.06279	6.27
	5000	365	12707	0.001348	6.08988	0.851661924	6.33	5.64	0.348	0.24012	6.09
Offsite Well No. 3	5109	365	12707	0.001407	6.04917	0.845968682	6.33	5.64	0.407	0.28083	6.05
	5280	365	12707	0.001503	5.98293	0.836705103	6.33	5.64	0.503	0.34707	5.98

Current Operation

Well ID	Distance (ft)	Combined h_o-h (ft)
	1	2.53
	50	1.68
	100	1.53
	500	1.19
	1000	1.03
	1500	0.94
Offsite Well No. 1	1729	0.90
	2000	0.88
Offsite Well No. 6	2184	0.86
	2500	0.83
Offsite Well No. 7	2799	0.83
	3000	0.79
Offsite Well No. 5	3012	0.76
Offsite Well No. 2	3374	0.79
Offsite Well No. 4	3443	0.75
	3500	0.76
Offsite Well No. 10	3865	0.73
	4000	0.73
OffSite Well No. 8	4025	0.71
Offsite Well No. 9	4195	0.75
Offsite Well No. 9A	4261	0.75
	4500	0.70
	5000	0.68
Offsite Well No. 3	5109	0.68
	5280	0.67

Additional Main Ag Well Pumping

Well ID	Distance (ft)	Combined h_o-h (ft)	Change in Drawdown
	1	3.67	
	50	2.44	
	100	2.21	
	500	1.72	
	1000	1.49	
	1500	1.36	
Offsite Well No.	1729	1.30	-0.41
	2000	1.27	
Offsite Well No.	2184	1.24	-0.38
	2500	1.20	
Offsite Well No.	2799	1.18	-0.36
	3000	1.14	
Offsite Well No.	3012	1.11	-0.35
Offsite Well No.	3374	1.13	-0.34
Offsite Well No.	3443	1.08	-0.34
	3500	6.90	
Offsite Well No.	3865	1.06	-0.32
	4000	1.05	
OffSite Well No.	4025	1.03	-0.32
Offsite Well No.	4195	1.07	-0.32
Offsite Well No.	4261	1.06	-0.31
	4500	1.01	
	5000	0.98	
Offsite Well No.	5109	0.98	-0.30
	5280	0.97	

Drawdown Evaluation Calculations
60 Months of Operation

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters / **Well Parameters**

				gpm	f^3/d
K (ft/dy)		26	Flow Rate	75	14439
S	1.00E-03		Duration (months)	60	
b (ft)	497				
T (ft^2/dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters / **Well Parameters**

				gpm	f^3/d
K (ft/dy)		140	Flow Rate	54	10396
S	1.00E-03		Duration (months)	60	
b (ft)	328				
T (ft^2/dy)		45875			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 8/5/2022

Ag Well Existing Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remainder	W(u) minus	W(u) final
	1	1825	12707	1.078E-11	24.69618	2.233014546	24.75	24.06	0.08	0.05382	24.70
	50	1825	12707	2.695E-08	16.86505	1.524928227	17.15	16.74	0.695	0.28495	16.87
	100	1825	12707	1.078E-07	15.48618	1.400251586	15.54	14.85	0.08	0.05382	15.49
	500	1825	12707	0.000003	12.263	1.108813484	12.55	12.14	0.7	0.287	12.26
	1000	1825	12707	0.000011	10.87000	0.982859216	10.94	10.24	0.1	0.07	10.87
	1500	1825	12707	0.000024	10.08	0.911427866	10.24	9.84	0.400	0.16	10.08
Offsite Well No. 1	1729	1825	12707	0.000032	9.78	0.884482875	9.84	9.55	0.200	0.058	9.78
	2000	1825	12707	0.000043	9.484	0.857537885	9.55	9.33	0.300	0.066	9.48
Offsite Well No. 6	2184	1825	12707	0.000051	9.311	0.841895323	9.33	9.14	0.100	0.019	9.31
	2500	1825	12707	0.000067	9.035	0.81693956	9.14	8.99	0.7	0.105	9.04
Offsite Well No. 7	2799	1825	12707	0.000084	8.812	0.796776027	8.86	8.74	0.4	0.048	8.81
	3000	1825	12707	0.000097	8.6630	0.783303532	8.74	8.63	0.7	0.077	8.66
Offsite Well No. 5	3012	1825	12707	0.000098	8.652	0.782308918	8.74	8.63	0.8	0.088	8.65
Offsite Well No. 2	3374	1825	12707	0.000123	8.4713	0.765970127	8.63	7.94	0.23	0.1587	8.47
Offsite Well No. 4	3443	1825	12707	0.000128	8.4368	0.762850656	8.63	7.94	0.28	0.1932	8.44
	3500	1825	12707	0.000132	8.4092	0.76035508	8.63	7.94	0.32	0.2208	8.41
Offsite Well No. 10	3865	1825	12707	0.000161	8.2091	0.742262152	8.63	7.94	0.61	0.4209	8.21
	4000	1825	12707	0.000172	8.1332	0.735399317	8.63	7.94	0.72	0.4968	8.13
OffSite Well No. 8	4025	1825	12707	0.000175	8.1125	0.733527635	8.63	7.94	0.75	0.5175	8.11
Offsite Well No. 9	4195	1825	12707	0.000190	8.009	0.724169224	8.63	7.94	0.9	0.621	8.01
Offsite Well No. 9A	4261	1825	12707	0.000196	7.9676	0.720425859	8.63	7.94	0.96	0.6624	7.97
	4500	1825	12707	0.000218	7.6202	0.689014149	7.94	7.53	0.78	0.3198	7.62
	5000	1825	12707	0.000270	5.847	0.528682414	6.33	5.64	0.7	0.483	5.85
Offsite Well No. 3	5109	1825	12707	0.000281	7.6079	0.68790199	7.94	7.53	0.81	0.3321	7.61
	5280	1825	12707	0.000301	7.5272	0.680605142	7.53	7.25	0.01	0.0028	7.53

Well Z

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remainder	W(u) minus	W(u) final
	1	1825	45875	2.986E-12	25.9656	0.468241	26.36	25.96	0.99	0.3944	25.97
	50	1825	45875	7.465E-09	18.13955	0.327113	18.20	18.07	0.465	0.06045	18.14
	100	1825	45875	2.986E-08	16.74574	0.301978	17.15	16.74	0.99	0.40426	16.75
	500	1825	45875	0.00000075	13.53	0.243988	13.60	13.46	0.5	0.07	13.53
	1000	1825	45875	0.0000030	12.14000	0.218922	12.14	11.85	0.00	0	12.14
Offsite Well No. 2	1422	1825	45875	0.00000604	11.4436	0.206364	11.45	11.29	0.04	0.0064	11.44
Offsite Well No. 7	1473	1825	45875	0.0000065	11.37	0.205037	11.45	11.29	0.5	0.08	11.37
	1500	1825	45875	0.0000067	11.338	0.20446	11.45	11.29	0.700	0.112	11.34
Offsite Well No. 9	1557	1825	45875	0.0000072	11.264	0.203125	11.29	11.16	0.2	0.026	11.26
Offsite Well No. 9A	1612	1825	45875	0.0000078	11.064	0.199519	11.16	11.04	0.8	0.096	11.06
	2000	1825	45875	0.000012	10.8	0.194758	10.94	10.24	0.200	0.14	10.80
Offsite Well No. 6	2259	1825	45875	0.000015	10.59	0.190971	10.94	10.24	0.500	0.35	10.59
	2500	1825	45875	0.000019	10.31	0.185922	10.94	10.24	0.9	0.63	10.31
Offsite Well No. 1	2795	1825	45875	0.000023	10.13	0.182622	10.25	9.84	0.300	0.123	10.13
	3000	1825	45875	0.000027	9.9630	0.179664	10.25	9.84	0.7	0.287	9.96
	3500	1825	45875	0.000037	9.637	0.173785	9.84	9.55	0.7	0.203	9.64
Offsite Well No. 10	3952	1825	45875	0.000047	9.374	0.169043	9.55	9.33	0.8	0.176	9.37
	4000	1825	45875	0.000048	9.374	0.169043	9.55	9.33	0.8	0.176	9.37
Offsite Well No. 4	4465	1825	45875	0.0000595	8.9975	0.162253	9.14	8.99	0.95	0.1425	9.00
	4500	1825	45875	0.0000605	9.1325	0.164688	9.14	8.99	0.05	0.0075	9.13
Offsite Well No. 3	4669	1825	45875	0.000065	9.065	0.16347	9.14	8.99	0.5	0.075	9.07
	5000	1825	45875	0.000075	8.925	0.160946	8.99	8.86	0.5	0.065	8.93
	5280	1825	45875	0.000083	8.824	0.159124	8.86	8.74	0.3	0.036	8.82
Offsite Well No. 5	5743	1825	45875	0.000098	8.652	0.156023	8.74	8.63	0.8	0.088	8.65
OffSite Well No. 8	6910	1825	45875	0.000143	8.5334	0.153884	8.63	7.94	0.14	0.0966	8.53

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters / **Well Parameters**

				gpm	f^3/d
K (ft/dy)		26	Flow Rate	116	22332
S	1.00E-03		Duration (months)	60	
b (ft)	497				
T (ft^2/dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

Ag Well Proposed Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remainder	W(u) minus	W(u) final
	1	1825	12707	1.078E-11	24.69618	3.453729165	24.75	24.06	0.08	0.05382	24.70
	50	1825	12707	2.695E-08	16.86505	2.358555657	17.15	16.74	0.695	0.28495	16.87
	100	1825	12707	1.078E-07	15.48618	2.165722452	15.54	14.85	0.08	0.05382	15.49
	500	1825	12707	0.0000027	12.263	1.714964855	12.55	12.14	0.7	0.287	12.26
	1000	1825	12707	0.000011	10.87000	1.520155588	10.94	10.24	0.1	0.07	10.87
	1500	1825	12707	0.000024	10.08	1.409675099	10.24	9.84	0.400	0.16	10.08
Offsite Well No. 1	1729	1825	12707	0.000032	9.78	1.36800018	9.84	9.55	0.200	0.058	9.78
	2000	1825	12707	0.000043	9.484	1.326325262	9.55	9.33	0.300	0.066	9.48
Offsite Well No. 6	2184	1825	12707	0.000051	9.311	1.302131433	9.33	9.14	0.100	0.019	9.31
	2500	1825	12707	0.000067	9.035	1.263533186	9.14	8.99	0.7	0.105	9.04
Offsite Well No. 7	2799	1825	12707	0.000084	8.812	1.232346922	8.86	8.74	0.4	0.048	8.81
	3000	1825	12707	0.000097	8.6630	1.211509462	8.74	8.63	0.7	0.077	8.66
Offsite Well No. 5	3012	1825	12707	0.000098	8.652	1.209971126	8.74	8.63	0.8	0.088	8.65
Offsite Well No. 2	3374	1825	12707	0.000123	8.4713	1.184700463	8.63	7.94	0.23	0.1587	8.47
Offsite Well No. 4	3443	1825	12707	0.000128	8.4368	1.179875682	8.63	7.94	0.28	0.1932	8.44
	3500	1825	12707	0.000132	8.4092	1.176015857	8.63	7.94	0.32	0.2208	8.41
Offsite Well No. 10	3865	1825	12707	0.000161	8.2091	1.148032128	8.63	7.94	0.61	0.4209	8.21
	4000	1825	12707	0.000172	8.1332	1.13741761	8.63	7.94	0.72	0.4968	8.13
OffSite Well No. 8	4025	1825	12707	0.000175	8.1125	1.134522742	8.63	7.94	0.75	0.5175	8.11
Offsite Well No. 9	4195	1825	12707	0.000190	8.009	1.120048399	8.63	7.94	0.9	0.621	8.01
Offsite Well No. 9A	4261	1825	12707	0.000196	7.9676	1.114258662	8.63	7.94	0.96	0.6624	7.97
	4500	1825	12707	0.000218	7.6202	1.065675217	7.94	7.53	0.78	0.3198	7.62
	5000	1825	12707	0.000270	5.847	0.817695467	6.33	5.64	0.7	0.483	5.85
Offsite Well No. 3	5109	1825	12707	0.000281	7.6079	1.063955078	7.94	7.53	0.81	0.3321	7.61
	5280	1825	12707	0.000301	7.5272	1.052669286	7.53	7.25	0.01	0.0028	7.53

Current Operation

Well ID	Distance (ft)	Combined h_o-h (ft)
	1	2.70
	50	1.85
	100	1.70
	500	1.35
	1000	1.20
	1500	1.12
Offsite Well No. 1	1729	1.07
	2000	1.05
Offsite Well No. 6	2184	1.03
	2500	1.00
Offsite Well No. 7	2799	1.00
	3000	0.96
Offsite Well No. 5	3012	0.94
Offsite Well No. 2	3374	0.97
Offsite Well No. 4	3443	0.93
	3500	0.93
Offsite Well No. 10	3865	0.91
	4000	0.90
OffSite Well No. 8	4025	0.89
Offsite Well No. 9	4195	0.93
Offsite Well No. 9A	4261	0.92
	4500	0.85
	5000	0.69
Offsite Well No. 3	5109	0.85
	5280	0.84

Additional Main Ag Well Pumping

Well ID	Distance (ft)	Combined h_o-h (ft)	Change in Drawdown
	1	3.92	
	50	2.69	
	100	2.47	
	500	1.96	
	1000	1.74	
	1500	1.61	
Offsite Well No.	1729	1.55	-0.48
	2000	1.52	
Offsite Well No.	2184	1.49	-0.46
	2500	1.45	
Offsite Well No.	2799	1.44	-0.44
	3000	1.39	
Offsite Well No.	3012	1.37	-0.43
Offsite Well No.	3374	1.39	-0.42
Offsite Well No.	3443	1.34	-0.42
	3500	8.58	
Offsite Well No.	3865	1.32	-0.41
	4000	1.31	
OffSite Well No.	4025	1.29	-0.40
Offsite Well No.	4195	1.32	-0.40
Offsite Well No.	4261	1.31	-0.39
	4500	1.23	
	5000	0.98	
Offsite Well No.	5109	1.23	-0.38
	5280	1.21	

Drawdown Evaluation Calculations
120 Months of Operation

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
				gpm	f^3/d
K (ft/dy)		26	Flow Rate	75	14439
S	1.00E-03		Duration (months)	120	
b (ft)	497				
T (ft^2/dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
				gpm	f^3/d
K (ft/dy)		140	Flow Rate	54	10396
S	1.00E-03		Duration (months)	120	
b (ft)	328				
T (ft^2/dy)		45875			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 8/5/2022

Ag Well Existing Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	3650	12707	5.390E-12	25.3698	2.293922883	25.44	25.26	0.39	0.0702	25.37
	50	3650	12707	1.348E-08	17.59988	1.591371137	17.84	17.15	0.348	0.24012	17.60
	100	3650	12707	5.390E-08	16.1598	1.461159923	16.23	16.05	0.39	0.0702	16.16
	500	3650	12707	0.0000013	13.033	1.178436446	13.24	12.55	0.3	0.207	13.03
	1000	3650	12707	0.000005	11.55800	1.045067785	11.63	11.45	0.4	0.072	11.56
	1500	3650	12707	0.000012	10.8	0.976529856	10.94	10.24	0.200	0.14	10.80
Offsite Well No. 1	1729	3650	12707	0.000016	10.52	0.951212415	10.94	10.24	0.600	0.42	10.52
	2000	3650	12707	0.000022	10.16	0.91866142	10.24	9.84	0.200	0.08	10.16
Offsite Well No. 6	2184	3650	12707	0.000026	10	0.904194311	10.24	9.84	0.600	0.24	10.00
	2500	3650	12707	0.000034	9.724	0.879238548	9.84	9.55	0.4	0.116	9.72
Offsite Well No. 7	2799	3650	12707	0.000042	9.506	0.859527112	9.55	9.33	0.2	0.044	9.51
	3000	3650	12707	0.000049	9.3630	0.846597133	9.55	9.33	0.85	0.187	9.36
Offsite Well No. 5	3012	3650	12707	0.000049	9.3542	0.845801442	9.55	9.33	0.89	0.1958	9.35
Offsite Well No. 2	3374	3650	12707	0.000061	9.125	0.825077309	9.14	8.99	0.1	0.015	9.13
Offsite Well No. 4	3443	3650	12707	0.000064	9.08	0.821008434	9.14	8.99	0.4	0.06	9.08
	3500	3650	12707	0.000066	9.05	0.818295852	9.14	8.99	0.6	0.09	9.05
Offsite Well No. 10	3865	3650	12707	0.000081	8.848	0.800031126	8.86	8.74	0.1	0.012	8.85
	4000	3650	12707	0.000086	8.788	0.794605961	8.86	8.74	0.6	0.072	8.79
OffSite Well No. 8	4025	3650	12707	0.000087	8.776	0.793520927	8.86	8.74	0.7	0.084	8.78
Offsite Well No. 9	4195	3650	12707	0.000095	8.685	0.785292759	8.74	8.63	0.5	0.055	8.69
Offsite Well No. 9A	4261	3650	12707	0.000098	8.652	0.782308918	8.74	8.63	0.8	0.088	8.65
	4500	3650	12707	0.000109	8.5679	0.774704644	8.63	7.94	0.09	0.0621	8.57
	5000	3650	12707	0.000135	8.3885	0.758483398	8.63	7.94	0.35	0.2415	8.39
Offsite Well No. 3	5109	3650	12707	0.000141	8.3471	0.754740033	8.63	7.94	0.41	0.2829	8.35
	5280	3650	12707	0.000150	8.6231	0.779695796	8.63	7.94	0.01	0.0069	8.62

Well Z

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	3650	45875	1.493E-12	26.70983	0.481662	27.05	26.36	0.49	0.34017	26.71
	50	3650	45875	3.733E-09	18.83743	0.339698	19.05	18.76	0.733	0.21257	18.84
	100	3650	45875	1.493E-08	17.49983	0.315577	17.84	17.15	0.49	0.34017	17.50
	500	3650	45875	0.00000037	14.237	0.256738	14.44	14.15	0.7	0.203	14.24
	1000	3650	45875	0.0000015	12.89500	0.232537	13.24	12.55	0.5	0.345	12.90
Offsite Well No. 2	1422	3650	45875	0.0000030	12.14	0.218922	12.14	11.85	0	0	12.14
Offsite Well No. 7	1473	3650	45875	0.0000032	12.082	0.217876	12.14	11.85	0.2	0.058	12.08
	1500	3650	45875	0.0000034	12.024	0.216831	12.14	11.85	0.4	0.116	12.02
Offsite Well No. 9	1557	3650	45875	0.0000036	11.966	0.215785	12.14	11.85	0.6	0.174	11.97
Offsite Well No. 9A	1612	3650	45875	0.0000039	11.879	0.214216	12.14	11.85	0.9	0.261	11.88
	2000	3650	45875	0.0000060	11.45	0.206479	11.45	11.29	0	0	11.45
Offsite Well No. 6	2259	3650	45875	0.0000076	11.19	0.201813	11.29	11.16	0.76	0.0988	11.19
	2500	3650	45875	0.0000093	11.01	0.198545	11.04	10.94	0.3	0.03	11.01
Offsite Well No. 1	2795	3650	45875	0.0000117	10.82	0.195137	10.94	10.24	0.170	0.119	10.82
	3000	3650	45875	0.000013	10.7300	0.193496	10.94	10.24	0.3	0.21	10.73
	3500	3650	45875	0.000018	10.38	0.187184	10.94	10.24	0.8	0.56	10.38
Offsite Well No. 10	3952	3650	45875	0.000023	10.12	0.182495	10.24	9.84	0.3	0.12	10.12
	4000	3650	45875	0.000024	10.08	0.181774	10.24	9.84	0.4	0.16	10.08
Offsite Well No. 4	4465	3650	45875	0.0000298	9.848	0.17759	10.24	9.84	0.98	0.392	9.85
	4500	3650	45875	0.0000302	9.8342	0.177342	9.84	9.55	0.02	0.0058	9.83
Offsite Well No. 3	4669	3650	45875	0.000033	9.753	0.175877	9.84	9.55	0.3	0.087	9.75
	5000	3650	45875	0.000037	9.637	0.173785	9.84	9.55	0.7	0.203	9.64
	5280	3650	45875	0.000042	9.506	0.171423	9.55	9.33	0.2	0.044	9.51
Offsite Well No. 5	5743	3650	45875	0.000049	9.352	0.168646	9.55	9.33	0.9	0.198	9.35
OffSite Well No. 8	6910	3650	45875	0.000071	8.977	0.161884	8.99	8.86	0.1	0.013	8.98

$$u = \frac{r^2 S}{4Tt}$$

$$h_o - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
				gpm	f^3/d
K (ft/dy)		26	Flow Rate	116	22332
S	1.00E-03		Duration (months)	120	
b (ft)	497				
T (ft^2/dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

Ag Well Proposed Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft^2/dy)	u	W(u)	h_o-h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	3650	12707	5.390E-12	25.3698	3.54793406	25.44	25.26	0.39	0.0702	25.37
	50	3650	12707	1.348E-08	17.59988	2.461320692	17.84	17.15	0.348	0.24012	17.60
	100	3650	12707	5.390E-08	16.1598	2.259927347	16.23	16.05	0.39	0.0702	16.16
	500	3650	12707	0.0000013	13.033	1.822648369	13.24	12.55	0.3	0.207	13.03
	1000	3650	12707	0.0000054	11.55800	1.616371507	11.63	11.45	0.4	0.072	11.56
	1500	3650	12707	0.000012	10.8	1.510366177	10.94	10.24	0.200	0.14	10.80
Offsite Well No. 1	1729	3650	12707	0.000016	10.52	1.471208536	10.94	10.24	0.600	0.42	10.52
	2000	3650	12707	0.000022	10.16	1.420862996	10.24	9.84	0.200	0.08	10.16
Offsite Well No. 6	2184	3650	12707	0.000026	10	1.398487201	10.24	9.84	0.600	0.24	10.00
	2500	3650	12707	0.000034	9.724	1.359888954	9.84	9.55	0.4	0.116	9.72
Offsite Well No. 7	2799	3650	12707	0.000042	9.506	1.329401933	9.55	9.33	0.2	0.044	9.51
	3000	3650	12707	0.0000485	9.3630	1.309403566	9.55	9.33	0.85	0.187	9.36
Offsite Well No. 5	3012	3650	12707	0.0000489	9.3542	1.308172898	9.55	9.33	0.89	0.1958	9.35
Offsite Well No. 2	3374	3650	12707	0.000061	9.125	1.276119571	9.14	8.99	0.1	0.015	9.13
Offsite Well No. 4	3443	3650	12707	0.000064	9.08	1.269826379	9.14	8.99	0.4	0.06	9.08
	3500	3650	12707	0.000066	9.05	1.265630917	9.14	8.99	0.6	0.09	9.05
Offsite Well No. 10	3865	3650	12707	0.000081	8.848	1.237381476	8.86	8.74	0.1	0.012	8.85
	4000	3650	12707	0.000086	8.788	1.228990552	8.86	8.74	0.6	0.072	8.79
OffSite Well No. 8	4025	3650	12707	0.000087	8.776	1.227312368	8.86	8.74	0.7	0.084	8.78
Offsite Well No. 9	4195	3650	12707	0.000095	8.685	1.214586134	8.74	8.63	0.5	0.055	8.69
Offsite Well No. 9A	4261	3650	12707	0.000098	8.652	1.209971126	8.74	8.63	0.8	0.088	8.65
	4500	3650	12707	0.000109	8.5679	1.198209849	8.63	7.94	0.09	0.0621	8.57
	5000	3650	12707	0.000135	8.3885	1.173120989	8.63	7.94	0.35	0.2415	8.39
Offsite Well No. 3	5109	3650	12707	0.000141	8.3471	1.167331252	8.63	7.94	0.41	0.2829	8.35
	5280	3650	12707	0.000150	8.6231	1.205929498	8.63	7.94	0.01	0.0069	8.62

Current Operation

Well ID	radius (ft)	combined h_o-h (ft)
	1	2.78
	50	1.93
	100	1.78
	500	1.44
	1000	1.28
	1500	1.20
Offsite Well No. 1	1729	1.15
	2000	1.13
Offsite Well No. 6	2184	1.11
	2500	1.08
Offsite Well No. 7	2799	1.08
	3000	1.04
Offsite Well No. 5	3012	1.01
Offsite Well No. 2	3374	1.04
Offsite Well No. 4	3443	1.00
	3500	1.01
Offsite Well No. 10	3865	0.98
	4000	0.98
OffSite Well No. 8	4025	0.96
Offsite Well No. 9	4195	1.00
Offsite Well No. 9A	4261	1.00
	4500	0.95
	5000	0.93
Offsite Well No. 3	5109	0.93
	5280	0.95

Additional Main Ag Well Pumping

Well ID	radius (ft)	combined h_o-h (ft)	change in drawdown
	1	4.03	
	50	2.80	
	100	2.58	
	500	2.08	
	1000	1.85	
	1500	1.73	
Offsite Well No.	1729	1.67	-0.52
	2000	1.63	
Offsite Well No.	2184	1.60	-0.49
	2500	1.56	
Offsite Well No.	2799	1.55	-0.47
	3000	1.50	
Offsite Well No.	3012	1.48	-0.46
Offsite Well No.	3374	1.50	-0.45
Offsite Well No.	3443	1.45	-0.45
	3500	9.24	
Offsite Well No.	3865	1.42	-0.44
	4000	1.41	
OffSite Well No.	4025	1.39	-0.43
Offsite Well No.	4195	1.43	-0.43
Offsite Well No.	4261	1.42	-0.43
	4500	1.38	
	5000	1.35	
Offsite Well No.	5109	1.34	-0.41
	5280	1.38	

ATTACHMENT D

Response to Comments Memorandum

MEMORANDUM

DATE October 5, 2022 **Project No.** GL13397640

TO John Doyle
Z-Best Composting Facility

CC Richard Haughey

FROM George Wegmann, PG, CHG; Michael Bombard PG, CHG **EMAIL** **george.wegmann@wsp,com**

RESPONSES TO: ***Memorandum: Further Clarification of Hydrology and Supply Analyses and the Groundwater Drawdown Evaluation***

This memorandum (memo) was prepared by Golder Associates USA (Golder), a member of WSP, to provide responses to the comments noted in the subject memorandum, which was prepared by AECOM and dated September 28, 2022 (AECOM Memorandum). This memorandum addresses only those comments in the AECOM memorandum related to Golder's August 26, 2022 Groundwater Drawdown Evaluation memorandum. Each related comment is presented below with its corresponding response.

Comment 2, 4th Bullet: Due to uncertainty in annual inflow to the drainage basins due to water year type, it would be more conservative to estimate the change in groundwater drawdown based on the proposed usage for primary and secondary composting of 21.9 MGPY, instead of the adjusted value of 18 MGPY which is based on a change in excess surface water. **It is recommended that Golder revise their August 26, 2022 memo to include calculation of the groundwater drawdown based on the more conservative value of 21.9 MGPY for the proposed change in composting use.**

Response: Golder has revised the memo to include calculation of the groundwater drawdown based on 21.9 MGPY.

Comment 3: Clarifications needed in Table 1 and Table 2. The Golder groundwater drawdown evaluation memo (August 26, 2022) includes a groundwater usage summary (Table 1). The values provided in Table 1 include annual volume (in MGPY) and estimated pumping rate (in gallons per minute; gpm). The main body of the text indicates that the operational period is approximately 30 hours per week. Table 2 of the memo provides the "parameters used in the drawdown calculation" and includes flow rates in gpm and daily usage in cubic feet per day. Attachment C directly shows the calculations used in the drawdown estimates and includes the input flow rate in gpm and cubic feet per day. **It is recommended that Golder revise their August 26, 2022 memo to resolve inconsistencies in the values shown at these three locations.**

Response: Golder has revised the memorandum to provide additional clarity.

Comment 3, Bullet 1: In Table 1, the annual volume/annual rate used in the estimates, but not the instantaneous rate in gpm, should be reported. (Golder does not use the gpm reported in Table 1 in the calculations in Attachment C.) In Table 2, actual flow rates used in Attachment C should be reported. (This will require moving up the explanation that 39 MGPY = 381 gpm @ 33 hours per week = 75 gpm @168 hours per week, etc., but this will reduce confusion later.)

Response: Golder has revised Table 1 and Table 2 as requested. The explanation of the proportional calculation of the model continuous flow rates was moved to above Table 2.

Comment 3, Bullet 2: In Table 1, Golder should only show the existing baseline value for the primary extraction well that was used in the calculations shown in Attachment C. It appears that only the 39 MGPY value was used in the estimates.

Response: Golder has revised Table 1 as requested.

Comment 4: **Provide drawdown estimates for the river distance.** The Golder groundwater drawdown evaluation memo (August 26, 2022) provides estimated drawdown at offsite wells. Because the Pajaro River is also a sensitive receptor, the estimated drawdown at the closes riverine location should also be provided. **It is recommended that Golder revise their August 26, 2022 memo to include the estimated drawdown for the closest riverine location to the well.**

Response: Golder disagrees with this recommendation. As shown in the well log for Main Aquifer Well, the top of screened interval is at 160 feet below ground surface (bgs). The well log also shows thick clay layers above the screened interval at 135 to 148 bgs, 90 to 110 feet bgs and 13 to 48 feet bgs. Attached with this memo, are two cross sections from the report titled *Llagas Basin Numerical Groundwater Model*, prepared for Santa Clara Valley Water District by CH2M Hill and dated May 2005. The cross sections, oriented roughly north to south and west to east, show two thick continuous clay layers located at depths above the reported screened interval for Main Aquifer Well that extend to the bank of the river (i.e., the model boundary). Further, as observed in well logs reviewed by Golder, the uppermost clay layer extends from the base of a thin (typically less than 3 feet thick) surficial topsoil layer to a depth below the bottom of the river. These data suggest a separation from the upper unconfined zone that includes the river and the deeper confined zones in which the Main Agriculture Well is screened. Therefore, it is highly unlikely that Main Agricultural Well is in hydraulic communication with the river.

An additional consideration is that the Theis method and Driscoll's approximation used to calculate the drawdown are based on confined aquifer conditions. The use of the Theis method for calculating drawdown in an unconfined receptor would be inappropriate. Based on these factors, no changes are proposed for the revised memorandum with respect to Comment 4.

End of Technical Memorandum

https://golderassociates.sharepoint.com/sites/112344/project files/5 technical work/drawdown evaluation/revised memo/z-best response to comments.docx

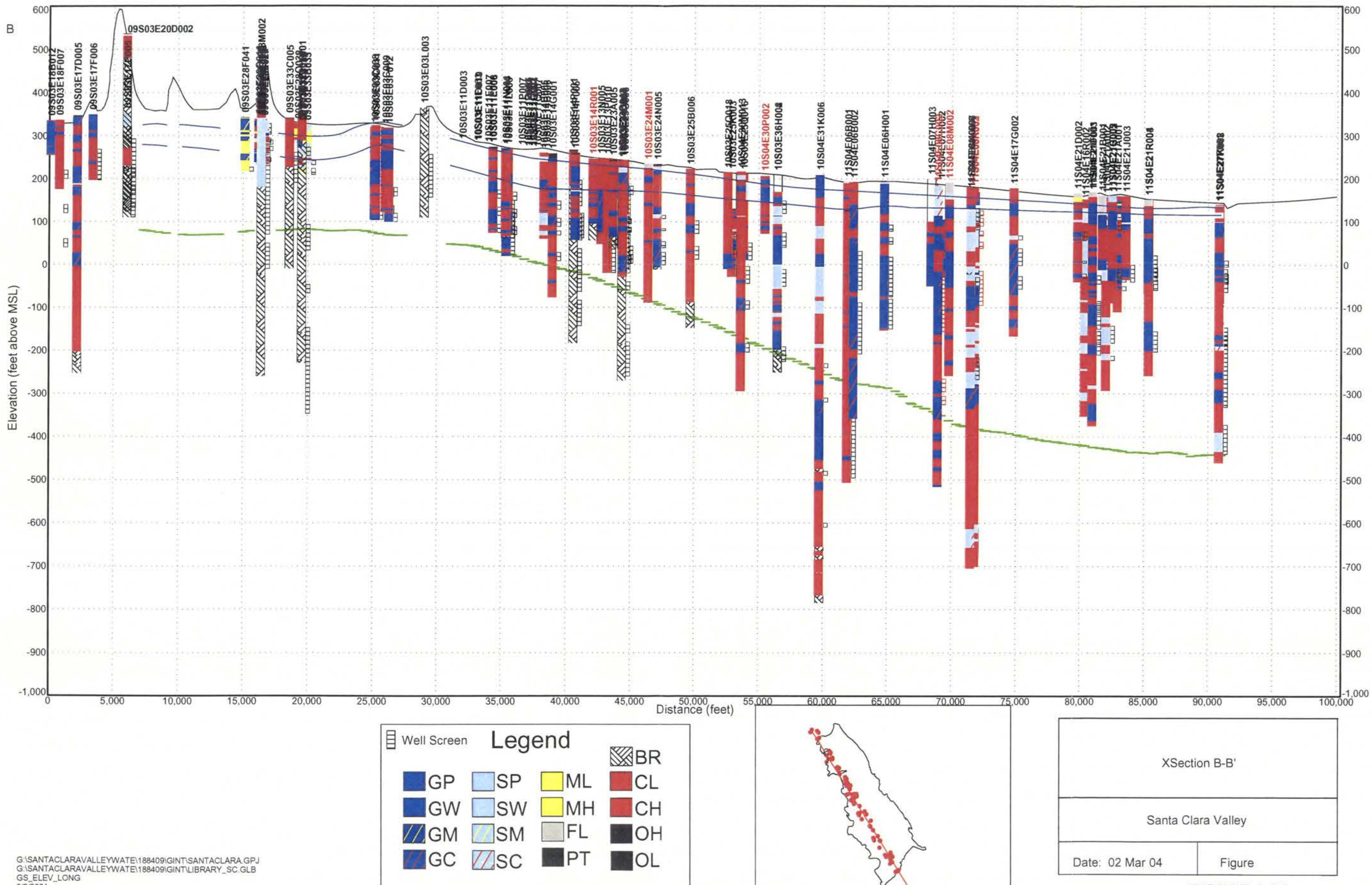


FIGURE 1-11
CROSS SECTION B-B'
LLAGAS BASIN GROUNDWATER MODEL
SANTA CLARA VALLEY WATER DISTRICT
CH2MHILL

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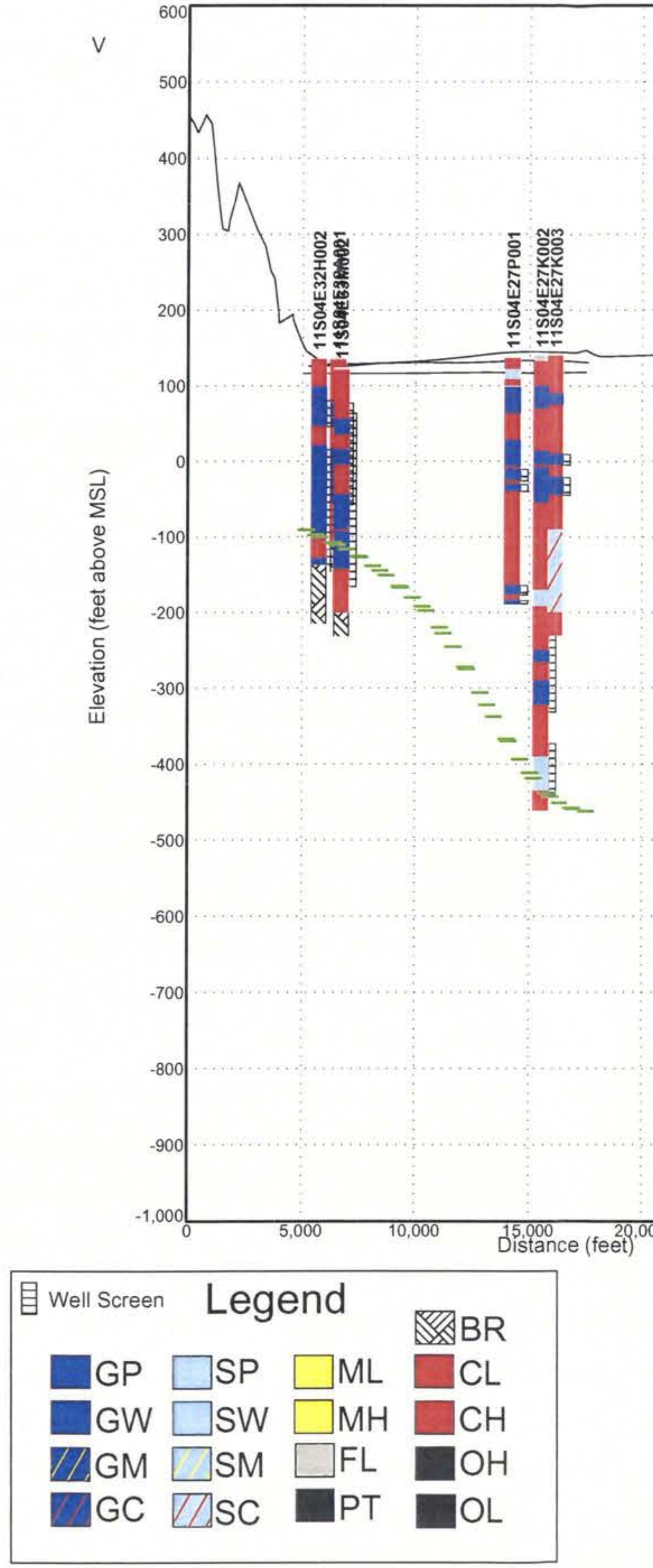

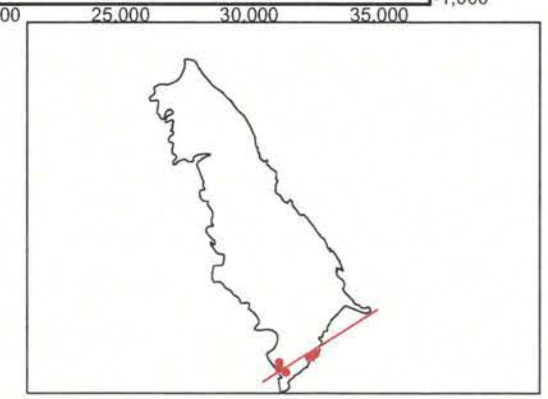

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XSection V-V'	
Santa Clara Valley	
Date: 01 Mar 04	Figure

FIGURE 1-31
CROSS SECTION V-V'
LLAGAS BASIN GROUNDWATER MODEL
SANTA CLARA VALLEY WATER DISTRICT

CH2MHILL

188409.LB.05 _Fig 3-24_4/15/04_ccc_sfo

AECOM
300 Lakeside Drive
Suite 400
Oakland
CA 94612
aecom.com

Project name:
Z-Best Composting Facility

Project ref:
60666256

From: Elizabeth Nielsen, Water Resources Engineer, AECOM

Date:
April 7, 2023

To: Valerie Negrete
County of Santa Clara Department of Planning and Development
70 West Hedding Street,
7th Floor East Wing
San Jose, CA 95110

CC: Emmanuel Ursu, Consultant Planner
Sam Gutierrez, Principal Planner
Elizabeth Vissers, Deputy County Counsel
Lizanne Reynolds, Deputy County Counsel

Memo

Subject: Detention Basin Analysis

This Technical Memorandum evaluates whether the storage capacity of the detention basins at the Z-Best Composting Facility, as proposed under the Z-Best Composing Facility Expansion and Upgrade Project (project), would be sufficient for the recent sequence of atmospheric rivers experienced during December 2022 to March 2023.

The analysis found that the proposed design capacity of the basins would be insufficient to detain the recent sequence of storm events and that, with consideration of antecedent rainfall conditions, the proposed design is unlikely to meet the required design conditions from the State Water Resources Control Board General Waste Discharge Requirements for Composting Operations (Composting Order), which requires detention basins to be designed to contain all runoff from working surfaces in addition to direct precipitation from the 25-year, 24-hour storm event.

1. Background

Z-Best Products has applied to the County of Santa Clara for a major modification to its existing Use Permit at the Z-Best Composting Facility located at 980 State Route 25 (SR-25) in an unincorporated area approximately 5 miles southeast of Gilroy, California. Proposed facility modifications will also require Architecture and Site Approval and Grading Approval. Z-Best is proposing to replace the existing composting process it uses for processing municipal solid waste feedstock with an Engineered Composting System (ECS) process that uses aerated static piles (ASP); existing green waste composting operations would remain unchanged. Additional components of the proposed project include expanding the existing flood storage facility, modifying Detention Basin #1, relocating the existing facility entrance, and widening SR-25 along the project site frontage to enable installation of acceleration lanes and deceleration lanes into and out of the proposed relocated entrance.

As part of the proposed project, the ECS improvements area within Area 1 would be raised by approximately 1 to 2 feet; the existing flood storage basin would increase by approximately 7.2 acres; and the footprint and elevation of the perimeter berms for Detention Basin #1 would be modified. Perimeter berms at the drainage basin would be raised to protect the basin from a 100-year flood and the footprint of the drainage basin would decrease from 6.3 acres to approximately 3.6 acres. As a result of these modifications, Detention Basin #1 would increase its maximum capacity from approximately 9.1 million gallons to approximately 14.5 million gallons. No modifications to Detention Basin #2 are proposed as part of the project. See Figure 1 through 3 for project plans showing existing and proposed conditions.

2. Methodology

The proposed storage capacity for Detention Basin #1 was evaluated based on the methodology provided in Golder (2020) with project data updated based on Golder (2022a, b, and c). A water balance model was used to estimate basin storage needs that accounts for direct precipitation to the basin, runoff from the facility, evaporation from the basin, and operational outflows. Operational outflows include water use for green waste composting operations and dust control; water used for ASP composting operations were assumed to come from Detention Basin #1, Detention Basin #2, or groundwater. Operations for Detention Basin #1 and Detention Basin #2 are interconnected and therefore inflows and outflows at both basins were modeled concurrently.

The major differences between the water balance presented herein and the one presented in Golder (2020) is the timestep of the model and input hydrology. This model uses a daily timestep and the daily precipitation data measured in Gilroy during water year 2023. These data were used to evaluate whether the storage capacity in Detention Basin #1 would be sufficient in light of the recent sequence of storm events experienced in the Gilroy area.

2.1 Input Data and Assumptions

The following input data and assumptions were used in the water balance.

- Detention basin characteristics. Detention basin capacity, surface area, and berm elevations and the contributing runoff area are described in Table 1.
- Stage-storage-area relationships. Information related to elevation, surface area, and volume for water stored within the drainage basins is provided in Tables 2 and 3. These data are the same as those reported in Golder (2020). Where drainage basin capacity was found to be limited (i.e., the basin would have overtopped), the volume and surface area were estimated based on trendlines fitted to these data. For the purpose of the modeling, where proposed capacity was limited, the berm elevations were assumed to increase (as opposed to changing the footprint of the drainage basins or allowing overtopping) so as to contain all runoff from the facility without discharge from the drainage basins.
- Direct precipitation. Direct precipitation to the basins was estimated based on rainfall and the footprints of the drainage basins.
- Runoff. Runoff to the drainage basins was estimated based on rainfall, the size of the contributing drainage area, and a runoff coefficient for the contributing drainage area. The runoff coefficient for Area 1 was assumed to be 0.76 and the runoff coefficient for Area 2 was assumed to be 0.72, which were considered reasonable estimates provided in Golder (2022a). Note that proposed conditions include runoff from an approximate 2.6-acre area south of Area 1's compost pad which

does not currently flow to Detention Basin #1 (Golder 2022a); in addition, the contributing drainage area from Area 2 was reduced to 24 acres to account for the increased size of the flood storage basin included in the proposed project, which captures about 2 acres of drainage that is currently part of Area 2.

- Evaporation. Evaporation from the detention basins was estimated based on the reference evapotranspiration rate (ETo) for Gilroy and the estimated surface area of the water stored in the drainage basins.[1] The ETo values used in Golder (2020 and 2022a) were verified as reasonable and used to facilitate consistency in the modeling. See Table 4.
- Operations. Operational decisions affect either or both of the detention basins. Operational outflows include water used for green waste composting and for dust control. Water demands for ASP composting are assumed to be met by groundwater.

  Water demands for primary and secondary green waste composting are each estimated at 176,000 gallons per day, Monday through Friday (260 days per year) with no reduction for concurrent rainfall or seasonal fluctuations in evaporation from the compost. The water demand for primary green waste composting was assumed to be met first from water stored in Detention Basin #1 until empty, then from Detention Basin #2. If both basins were insufficient or empty, demand would then be met by groundwater. The water demand for secondary green waste composting was assumed to be met from Detention Basin #2 or, if insufficient or empty, from groundwater.

  Water demands for dust control are estimated at 147,000 gallons per day, Monday through Friday. Water demand for dust control was assumed to be met after demands for green composting operations were resolved. Water for dust control was obtained first from the remaining water in Detention Basin #1, then Detention Basin #2, and, if both were empty or insufficient, from groundwater.

  Water demands for primary ASP composting are estimated at 20,000 gallons per day, 365 days per year and water demands for secondary ASP composting are estimated at 40,000 gallons per day, 365 days per year. Golder (2020) indicates that ASP primary and secondary composting demands would be met preferentially from groundwater but could also be met from water captured in Detention Basin #2. This assumption was updated based on personal communication from Z-Best Operations Manager, John Doyle in 2023; water for ECS ASP composting would be obtained from Detention Basin #1, Detention Basin #2, or groundwater.
- Transfers between detention basins. For the purpose of the modeling, it was assumed that transfers would not occur between drainage basins. However, as it is possible to pump water between the drainage basins, the potential for overtopping has also been evaluated based on the combined capacity of the two drainage basins.

2.2 Hydrology

Precipitation data for Gilroy, California were downloaded from the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information and NOAA's National Weather Service (NOAA 2023a, 2023b). Three weather stations recorded precipitation data in the Gilroy area during water year 2023; see Table 5 for a summary of these data. The National Weather Service reports daily precipitation for Gilroy, California based on data recorded at the weather station Gilroy, CA US, USC00043417, which has a long-term data record. Minor corrections to data are made during review (NOAA 2023b). Data from weather station Gilroy, CA US, USC00043417, was selected for the model to allow for comparison to the long-term record. One datapoint was removed from the

[1] ETo is approximately equal to evaporation from a large body of water.

October 2022 to March 2023 record (data for March 9, 2023); this datapoint was also excluded by the National Weather Service.

There have been several flood events in the vicinity of the project area in 2023. On January 9, 2023, and on March 10, 2023, storms caused flooding on Highway 101, Bloomfield Avenue, and Bolsa Road. Winter 2023 was particularly wet, with atmospheric rivers providing multiple inches of rain over several weeks-long periods. The March 10, 2023, storm was the largest 24-hour precipitation event during this period, with 4.05 inches of rain. December and early January also experienced substantial rainfall. The maximum 45-day averaging period during December and early January was 18.65 inches inclusive of the January 9, 2023, storm.

Table 6 compares point precipitation frequency estimates for the Gilroy, CA US, USC00043417 gauge location, obtained from NOAA's National Weather Service Hydrometeorological Design Studies Center (NOAA 2023c), to the precipitation data from this weather station for different averaging periods. The maximum 1-day precipitation was between a 5-year and a 10-year event and the maximum 45-day precipitation was between a 10-year and a 25-year event.

3. Results

The water balance predicts flooding under proposed conditions at the Z-Best Composting Facility and overtopping of the detention basins after the January 9, 2023, and March 10, 2023, storms. Although the capacity at the crest of Detention Basin #1 would increase from 9.1 million gallons to 14.5 million gallons as a result of the project, there would not be adequate storage within Detention Basin #1 and #2 to hold runoff from the facility as well as the direct precipitation to the basins during the January 9th and March 10th storms. The atmospheric river conditions experienced in December 2022 through March 2023 are predicted to fill the detention basins to 80 to 90 percent capacity prior to when these large events would occur, and water use demands are not expected to be sufficient to prevent overtopping of the basin berms. Water use demands were assumed conservatively and did not account for reductions to demand based on concurrent rainfall or seasonal fluctuations in evaporation from the compost.

Because the proposed capacity was not predicted to be adequate to retain the runoff and precipitation from these storms, for the purpose of the modeling, increased capacity was assumed for the drainage basins. As discussed in Section 2.1, where the proposed capacity was limiting, the berm elevations were assumed to increase (as opposed to increasing the footprint of the drainage basins or allowing overtopping) until all runoff from the facility would be contained without discharge from the drainage basins. This is a simplifying assumption and it does not represent optimization for site conditions.

Figures 4, 5, and 6 show the results of the water balance with the above-mentioned assumptions. Assuming that all runoff and precipitation could be held within the basins, the water balance indicates that approximately 3.8 million gallons of additional capacity would be needed at Detention Basin #1 and an additional 0.5 million gallons of capacity would be needed at Detention Basin #2 to accommodate the post-January 9, 2023, storms without overtopping. This value would increase to 6.1 and 1.8 million gallons of additional capacity below the freeboard, respectively, if 2 feet of freeboard would be maintained at each of the detention basins. Detailed results of the water balance model are shown in Attachment A. These results are specific to the rainfall that occurred in water year 2023, and a different amount of additional storage may be required for historical rainfall periods in other wet years. Including additional operational complexity such as fluctuating the demand based on rainfall and evaporation conditions, which would increase the estimated amount of additional storage needed because wet winter conditions would likely have lower demand than the annual average, as is assumed here.

4. Conclusions and Recommendations

The State Water Resources Control Board Composting Order requires detention basins to be designed to contain all runoff from working surfaces in addition to direct precipitation from the 25-year, 24-hour storm event. Specifically, it indicates that:

Detention ponds, if used, must be designed, constructed, and maintained to prevent conditions contributing to, causing, or threatening to cause contamination, pollution, or nuisance, and must be capable of containing, without overflow or overtopping (taking into consideration the crest of winddriven waves and water reused in the composting operation), all runoff from the working surfaces in addition to precipitation that falls into the detention pond from a 25-year, 24-hour peak storm event at a minimum, or equivalent alternative approved by the Regional Water Board.

According to NOAA point precipitation frequency estimates, the 25-year, 24-hour storm event is 5.8 inches of rain (NOAA 2023c), and such an event could be accommodated if the detention basins were empty. A storm with 5.8 inches of rain is expected to fill the detention basins to approximately 65 percent of their combined capacity. However, as demonstrated in Golder (2020) and in this water balance model, operations of the detention basins will not draw down water levels to empty during extended periods of time in wet years. In addition, extreme events such as the 25-year, 24-hour storm event are more likely to occur during wet years than dry years. As such, there remains a substantial risk of overtopping if an extreme event occurs during a wet year assuming the currently proposed capacity increase in Detention Basin #1.

It is recommended that design capacity of Detention Basin #1 consider the operational context of the detention basin. A wet year is expected to provide antecedent rainfall conditions which would likely occupy a portion of the drainage basins prior to an extreme event. Wet conditions would also reduce water use demands. Although 2023 has been a very wet year with storm events providing multiple inches of rain, single day and multiple day events were less than the 25-year event.

5. References

Doyle, John, pers. comm. 2023. Personal communication from Z-Best Operations Manager, John Doyle.

Golder Associates Inc. (Golder), 2020. Area 1 and Area 2 Water Balance. Appendix C of Z-Best Composting Facility Technical Report. Submitted by Golder Associates Inc. to Zanker Road Resource Management Ltd. December 2020.

Golder, 2022a. Water Supply Evaluation, Z-Best Compost Facility. August 15, 2022.

Golder, 2022b. Aerated Static Pile Composting Permit Package. Project No. 133-97640. County File No. 6498-81-11-09G 08P 08A 08EA. April 2022.

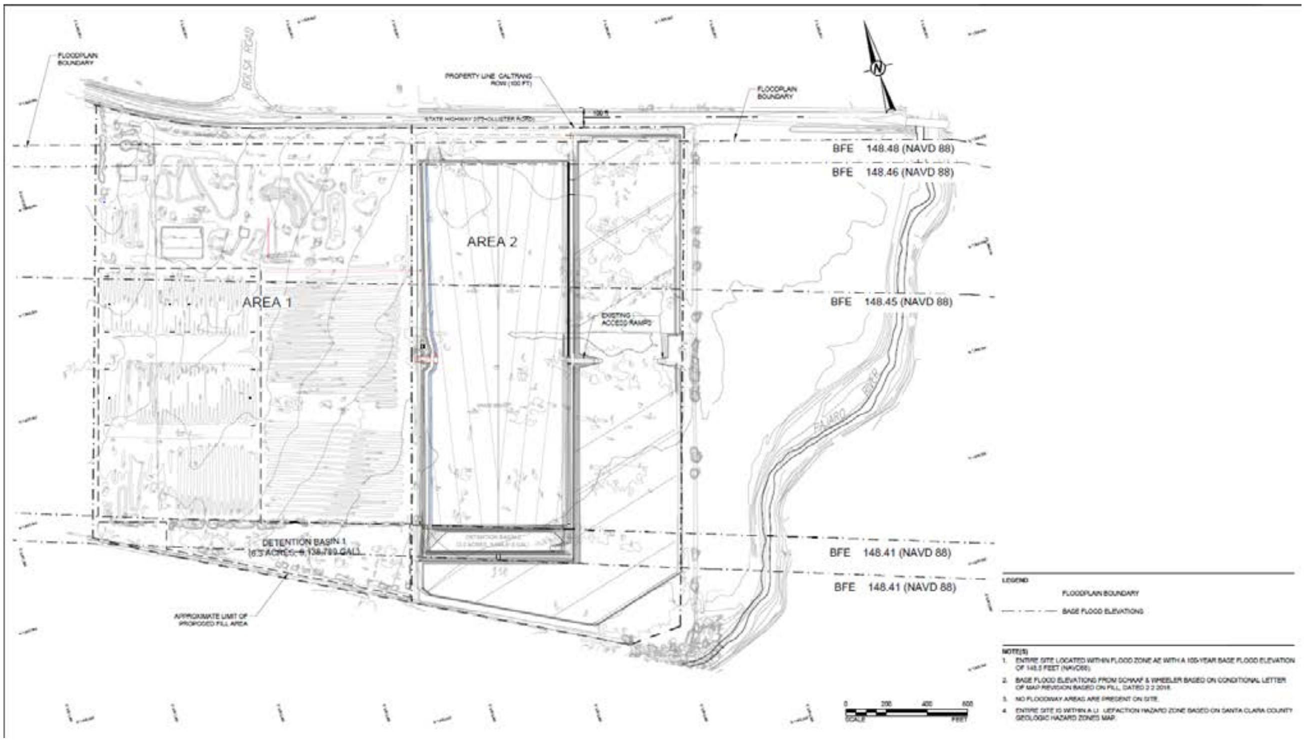
Golder, 2022c. Drawing 13, Proposed Detention Basin 1 - Plan and Section. Aerated Static Pile Composting Permit Package. Project No. 133-97640. County File No. 6498-81-11-09G 08P 08A 08EA. August 22, 2022.

National Oceanic and Atmospheric Administration (NOAA), 2023a. Climate Data Online. National Centers for Environmental Information. https://www.ncei.noaa.gov/cdo-web/

National Oceanic and Atmospheric Administration (NOAA), 2023b. NOWData – NOAA Online Weather Data. National Weather Service. https://www.weather.gov/wrh/Climate?wfo=mtr

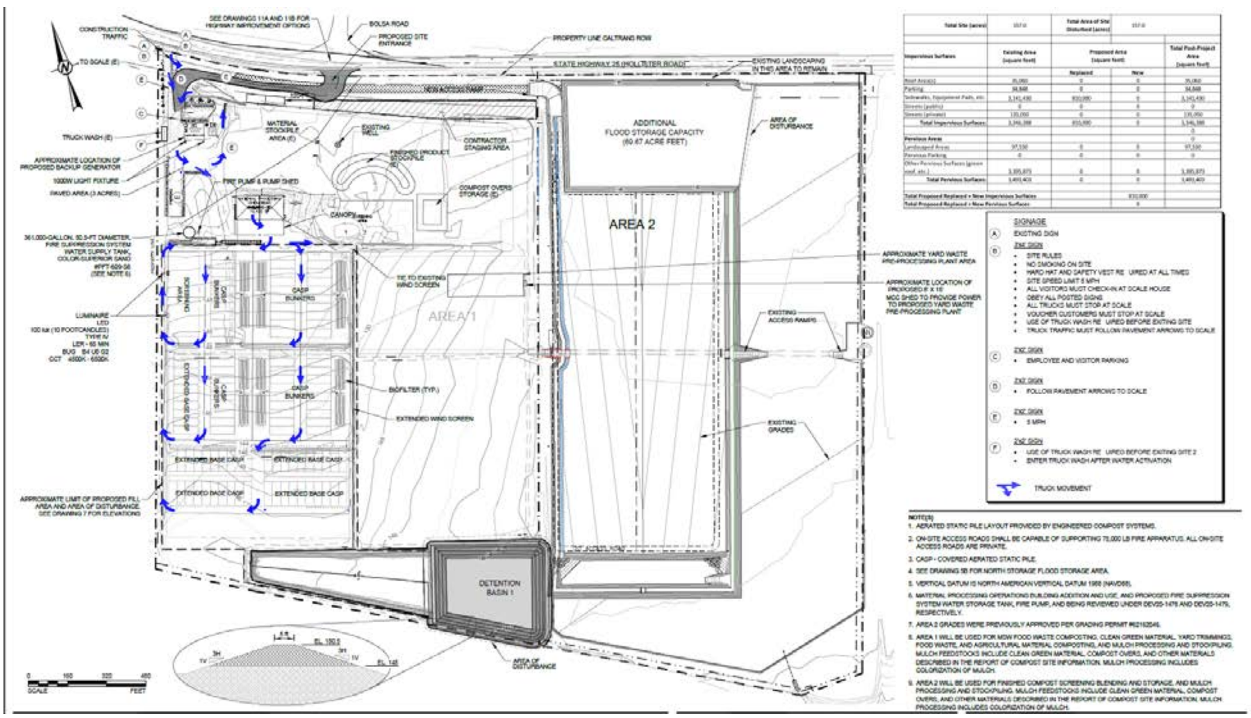
National Oceanic and Atmospheric Administration (NOAA), 2023c. NOAA Atlas 14 Point Precipitation Frequency Estimates. National Weather Service, Hydrometeorological Design Studies Center. https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html

Figures



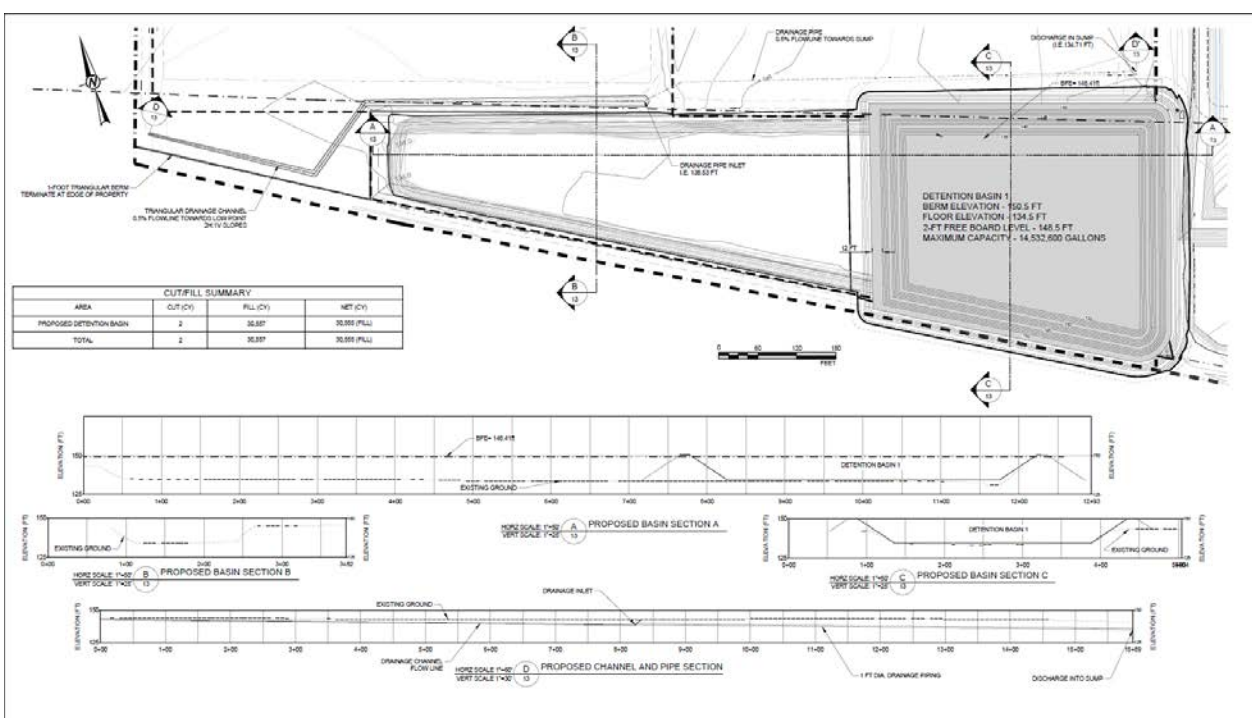
Source: Golder 2022b

Figure 1. Existing Site



Source: Golder 2022b

Figure 2. Proposed Site Plan



Source: Golder 2022c

Figure 3. Detail of Detention Basin #1, Proposed Site Plan

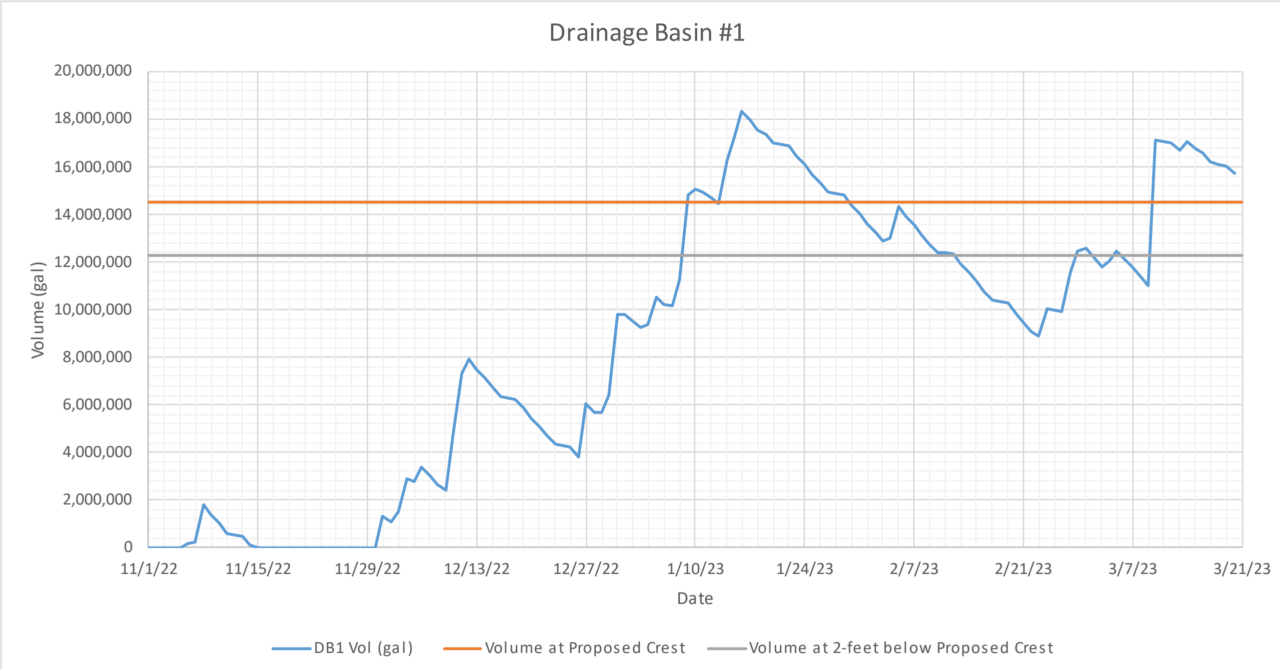


Figure 4. Model Results for Detention Basin #1

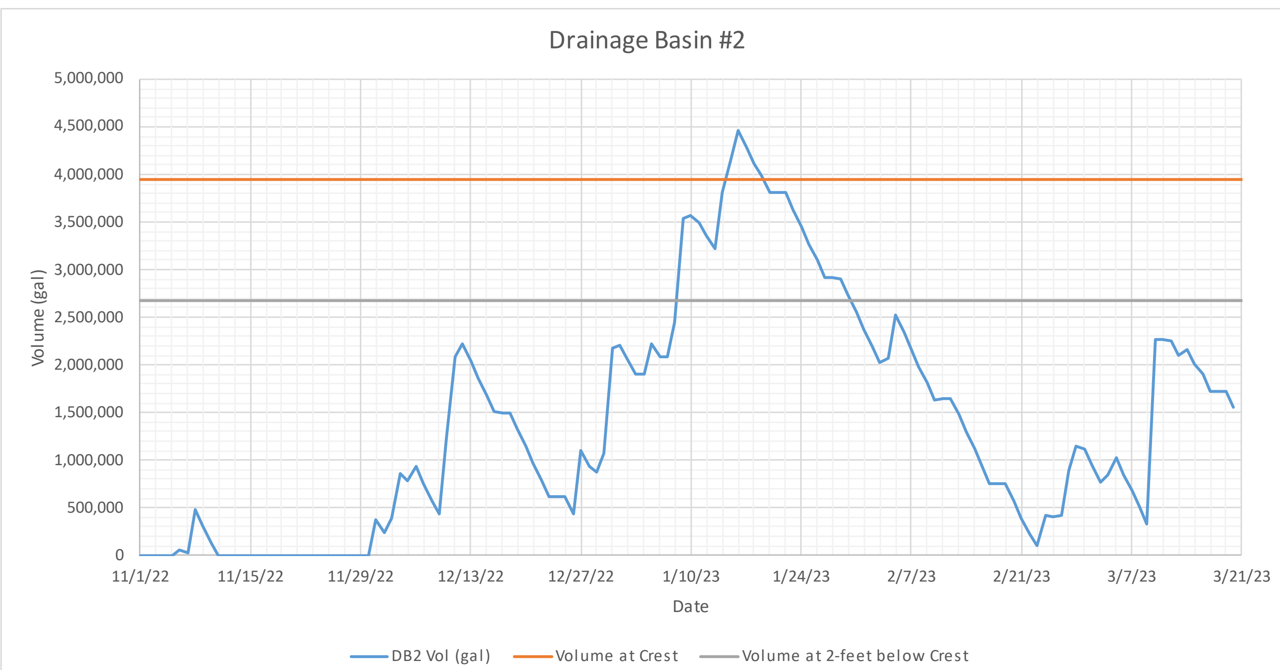


Figure 5. Model Results for Detention Basin #2

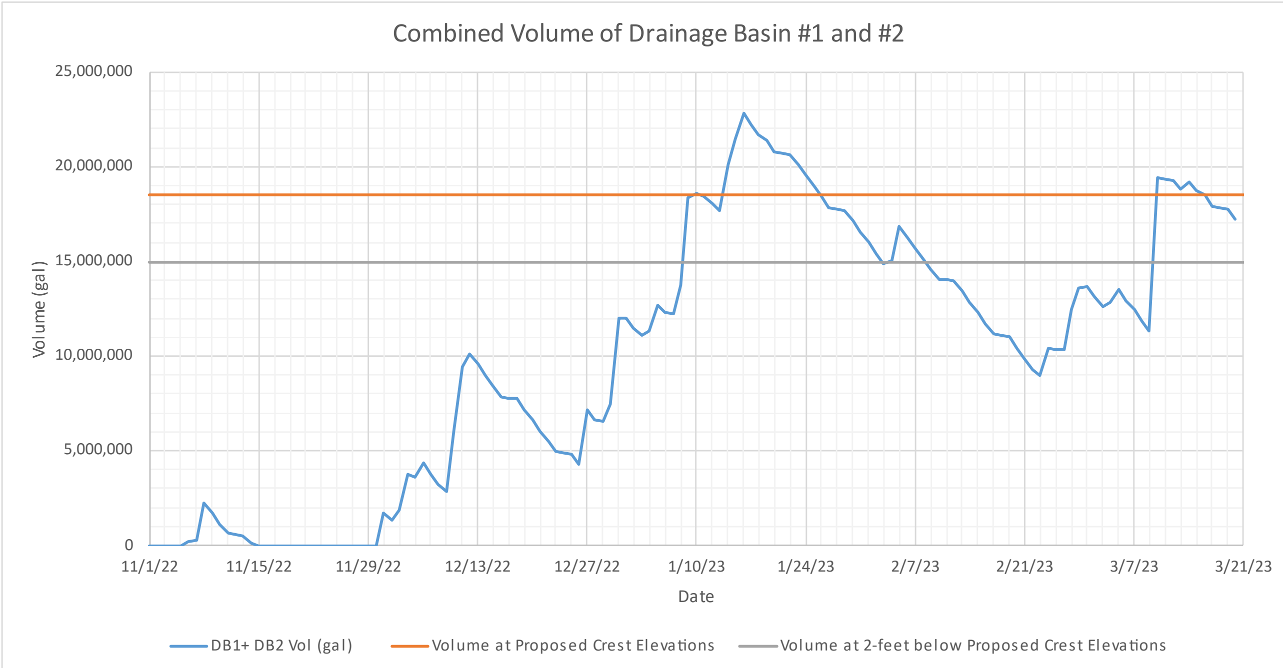


Figure 6. Model Results for the Combined Capacity of Detention Basin #1 and #2

Tables

Table 1. Detention Basin Characteristics

Description	Value	Data Source
Area 1 drainage area, existing	3,057,780 sq ft (70.2 ac)	Golder 2022, table 5
Area 1 drainage area, proposed	3,170,560 sq ft (72.8 ac)	Golder 2022, table 12
DB1 capacity, existing	9,138,789 gal	Golder 2022, table 1
DB1 capacity, proposed	14,532,600 gal	Update to Drawing 13
DB1 surface area, proposed	sq ft	Golder 2022, page 10
DB1 floor elevation	134.5 ft	Update to Drawing 13
Base flood elevation of the 100-year floodplain	148.41 ft	Project plans, Drawing 3
DB1 berm elevation, proposed	150.5 ft	Update to Drawing 13
Area 2 drainage area, existing	1,132,560 sq ft (26 acres)	Golder 2022
Area 2 drainage area, proposed	1,045,440 sq ft (24 acres)	Estimated from project plans
DB2 capacity	3,944,915 gal	Golder 2020
DB2 surface area	88,226 sq ft	Golder 2020
DB2 floor elevation	141.8 ft	Golder 2020
DB2 berm elevation	149 ft	Golder 2020

Source: Golder 2020 and 2022a; Project plans (Golder 2022b); Update to Drawing 13 (Golder 2022b)

Table 2. Detention Basin #1 Stage-Storage-Area Relationship, Proposed Condition

Elevation (ft)	Surface Area (sq ft)	Volume (Acre-ft)	Volume (gal)
150.5	156,295	44.5	14,532,595
150	153,947	42.8	13,952,443
149	149,301	39.3	12,818,295
148.5	147,008	37.6	12,264,196
148	144,722	35.9	11,718,661
147	140,209	32.7	10,653,019
146	135,762	29.5	9,620,887
145	131,381	26.4	8,621,771
144	127,066	23.5	7,655,177
143	122,818	20.6	6,720,611
142	118,635	17.8	5,817,576
141	114,519	15.2	4,945,579
140	110,469	12.6	4,104,126
139	106,485	10.1	3,292,721

Elevation (ft)	Surface Area (sq ft)	Volume (Acre-ft)	Volume (gal)
138	102,567	7.7	2,510,869
137	98,715	5.4	1,758,077
136	94,929	3.2	1,033,850
135	91,209	1.0	337,692
134.5	89,374	0.0	Approx. 0

Source: Golder 2020; elevations verified by Drawing 13 (Golder 2020c).

Table 3. Detention Basin #2 Stage-Storage-Area Relationship

Elevation (ft)	Surface Area (sq ft)	Volume (Acre-ft)	Volume (gal)
149	88,226	12.1	3,944,915
148	84,677	10.1	3,298,256
147	80,203	8.2	2,681,604
146	76,032	6.4	2,097,284
145	71,822	4.7	1,544,309
144	67,345	3.1	1,023,825
143	62,723	1.6	537,370
142	57,968	0.3	85,984
141.8	56,983	0.0	Approx. 0

Source: Golder 2020; elevations verified by project plans (Drawing 5B) (Golder 2022b)

Table 4. Reference Evapotranspiration for Gilroy, CA

Month	ETo (inches/month)	ETo (inches/day)
January	1.55	0.050
February	2.00	0.071
March	3.55	0.115
April	4.71	0.157
May	6.08	0.196
June	6.65	0.222
July	6.99	0.225
August	6.32	0.204
September	4.93	0.164
October	3.50	0.113
November	1.89	0.063
December	1.39	0.045

Source: Golder 2020 and 2022a

Table 5. Precipitation in Gilroy, California

Month	Gilroy, CA US (USC00043417), precipitation in inches	Gilroy 2.0 S, CA US (US1CASC0063), precipitation in inches	Gilroy 0.1 SE, CA US (US1CASC0054), precipitation in inches
October 2022	0	0	0
November 2022	1.61	3.24	3.04
December 2022	11.65	11.58	11.12
January 2023	8.25	11.52	11.74
February 2023	4.19	2.94	4.38
March 2023*	5.49	7.85	7.7
Total (through March 15th)	31.19	37.13	37.98

Source: NOAA 2023a

Note: * March 1 through March 15. Outlier occurring on March 9, 2023 was removed from Gilroy, CA US (USC00043417).

Table 6. Comparison of Precipitation Frequency Estimates, in inches, to Water Year 2023 Data, in inches

Duration	Maximum precipitation, inches [1,2]	Average Return Interval, in years									
		1	2	5	10	25	50	100	200	500	1,000
24-hour	4.05	1.83	2.71	3.81	4.67	5.80	6.64	7.46	8.29	9.37	10.2
7-day	5.03	3.71	5.09	6.87	8.31	10.3	11.7	13.2	14.8	16.8	18.4
10-day	6.77	4.19	5.66	7.57	9.11	11.2	12.8	14.4	16.0	18.2	20.0
20-day	11.9	5.47	7.29	9.60	11.4	13.9	15.7	17.5	19.3	21.7	23.5
30-day	12.95	6.72	8.92	11.7	13.8	16.6	18.6	20.6	22.5	25.0	26.9
45-day	18.65	8.28	10.9	14.1	16.6	19.7	21.9	24.0	26.1	28.6	30.5
60-day	19.9	9.73	12.8	16.4	19.1	22.5	24.8	27.0	29.1	31.7	33.5

Source: NOAA Atlas 14, Volume 6, Version 2 Point Precipitation Frequency Estimates (NOAA 2023c)

Notes:

[1] Gauge location name: Gilroy, California, USA, Latitude: 37.003°, Longitude: -121.5608°

[2] Maximum precipitation from November 1, 2022 to March 15, 2023. October 2022 had no rainfall in Gilroy, California.

Attachment A - Calculations

Detention Basin Analysis

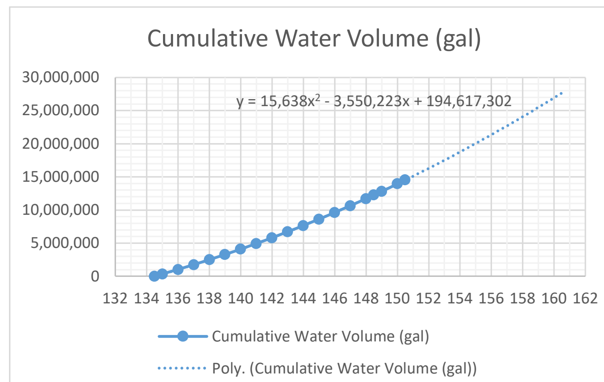
Detention Basin 1	*Value*	*Unit*	*Source*
Area 1 runoff area, existing	3,057,780	sq ft (70.2 ac)	Golder 2022, table 5
Area 1 runoff area, proposed	3,170,560	sq ft (72.8 ac)	Golder 2022, table 12
DB1 capacity, existing	9,138,789	gal	Golder 2022, table 1
DB1 capacity, proposed	14,532,600	gal	Drawing 13
DB1 surface area, proposed	185,388	sq ft	Golder 2022, page 10
DB1 floor El.	134.5	ft	Drawing 13
BFE	148.41	ft	Project plans, Drawing 3
Base of freeboard	148.5	ft	Drawing 13
Berm El.	150.5	ft	Drawing 13

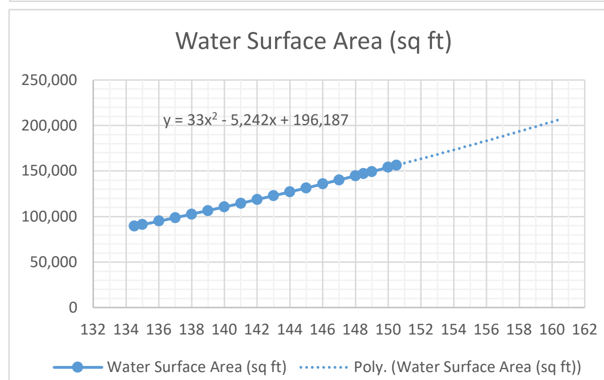
Detention Basin 2	*Value*	*Unit*	*Source*
Area 2 runoff area, exist	1,132,560	sq ft (26 ac)	Golder 2022
Area 2 runoff area, prop	1,045,440	sq ft (24 ac)	
DB2 capacity	3,944,915	gal	Golder 2020
DB2 surface area	88,226	sq ft	Golder 2020
DB2 floor El.	141.8	ft	Golder 2020
DB2 berm elevation	149	ft	Golder 2020

Composing General Order: Detention ponds, if used, must be designed, constructed, and maintained to prevent conditions contributing to, causing, or threatening to cause contamination, pollution, or nuisance, and must be capable of containing, without overflow or overtopping (taking into consideration the crest of winddriven waves and water reused in the composting operation), all runoff from the working surfaces in addition to precipitation that falls into the detention pond from a 25-year, 24-hour peak storm event at a minimum, or equivalent alternative approved by the Regional Water Board.

DB1 (proposed) Stage Storage Area (source: Golder 2020; elevations verified on Drawing 13)

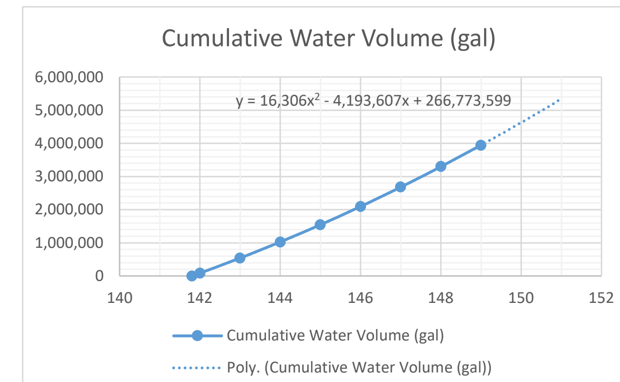
Elevation (ft)	Cumulative Water Volume (Acre-ft)	Cumulative Water Volume (gal)	Water Surface Area (sq ft)
134.5	0	0	0
134.5	0.0	67	**89,374**
135	1.0	337,692	91,209
136	3.2	1,033,850	94,929
137	5.4	1,758,077	98,715
138	7.7	2,510,869	102,567
139	10.1	3,292,721	106,485
140	12.6	4,104,126	110,469
141	15.2	4,945,579	114,519
142	17.8	5,817,576	118,635
143	20.6	6,720,611	122,818
144	23.5	7,655,177	127,066
145	26.4	8,621,771	131,381
146	29.5	9,620,887	135,762
147	32.7	10,653,019	140,209
148	35.9	11,718,661	144,722
148.5	37.6	**12,264,196**	**147,008**
149	39.3	12,818,295	149,301
150	42.8	13,952,443	153,947
150.5	44.5	**14,532,595**	**156,295**
151		15,095,667	157,078
152		16,283,758	161,835
154		18,753,768	171,547
156		21,348,882	181,523
158		24,069,100	191,763
160		26,914,422	202,267
162		29,884,848	213,035

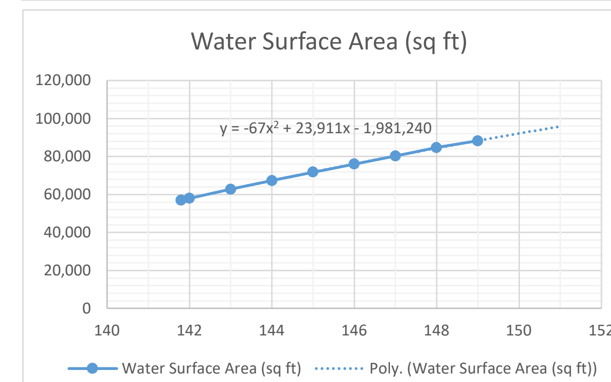




DB2 Stage Storage Area (source Golder 2020; elevations verified by Drawing 5B)

Elevation (ft)	Cumulative Water Volume (Acre-ft)	Cumulative Water Volume (gal)	Water Surface Area (sq ft)
141.8	0	0	0
141.8	0.0	43	**56,983**
142	0.3	85,984	57,968
143	1.6	537,370	62,723
144	3.1	1,023,825	67,345
145	4.7	1,544,309	71,822
146	6.4	2,097,284	76,032
147	8.2	2,681,604	**80,203**
148	10.1	3,298,256	84,677
149	12.1	3,944,915	**88,226**
150		4,617,549	97,910
152		6,079,159	105,264





Inflows

Direct precipitation at basin = rainfall * basin surface area

Runoff = rainfall * drainage area* runoff coefficient Q=CIA

Runoff coefficient	*Value*	*Source*
Area 1 coefficient	0.76	Golder 2022, table 12
Area 2 coefficient	0.72	Golder 2022, table 6

Outflows

Evaporation = ETo * basin surface area

Evaporation rate = ETo for Gilroy (inches)

Operations (Source: Golder 2020)

Green compost, primary	176,000	gal/day for 260 days/yr (M-F) from DB1, then DB2, then GW
Green compost, secondary	176,000	gal/day for 260 days/yr (M-F) from DB2, then GW
Dust control*	147,000	gal/day for 245 days/yr (36M gal/yr)

* after green compost primary and secondary; from DB1, then DB2, then GW

Operations (Source: Golder 2022, pers comm. 2023)

ASP primary	20,000	gal/day for 365 day/yr
ASP secondary	40,000	gal/day for 365 day/yr

ETo for Gilroy (source: Golder 2020, 2022)

	Month	in/mo	days/mo	in/day
Jan	1	1.55	31	0.050
Feb	2	2.00	28	0.071
Mar	3	3.55	31	0.115
Apr	4	4.71	30	0.157
May	5	6.08	31	0.196
Jun	6	6.65	30	0.222
Jul	7	6.99	31	0.225
Aug	8	6.32	31	0.204
Sep	9	4.93	30	0.164
Oct	10	3.50	31	0.113
Nov	11	1.89	30	0.063
Dec	12	1.39	31	0.045
Total		49.56		

Initial Conditions
DB1 Vol (gal) 100,000

Initial Conditions
DB2 Vol (gal) 100,000

				DB1 Starting Condition			DB1 - Rainfall, Runoff, Evaporation				DB2 Starting Condition			DB2 - Rainfall, Runoff, Evaporation			
Date	Rainfall at GILROY, CA (in/day)	ETo (in/day)	Flag for Weekday	Vol (gal)	Elevation (ft)	Surface Area (sq ft)	Direct Precipitation in Basin (gal)	Runoff from Drainage Area (gal)	Evaporation (gal)	DB1 volume subtotal (gal)	Vol (gal)	Elevation (ft)	Surface Area (sq ft)	Direct Precipitation in Basin (gal)	Runoff from Drainage Area (gal)	Evaporation (gal)	DB2 volume subtotal (gal)
11/1/22	0	0.063	1	100,000	134.65	89,917	0	0	3,531	96,469	100,000	142.03	58,116	0	0	2,282	97,718
11/2/22	0	0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/3/22	0	0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/4/22	0	0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/5/22	0	0.063	0	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/6/22	0.12	0.063	0	0	134.50	0	13,868	180,253	0	194,121	0	141.80	0	6,600	56,307	0	62,907
11/7/22	0.28	0.063	1	134,121	134.70	90,103	32,359	420,589	3,539	583,530	62,907	141.95	57,704	15,399	131,383	2,266	207,423
11/8/22	1.21	0.063	1	200,530	134.80	90,464	139,836	1,817,546	3,553	2,154,359	31,423	141.87	57,343	66,548	567,764	2,252	663,483
11/9/22		0.063	1	1,771,359	137.02	98,783	0	0	3,879	1,767,479	487,483	142.89	62,197	0	0	2,443	485,040
11/10/22		0.063	1	1,384,479	136.48	96,762	0	0	3,800	1,380,679	309,040	142.49	60,318	0	0	2,369	306,671
11/11/22		0.063	1	997,679	135.95	94,736	0	0	3,721	993,959	130,671	142.10	58,439	0	0	2,295	128,376
11/12/22		0.063	0	610,959	135.39	92,669	0	0	3,639	607,319	0	141.80	0	0	0	0	0
11/13/22		0.063	0	547,319	135.30	92,329	0	0	3,626	543,693	0	141.80	0	0	0	0	0
11/14/22		0.063	1	483,693	135.21	91,989	0	0	3,613	480,081	0	141.80	0	0	0	0	0
11/15/22		0.063	1	97,081	134.64	89,901	0	0	3,531	93,550	0	141.80	0	0	0	0	0
11/16/22		0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/17/22		0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/18/22		0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/19/22		0.063	0	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/20/22		0.063	0	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/21/22	0	0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/22/22	0	0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/23/22	0	0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/24/22	0	0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/25/22	0	0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/26/22	0	0.063	0	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/27/22	0	0.063	0	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/28/22	0	0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/29/22	0	0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
11/30/22	0	0.063	1	0	134.50	0	0	0	0	0	0	141.80	0	0	0	0	0
12/1/22	1.04	0.045	1	0	134.50	0	120,189	1,562,189	0	1,682,378	0	141.80	0	57,198	487,995	0	545,193
12/2/22	0.09	0.045	1	1,299,378	136.37	96,317	10,401	135,189	2,692	1,442,276	369,193	142.63	60,951	4,950	42,230	1,704	414,670
12/3/22	0.3	0.045	0	1,059,276	136.04	95,062	34,670	450,631	2,657	1,541,920	238,670	142.34	59,576	16,499	140,768	1,665	394,272
12/4/22	0.9	0.045	0	1,481,920	136.62	97,271	104,010	1,351,894	2,719	2,935,105	394,272	142.68	61,216	49,498	422,303	1,711	864,362
12/5/22	0.19	0.045	1	2,875,105	138.47	104,392	21,958	285,400	2,918	3,179,545	864,362	143.67	65,830	10,450	89,153	1,840	962,125
12/6/22	0.61	0.045	1	2,796,545	138.37	103,999	70,496	916,284	2,907	3,780,417	786,125	143.51	65,087	33,549	286,228	1,819	1,104,082
12/7/22	0	0.045	1	3,397,417	139.13	106,999	0	0	2,991	3,394,426	928,082	143.80	66,435	0	0	1,857	926,225
12/8/22	0	0.045	1	3,011,426	138.64	105,075	0	0	2,937	3,008,489	750,225	143.44	64,745	0	0	1,810	748,416
12/9/22	0.09	0.045	1	2,625,489	138.15	103,141	10,401	135,189	2,883	2,768,197	572,416	143.07	63,056	4,950	42,230	1,763	617,833
12/10/22	1.51	0.045	0	2,385,197	137.83	101,924	174,505	2,268,178	2,849	4,825,031	441,833	142.79	61,717	83,047	708,531	1,725	1,231,687
12/11/22	1.63	0.045	0	4,765,031	140.79	113,650	188,373	2,448,430	3,177	7,398,658	1,231,687	144.40	69,133	89,647	764,839	1,932	2,084,240
12/12/22	0.59	0.045	1	7,338,658	143.66	125,627	68,184	886,242	3,511	8,289,572	2,084,240	145.98	75,933	32,449	276,843	2,122	2,391,409
12/13/22	0	0.045	1	7,906,572	144.26	128,188	0	0	3,583	7,902,989	2,215,409	146.20	76,875	0	0	2,149	2,213,261
12/14/22	0	0.045	1	7,519,989	143.86	126,452	0	0	3,534	7,516,455	2,037,261	145.89	75,575	0	0	2,112	2,035,148
12/15/22	0	0.045	1	7,133,455	143.44	124,695	0	0	3,485	7,129,969	1,859,148	145.57	74,219	0	0	2,075	1,857,074
12/16/22	0	0.045	1	6,746,969	143.03	122,938	0	0	3,436	6,743,533	1,681,074	145.25	72,863	0	0	2,037	1,679,037
12/17/22	0	0.045	0	6,360,533	142.60	121,150	0	0	3,386	6,357,147	1,503,037	144.92	71,467	0	0	1,998	1,501,039
12/18/22	0	0.045	0	6,297,147	142.53	120,856	0	0	3,378	6,293,769	1,501,039	144.92	71,450	0	0	1,997	1,499,042
12/19/22	0	0.045	1	6,233,769	142.46	120,563	0	0	3,370	6,230,399	1,499,042	144.91	71,433	0	0	1,997	1,497,046
12/20/22	0	0.045	1	5,847,399	142.03	118,773	0	0	3,320	5,844,079	1,321,046	144.57	69,902	0	0	1,954	1,319,092
12/21/22	0	0.045	1	5,461,079	141.59	116,952	0	0	3,269	5,457,810	1,143,092	144.23	68,371	0	0	1,911	1,141,181
12/22/22	0	0.045	1	5,074,810	141.15	115,129	0	0	3,218	5,071,592	965,181	143.88	66,788	0	0	1,867	963,314
12/23/22	0.01	0.045	1	4,688,592	140.69	113,282	1,156	15,021	3,166	4,701,602	787,314	143.51	65,098	550	4,692	1,820	790,737
12/24/22	0	0.045	0	4,318,602	140.25	111,501	0	0	3,117	4,315,485	614,737	143.16	63,458	0	0	1,774	612,963
12/25/22	0	0.045	0	4,255,485	140.18	111,198	0	0	3,108	4,252,377	612,963	143.16	63,441	0	0	1,773	611,190
12/26/22	0.01	0.045	1	4,192,377	140.10	110,894	1,156	15,021	3,100	4,205,454	611,190	143.15	63,424	550	4,692	1,773	614,659
12/27/22	1.6	0.045	1	3,822,454	139.65	109,086	184,906	2,403,367	3,049	6,407,679	438,659	142.78	61,683	87,997	750,762	1,724	1,275,693
12/28/22	0.03	0.045	1	6,024,679	142.23	119,594	3,467	45,063	3,343	6,069,866	1,099,693	144.15	67,998	1,650	14,077	1,901	1,113,520
12/29/22	0.23	0.045	1	5,686,866	141.85	118,018	26,580	345,484	3,299	6,055,632	937,520	143.82	66,525	12,650	107,922	1,859	1,056,232
12/30/22	0.7	0.045	1	5,672,632	141.83	117,951	80,897	1,051,473	3,297	6,801,704	880,232	143.70	65,981	38,499	328,458	1,844	1,245,344
12/31/22	2.12	0.045	0	6,418,704	142.67	121,420	245,001	3,184,461	3,394	9,844,773	1,069,344	144.09	67,737	116,596	994,759	1,893	2,178,806
1/1/23	0.05	0.050	0	9,784,773	146.16	136,468	5,778	75,105	4,254	9,861,403	2,178,806	146.14	76,614	2,750	23,461	2,388	2,202,629
1/2/23	0.03	0.050	1	9,801,403	146.17	136,540	3,467	45,063	4,256	9,845,677	2,202,629	146.18	76,784	1,650	14,077	2,393	2,215,963
1/3/23	0.09	0.050	1	9,462,677	145.84	135,068	10,401	135,189	4,210	9,604,058	2,039,963	145.90	75,596	4,950	42,230	2,356	2,084,787
1/4/23	0.34	0.050	1	9,221,058	145.60	134,009	39,293	510,715	4,177	9,766,889	1,908,787	145.66	74,597	18,699	159,537	2,325	2,084,698
1/5/23	0.93	0.050	1	9,383,889	145.76	134,723	107,477	1,396,957	4,199	10,884,124	1,908,698	145.66	74,596	51,148	436,380	2,325	2,393,901
1/6/23	0.08	0.050	1	10,501,124	146.85	139,555	9,245	120,168	4,350	10,626,188	2,217,901	146.21	76,893	4,400	37,538	2,397	2,257,442
1/7/23	0	0.050	0	10,243,188	146.60	138,443	0	0	4,315	10,238,873	2,081,442	145.97	75,911	0	0	2,366	2,079,076
1/8/23	0.71	0.050	0	10,178,873	146.54	138,166	82,052	1,066,494	4,306	11,323,112	2,079,076	145.97	75,893	39,049	333,151	2,366	2,448,910
1/9/23	2.42	0.050	1	11,263,112	147.57	142,793	279,671	3,635,093	4,451	15,173,425	2,448,910	146.60	78,542	133,095	1,135,527	2,448	3,715,084
1/10/23	0.4	0.050	1	14,790,425	150.73	156,654	46,227	600,842	4,883	15,432,611	3,539,084	148.37	85,999	21,999	187,690	2,680	3,746,093
1/11/23	0.18	0.050	1	15,049,611	150.96	157,014	20,802	270,379	4,894	15,335,898	3,570,093	148.42	86,169	9,900	84,461	2,686	3,661,768
1/12/23	0.09	0.050	1	14,952,898	150.87	156,879	10,401	135,189	4,890	15,093,599	3,485,768	148.29	85,706	4,950	42,230	2,671	3,530,277
1/13/23	0.08	0.050	1	14,710,599	150.66	156,543	9,245	120,168	4,879	14,835,133	3,354,277	148.09	84,984	4,400	37,538	2,649	3,393,566
1/14/23	1.15	0.050	0	14,452,133	150.43	155,969	132,902	1,727,420	4,861	16,307,593	3,217,566	147.87	84,092	63,248	539,610	2,621	3,817,803
1/15/23	0.67	0.050	0	16,247,593	151.97	161,690	77,430	1,006,410	5,040	17,326,393	3,817,803	148.80	87,528	36,849	314,381	2,728	4,166,305
1/16/23	0.91	0.050	1	17,266,393	152.80	165,699	105,166	1,366,915	5,165	18,733,309	4,166,305	149.33	91,413	50,048	426,996	2,849	4,640,499
1/17/23	0	0.050	1	18,350,309	153.67	169,961	0	0	5,297	18,345,011	4,464,499	149.77	95,707	0	0	2,983	4,461,516
1/18/23	0	0.050	1	17,962,011	153.36	168,434	0	0	5,250	17,956,761	4,285,516	149.51	93,130	0	0	2,903	4,282,613
1/19/23	0.12	0.050	1	17,573,761	153.04	166,907	13,868	180,253	5,202	17,762,680	4,106,613	149.24	90,554	6,600	56,307	2,822	4,166,698
1/20/23	0	0.050	1	17,379,680	152.89	166,144	0	0	5,179	17,374,501	3,990,698	149.07	88,885	0	0	2,770	3,987,927
1/21/23	0	0.050	0	16,991,501	152.57	164,618	0	0	5,131	16,986,370	3,811,927	148.79	87,496	0	0	2,727	3,809,200
1/22/23	0	0.050	0	16,926,370	152.52	164,362	0	0	5,123	16,921,247	3,809,200	148.79	87,481	0	0	2,727	3,806,474
1/23/23	0	0.050	1	16,861,247	152.47	164,106	0	0	5,115	16,856,132	3,806,474	148.79	87,466	0	0	2,726	3,803,747
1/24/23	0	0.050	1	16,473,132	152.15	162,580	0	0	5,067	16,468,065	3,627,747	148.51	86,485	0	0	2,696	3,625,052
1/25/23	0	0.050	1	16,085,065	151.83	161,039	0	0	5,019	16,080,045	3,449,052	148.23	85,505	0	0	2,665	3,446,387
1/26/23	0	0.050	1	15,697,045	151.51	159,486	0	0	4,971	15,692,074	3,270,387	147.95	84,475	0	0	2,633	3,267,754
1/27/23	0	0.050	1	15,309,074	151.18	157,932	0	0	4,923	15,304,152	3,091,754	147.67	83,179	0	0	2,593	3,089,161
1/28/23	0	0.050	0	14,921,152	150.85	156,835	0	0	4,888	14,916,264	2,913,161	147.38	81,883	0	0	2,552	2,910,609
1/29/23	0	0.050	0	14,856,264	150.79	156,745	0	0	4,886	14,851,378	2,910,609	147.37	81,865	0	0	2,552	2,908,057
1/30/23	0	0.050	1	14,791,378	150.73	156,655	0	0	4,883	14,786,495	2,908,057	147.37	81,846	0	0	2,551	2,905,506
1/31/23	0	0.050	1	14,403,495	150.39	155,773	0	0	4,855	14,398,640	2,729,506	147.08	80,551	0	0	2,511	2,726,996
2/1/23	0	0.071	1	14,015,640	150.05	154,203	0	0	6,866	14,008,774	2,550,996	146.78	79,271	0	0	3,530	2,547,466
2/2/23	0	0.071	1	13,625,774	149.71	152,609	0	0	6,795	13,618,979	2,371,466	146.47	77,989	0	0	3,473	2,367,993
2/3/23	0.02	0.071	1	13,235,979	149.37	151,012	2,311	30,042	6,724	13,261,608	2,191,993	146.16	76,708	1,100	9,385	3,416	2,199,062
2/4/23	0.1	0.071	0	12,878,608	149.05	149,548	11,557	150,210	6,659	13,033,716	2,023,062	145.87	75,467	5,500	46,923	3,360	2,072,124
2/5/23	0.87	0.071	0	12,973,716	149.14	149,938	100,543	1,306,831	6,676	14,374,414	2,072,124	145.95	75,840	47,848	408,227	3,377	2,524,822
2/6/23	0	0.071	1	14,314,414	150.31	155,412	0	0	6,920	14,307,494	2,524,822	146.73	79,084	0	0	3,521	2,521,301
2/7/23	0	0.071	1	13,924,494	149.98	153,833	0	0	6,850	13,917,644	2,345,301	146.42	77,802	0	0	3,464	2,341,837
2/8/23	0	0.071	1	13,534,644	149.63	152,235	0	0	6,779	13,527,865	2,165,837	146.12	76,521	0	0	3,407	2,162,429
2/9/23	0	0.071	1	13,144,865	149.29	150,639	0	0	6,707	13,138,158	1,986,429	145.80	75,188	0	0	3,348	1,983,082
2/10/23	0.01	0.071	1	12,755,158	148.94	149,040	1,156	15,021	6,636	12,764,698	1,807,082	145.48	73,823	550	4,692	3,287	1,809,037
2/11/23	0.04	0.071	0	12,381,698	148.61	147,494	4,623	60,084	6,567	12,439,838	1,633,037	145.16	72,498	2,200	18,769	3,228	1,650,778
2/12/23	0	0.071	0	12,379,838	148.60	147,487	0	0	6,567	12,373,270	1,650,778	145.19	72,633	0	0	3,234	1,647,543
2/13/23	0.01	0.071	1	12,313,270	148.54	147,211	1,156	15,021	6,555	12,322,892	1,647,543	145.19	72,608	550	4,692	3,233	1,649,553
2/14/23	0	0.071	1	11,939,892	148.20	145,649	0	0	6,485	11,933,407	1,473,553	144.86	71,213	0	0	3,171	1,470,382
2/15/23	0	0.071	1	11,550,407	147.84	144,009	0	0	6,412	11,543,995	1,294,382	144.52	69,672	0	0	3,102	1,291,279
2/16/23	0	0.071	1	11,160,995	147.48	142,360	0	0	6,339	11,154,656	1,115,279	144.18	68,132	0	0	3,034	1,112,246
2/17/23	0	0.071	1	10,771,656	147.11	140,711	0	0	6,265	10,765,390	936,246	143.82	66,513	0	0	2,962	933,284
2/18/23	0	0.071	0	10,382,390	146.74	139,043	0	0	6,191	10,376,199	757,284	143.45	64,812	0	0	2,886	754,398
2/19/23	0	0.071	0	10,316,199	146.67	138,758	0	0	6,178	10,310,021	754,398	143.45	64,785	0	0	2,885	751,514
2/20/23	0	0.071	1	10,250,021	146.61	138,473	0	0	6,166	10,243,855	751,514	143.44	64,758	0	0	2,883	748,630
2/21/23	0	0.071	1	9,860,855	146.23	136,796	0	0	6,091	9,854,764	572,630	143.07	63,058	0	0	2,808	569,822
2/22/23	0	0.071	1	9,471,764	145.85	135,108	0	0	6,016	9,465,748	393,822	142.68	61,211	0	0	2,726	391,097
2/23/23	0.11	0.071	1	9,082,748	145.46	133,402	12,712	165,231	5,940	9,254,752	215,097	142.29	59,328	6,050	51,615	2,642	270,120
2/24/23	0.95	0.071	1	8,871,752	145.25	132,477	109,788	1,426,999	5,899	10,402,640	94,120	142.02	58,054	52,248	445,765	2,585	589,548
2/25/23	0	0.071	0	10,019,640	146.39	137,480	0	0	6,122	10,013,519	413,548	142.73	61,419	0	0	2,735	410,813

	Operations (Demands)															Final Conditions					
Date	Green Compost, Primary (gal)	From DB1	From DB2	From GW	Green Compost, secondary (gal)	From DB2	From GW	Dust Control (gal)	From DB1	From DB2	From GW	ASP Composting (gal)	From DB1	From DB2	From GW	DB1 Vol (gal)	DB1 Capacity (%)	DB2 Vol (gal)	DB2 Capacity (%)	DB1+ DB2 Vol (gal)	Percent Capacity of DB1+ DB2
11/1/22	176,000	96,469	79,531	0	176,000	18,186	157,814	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/2/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/3/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/4/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/5/22	0	0	0	0	0	0	0	0	0	0	0	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/6/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	134,121	1%	62,907	2%	197,027	1%
11/7/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	200,530	1%	31,423	1%	231,953	1%
11/8/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	1,771,359	12%	487,483	12%	2,258,842	12%
11/9/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	1,384,479	10%	309,040	8%	1,693,519	9%
11/10/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	997,679	7%	130,671	3%	1,128,350	6%
11/11/22	176,000	176,000	0	0	176,000	128,376	47,624	147,000	147,000	0	0	60,000	60,000	0	0	610,959	4%	0	0%	610,959	3%
11/12/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	547,319	4%	0	0%	547,319	3%
11/13/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	483,693	3%	0	0%	483,693	3%
11/14/22	176,000	176,000	0	0	176,000	0	176,000	147,000	147,000	0	0	60,000	60,000	0	0	97,081	1%	0	0%	97,081	1%
11/15/22	176,000	93,550	0	82,450	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/16/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/17/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/18/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/19/22	0	0	0	0	0	0	0	0	0	0	0	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/20/22	0	0	0	0	0	0	0	0	0	0	0	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/21/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/22/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/23/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/24/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/25/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/26/22	0	0	0	0	0	0	0	0	0	0	0	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/27/22	0	0	0	0	0	0	0	0	0	0	0	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/28/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/29/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
11/30/22	176,000	0	0	176,000	176,000	0	176,000	147,000	0	0	147,000	60,000	0	0	60,000	0	0%	0	0%	0	0%
12/1/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	1,299,378	9%	369,193	9%	1,668,571	9%
12/2/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	1,059,276	7%	238,670	6%	1,297,946	7%
12/3/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	1,481,920	10%	394,272	10%	1,876,192	10%
12/4/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	2,875,105	20%	864,362	22%	3,739,467	20%
12/5/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	2,796,545	19%	786,125	20%	3,582,669	19%
12/6/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	3,397,417	23%	928,082	24%	4,325,499	23%
12/7/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	3,011,426	21%	750,225	19%	3,761,651	20%
12/8/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	2,625,489	18%	572,416	15%	3,197,905	17%
12/9/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	2,385,197	16%	441,833	11%	2,827,030	15%
12/10/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	4,765,031	33%	1,231,687	31%	5,996,717	32%
12/11/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	7,338,658	50%	2,084,240	53%	9,422,897	51%
12/12/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	7,906,572	54%	2,215,409	56%	10,121,981	55%
12/13/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	7,519,989	52%	2,037,261	52%	9,557,250	52%
12/14/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	7,133,455	49%	1,859,148	47%	8,992,603	49%
12/15/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	6,746,969	46%	1,681,074	43%	8,428,043	46%
12/16/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	6,360,533	44%	1,503,037	38%	7,863,570	43%
12/17/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	6,297,147	43%	1,501,039	38%	7,798,186	42%
12/18/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	6,233,769	43%	1,499,042	38%	7,732,811	42%
12/19/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	5,847,399	40%	1,321,046	33%	7,168,444	39%
12/20/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	5,461,079	38%	1,143,092	29%	6,604,170	36%
12/21/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	5,074,810	35%	965,181	24%	6,039,990	33%
12/22/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	4,688,592	32%	787,314	20%	5,475,906	30%
12/23/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	4,318,602	30%	614,737	16%	4,933,339	27%
12/24/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	4,255,485	29%	612,963	16%	4,868,448	26%
12/25/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	4,192,377	29%	611,190	15%	4,803,567	26%
12/26/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	3,822,454	26%	438,659	11%	4,261,113	23%
12/27/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	6,024,679	41%	1,099,693	28%	7,124,372	39%
12/28/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	5,686,866	39%	937,520	24%	6,624,386	36%
12/29/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	5,672,632	39%	880,232	22%	6,552,863	35%
12/30/22	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	6,418,704	44%	1,069,344	27%	7,488,049	41%
12/31/22	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	9,784,773	67%	2,178,806	55%	11,963,579	65%
1/1/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	9,801,403	67%	2,202,629	56%	12,004,032	65%
1/2/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	9,462,677	65%	2,039,963	52%	11,502,640	62%
1/3/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	9,221,058	63%	1,908,787	48%	11,129,844	60%
1/4/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	9,383,889	65%	1,908,698	48%	11,292,587	61%
1/5/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	10,501,124	72%	2,217,901	56%	12,719,025	69%
1/6/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	10,243,188	70%	2,081,442	53%	12,324,630	67%
1/7/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	10,178,873	70%	2,079,076	53%	12,257,949	66%
1/8/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	11,263,112	78%	2,448,910	62%	13,712,022	74%
1/9/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	14,790,425	102%	3,539,084	90%	18,329,510	99%
1/10/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	15,049,611	104%	3,570,093	90%	18,619,704	101%
1/11/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	14,952,898	103%	3,485,768	88%	18,438,666	100%
1/12/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	14,710,599	101%	3,354,277	85%	18,064,875	98%
1/13/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	14,452,133	99%	3,217,566	82%	17,669,699	96%
1/14/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	16,247,593	112%	3,817,803	97%	20,065,396	109%
1/15/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	17,266,393	119%	4,166,305	106%	21,432,697	116%
1/16/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	18,350,309	126%	4,464,499	113%	22,814,808	123%
1/17/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	17,962,011	124%	4,285,516	109%	22,247,528	120%
1/18/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	17,573,761	121%	4,106,613	104%	21,680,375	117%
1/19/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	17,379,680	120%	3,990,698	101%	21,370,378	116%
1/20/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	16,991,501	117%	3,811,927	97%	20,803,429	113%
1/21/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	16,926,370	116%	3,809,200	97%	20,735,571	112%
1/22/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	16,861,247	116%	3,806,474	96%	20,667,721	112%
1/23/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	16,473,132	113%	3,627,747	92%	20,100,880	109%
1/24/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	16,085,065	111%	3,449,052	87%	19,534,117	106%
1/25/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	15,697,045	108%	3,270,387	83%	18,967,432	103%
1/26/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	15,309,074	105%	3,091,754	78%	18,400,828	100%
1/27/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	14,921,152	103%	2,913,161	74%	17,834,313	97%
1/28/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	14,856,264	102%	2,910,609	74%	17,766,872	96%
1/29/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	14,791,378	102%	2,908,057	74%	17,699,435	96%
1/30/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	14,403,495	99%	2,729,506	69%	17,133,001	93%
1/31/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	14,015,640	96%	2,550,996	65%	16,566,636	90%
2/1/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	13,625,774	94%	2,371,466	60%	15,997,240	87%
2/2/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	13,235,979	91%	2,191,993	56%	15,427,972	83%
2/3/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	12,878,608	89%	2,023,062	51%	14,901,670	81%
2/4/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	12,973,716	89%	2,072,124	53%	15,045,840	81%
2/5/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	14,314,414	98%	2,524,822	64%	16,839,236	91%
2/6/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	13,924,494	96%	2,345,301	59%	16,269,794	88%
2/7/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	13,534,644	93%	2,165,837	55%	15,700,481	85%
2/8/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	13,144,865	90%	1,986,429	50%	15,131,295	82%
2/9/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	12,755,158	88%	1,807,082	46%	14,562,239	79%
2/10/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	12,381,698	85%	1,633,037	41%	14,014,735	76%
2/11/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	12,379,838	85%	1,650,778	42%	14,030,615	76%
2/12/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	12,313,270	85%	1,647,543	42%	13,960,814	76%
2/13/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	11,939,892	82%	1,473,553	37%	13,413,445	73%
2/14/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	11,550,407	79%	1,294,382	33%	12,844,789	70%
2/15/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	11,160,995	77%	1,115,279	28%	12,276,274	66%
2/16/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	10,771,656	74%	936,246	24%	11,707,902	63%
2/17/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	10,382,390	71%	757,284	19%	11,139,675	60%
2/18/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	10,316,199	71%	754,398	19%	11,070,598	60%
2/19/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	10,250,021	71%	751,514	19%	11,001,534	60%
2/20/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	9,860,855	68%	572,630	15%	10,433,485	56%
2/21/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	9,471,764	65%	393,822	10%	9,865,586	53%
2/22/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	9,082,748	62%	215,097	5%	9,297,845	50%
2/23/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	8,871,752	61%	94,120	2%	8,965,872	49%
2/24/23	176,000	176,000	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	10,019,640	69%	413,548	10%	10,433,188	56%
2/25/23	0	0	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	9,953,519	68%	410,813	10%	10,364,332	56%

22,814,808 gal; peak volume
18,477,515 gal; proposed max capacity of combined DB1 +DB2
4,337,293 gal; additional capacity required to hold storm event without overtopping

3,817,709 gal; additional capacity at DB1 to prevent overtopping
519,584 gal; additional capacity at DB2 to prevent overtopping

6,086,113 gal; additional capacity below DB1 freeboard
1,782,895 gal; additional capacity below DB2 freeboard

2/26/23	0.01	0.071	0	9,953,519	146.32	137,195	1,156	15,021	6,109	9,963,587	410,813	142.72	61,390	550	4,692	2,733	413,322	0	0
2/27/23	1.25	0.071	1	9,903,587	146.27	136,980	144,458	1,877,630	6,099	11,919,576	413,322	142.73	61,416	68,748	586,533	2,735	1,065,867	176,000	176,000
2/28/23	0.82	0.071	1	11,536,576	147.83	143,951	94,765	1,231,726	6,410	12,856,657	889,867	143.72	66,072	45,098	384,765	2,942	1,316,789	176,000	176,000
3/1/23	0.3	0.115	1	12,473,657	148.69	147,875	34,670	450,631	10,556	12,948,402	1,140,789	144.22	68,351	16,499	140,768	4,879	1,293,177	176,000	176,000
3/2/23	0.02	0.115	1	12,565,402	148.77	148,254	2,311	30,042	10,583	12,587,172	1,117,177	144.18	68,148	1,100	9,385	4,865	1,122,796	176,000	176,000
3/3/23	0	0.115	1	12,204,172	148.44	146,756	0	0	10,476	12,193,695	946,796	143.84	66,613	0	0	4,755	942,041	176,000	176,000
3/4/23	0.17	0.115	0	11,810,695	148.08	145,108	19,646	255,358	10,359	12,075,340	766,041	143.47	64,896	9,350	79,768	4,633	850,527	0	0
3/5/23	0.33	0.115	0	12,015,340	148.27	145,965	38,137	495,694	10,420	12,538,752	850,527	143.64	65,698	18,149	154,845	4,690	1,018,831	0	0
3/6/23		0.115	1	12,478,752	148.69	147,896	0	0	10,558	12,468,194	1,018,831	143.99	67,298	0	0	4,804	1,014,026	176,000	176,000
3/7/23	0.05	0.115	1	12,085,194	148.34	146,258	5,778	75,105	10,441	12,155,637	838,026	143.62	65,580	2,750	23,461	4,682	859,556	176,000	176,000
3/8/23		0.115	1	11,772,637	148.05	144,948	0	0	10,347	11,762,289	683,556	143.30	64,112	0	0	4,577	678,979	176,000	176,000
3/9/23		0.115	1	11,379,289	147.68	143,285	0	0	10,229	11,369,061	502,979	142.92	62,361	0	0	4,452	498,528	176,000	176,000
3/10/23	4.05	0.115	1	10,986,061	147.31	141,619	468,045	6,083,523	10,110	17,527,518	322,528	142.52	60,460	222,742	1,900,366	4,316	2,441,319	176,000	176,000
3/11/23		0.115	0	17,144,518	152.70	165,219	0	0	11,794	17,132,724	2,265,319	146.29	77,231	0	0	5,513	2,259,806	0	0
3/12/23		0.115	0	17,072,724	152.64	164,937	0	0	11,774	17,060,949	2,259,806	146.28	77,192	0	0	5,510	2,254,295	0	0
3/13/23	0.06	0.115	1	17,000,949	152.58	164,655	6,934	90,126	11,754	17,086,256	2,254,295	146.27	77,153	3,300	28,154	5,508	2,280,241	176,000	176,000
3/14/23	0.45	0.115	1	16,703,256	152.34	163,484	52,005	675,947	11,671	17,419,537	2,104,241	146.01	76,082	24,749	211,152	5,431	2,334,711	176,000	176,000
3/15/23	0.06	0.115	1	17,036,537	152.61	164,795	6,934	90,126	11,764	17,121,833	2,158,711	146.11	76,470	3,300	28,154	5,459	2,184,705	176,000	176,000
3/16/23	0.15	0.115	1	16,738,833	152.37	163,624	17,335	225,316	11,681	16,969,803	2,008,705	145.84	75,358	8,250	70,384	5,380	2,081,959	176,000	176,000
3/17/23		0.115	1	16,586,803	152.25	163,027	0	0	11,638	16,575,165	1,905,959	145.65	74,575	0	0	5,324	1,900,636	176,000	176,000
3/18/23		0.115	0	16,192,165	151.92	161,468	0	0	11,527	16,180,638	1,724,636	145.33	73,195	0	0	5,225	1,719,411	0	0
3/19/23		0.115	0	16,120,638	151.86	161,182	0	0	11,506	16,109,132	1,719,411	145.32	73,155	0	0	5,222	1,714,188	0	0
3/20/23	0.03	0.115	1	16,049,132	151.80	160,896	3,467	45,063	11,486	16,086,176	1,714,188	145.31	73,115	1,650	14,077	5,219	1,724,696	176,000	176,000
3/21/23	0.46	0.115	1	15,703,176	151.51	159,510	53,161	690,968	11,387	16,435,918	1,548,696	145.01	71,855	25,299	215,844	5,130	1,784,709	176,000	176,000
3/22/23		0.115	1	16,052,918	151.81	160,911	0	0	11,487	16,041,431	1,608,709	145.12	72,312	0	0	5,162	1,603,547	176,000	176,000
3/23/23		0.115	1	15,658,431	151.47	159,331	0	0	11,374	15,647,057	1,427,547	144.78	70,818	0	0	5,055	1,422,492	176,000	176,000
3/24/23	0	0.115	1	15,264,057	151.14	157,752	0	0	11,261	15,252,796	1,246,492	144.43	69,260	0	0	4,944	1,241,547	176,000	176,000
3/25/23		0.115	0	14,869,796	150.80	156,764	0	0	11,191	14,858,605	1,065,547	144.08	67,704	0	0	4,833	1,060,714	0	0
3/26/23		0.115	0	14,798,605	150.74	156,665	0	0	11,184	14,787,421	1,060,714	144.07	67,662	0	0	4,830	1,055,884	0	0
3/27/23	0	0.115	1	14,727,421	150.67	156,566	0	0	11,177	14,716,244	1,055,884	144.06	67,621	0	0	4,827	1,051,057	176,000	176,000
3/28/23		0.115	1	14,333,244	150.33	155,488	0	0	11,100	14,322,145	875,057	143.69	65,931	0	0	4,707	870,350	176,000	176,000
3/29/23		0.115	1	13,939,145	149.99	153,893	0	0	10,986	13,928,159	694,350	143.32	64,215	0	0	4,584	689,766	176,000	176,000
3/30/23		0.115	1	13,545,159	149.64	152,279	0	0	10,871	13,534,288	513,766	142.95	62,474	0	0	4,460	509,306	176,000	176,000
3/31/23		0.115	1	13,151,288	149.29	150,665	0	0	10,755	13,140,533	333,306	142.55	60,573	0	0	4,324	328,982	176,000	176,000

2/26/23	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	9,903,587	68%	413,322	10%	10,316,908	56%
2/27/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	11,536,576	79%	889,867	23%	12,426,443	67%
2/28/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	12,473,657	86%	1,140,789	29%	13,614,445	74%
3/1/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	12,565,402	86%	1,117,177	28%	13,682,578	74%
3/2/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	12,204,172	84%	946,796	24%	13,150,968	71%
3/3/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	11,810,695	81%	766,041	19%	12,576,736	68%
3/4/23	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	12,015,340	83%	850,527	22%	12,865,867	70%
3/5/23	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	12,478,752	86%	1,018,831	26%	13,497,582	73%
3/6/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	12,085,194	83%	838,026	21%	12,923,220	70%
3/7/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	11,772,637	81%	683,556	17%	12,456,193	67%
3/8/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	11,379,289	78%	502,979	13%	11,882,269	64%
3/9/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	10,986,061	76%	322,528	8%	11,308,588	61%
3/10/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	17,144,518	118%	2,265,319	57%	19,409,838	105%
3/11/23	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	17,072,724	117%	2,259,806	57%	19,332,530	105%
3/12/23	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	17,000,949	117%	2,254,295	57%	19,255,245	104%
3/13/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	16,703,256	115%	2,104,241	53%	18,807,497	102%
3/14/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	17,036,537	117%	2,158,711	55%	19,195,248	104%
3/15/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	16,738,833	115%	2,008,705	51%	18,747,538	101%
3/16/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	16,586,803	114%	1,905,959	48%	18,492,762	100%
3/17/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	16,192,165	111%	1,724,636	44%	17,916,801	97%
3/18/23	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	16,120,638	111%	1,719,411	44%	17,840,049	97%
3/19/23	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	16,049,132	110%	1,714,188	43%	17,763,320	96%
3/20/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	15,703,176	108%	1,548,696	39%	17,251,872	93%
3/21/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	16,052,918	110%	1,608,709	41%	17,661,627	96%
3/22/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	15,658,431	108%	1,427,547	36%	17,085,978	92%
3/23/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	15,264,057	105%	1,246,492	32%	16,510,549	89%
3/24/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	14,869,796	102%	1,065,547	27%	15,935,343	86%
3/25/23	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	14,798,605	102%	1,060,714	27%	15,859,319	86%
3/26/23	0	0	0	0	0	0	0	0	0	60,000	60,000	0	0	14,727,421	101%	1,055,884	27%	15,783,305	85%
3/27/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	14,333,244	99%	875,057	22%	15,208,301	82%
3/28/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	13,939,145	96%	694,350	18%	14,633,495	79%
3/29/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	13,545,159	93%	513,766	13%	14,058,925	76%
3/30/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	13,151,288	90%	333,306	8%	13,484,594	73%
3/31/23	0	0	176,000	176,000	0	147,000	147,000	0	0	60,000	60,000	0	0	12,757,533	88%	152,982	4%	12,910,515	70%

19,409,838 gal; peak volume
18,477,515 gal; proposed max capacity of combined DB1 +DB2
932,323 gal; additional capacity required to hold storm event without overtoppin

AECOM

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Project name:
Z-Best Composting Facility

Project ref:
60666256

From: **Elizabeth Nielsen, Water Resources Engineer**, AECOM

Date:
April 7, 2023

To: Valerie Negrete
County of Santa Clara Department of Planning and Development
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7th Floor East Wing
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CC: Emmanuel Ursu, Consultant Planner
Sam Gutierrez, Principal Planner
Elizabeth Vissers, Deputy County Counsel
Lizanne Reynolds, Deputy County Counsel

Memo

Subject: Flow Frequency Analysis

This Technical Memorandum provides a flow frequency analysis for four U.S. Geological Survey (USGS) river gauges located in the vicinity of the Z-Best Composting Facility near Gilroy, California. This analysis found that the January and March 2023 storms, which caused flooding throughout the region, can be characterized as having peak flows with a return interval between the 5-year event and those in excess of the 20-year event.

1. Background

Z-Best Products has applied to the County of Santa Clara for a major modification to its existing Use Permit at the Z-Best Composting Facility located at 980 State Route 25 (SR-25) in an unincorporated area approximately 5 miles southeast of Gilroy, California. Proposed facility modifications associated with the Z-Best Composing Facility Expansion and Upgrade Project (project) will also require Architecture and Site Approval and Grading Approval. Z-Best is proposing to replace the existing composting process it uses for processing municipal solid waste feedstock with an Engineered Composting System (ECS) process that uses aerated static piles (ASP); existing green waste composting operations would remain unchanged. Additional components of the proposed project include expanding the existing flood storage facility, modifying Detention Basin #1, relocating the existing facility entrance, and widening SR-25 along the project site frontage to enable installation of acceleration lanes and deceleration lanes into and out of the proposed relocated entrance. See Figures 1 and 2 for project plans showing existing and proposed conditions.

The project site is located within the Federal Emergency Management Agency (FEMA) designated 100-year floodplain for the Pajaro River. The northern Pajaro River basin receives water from the Uvas Creek, Llagas Creek, Pacheco Creek, and Tequisquita Slough/Santa Ana Creek subbasins. San Felipe Lake, also known as Upper Soap Lake, is a permanent body of water on the mainstem of the Pajaro River. Lower Soap Lake (or just Soap Lake) is an intermittent floodplain area located between San Felipe Lake and US-101 (see Figure 3); the project site is located within the floodplain for Soap

Lake. This area floods when water backs up on the Pajaro River upstream of the San Benito River confluence.

There have been several flood events on the Pajaro River in the vicinity of the project area including the recent floods in 2023. On January 9, 2023, and on March 10, 2023, storms caused flooding on US-101, Bloomfield Avenue, and Bolsa Road. Peak flows at the USGS gauge located on the Pajaro River near Chittenden (downstream of the project area) reached 11,100 cubic feet per second (cfs) on January 10, 2023, and 11,900 cfs on March 10, 2023. Although this level of flooding has not been seen in the project vicinity since 1998, flood events have also occurred in the 1950's, 1960's, 1980's, and 1990's with peak flows in the Pajaro River exceeding those experienced in January and March 2023 (USGS 2023). In addition to local flooding near the project area, levee failure occurred on the Pajaro River downstream of the project area on March 11, 2023, causing massive flooding in Monterey County.

The flow frequency analysis provided herein provides context that can be used to characterize the severity of the 2023 floods.

2. Methodology and Results

2.1 Flow Data

Historical stream flow data and annual peak discharges were obtained for USGS gauging stations located near Gilroy, California (USGS 2023). These USGS gauge stations included:

- USGS 11159000, Pajaro River at Chittenden, California;
- USGS 11158600, San Benito River at State Highway 156, near Hollister, California;
- USGS 11153000, Pacheco Creek near Dunneville, California; and
- USGS 11153650, Llagas Creek near Gilroy, California.

Table 1 shows the peak flows measured at the gauging stations during the January and March 2023 storms. Pacheco Creek and Llagas Creek contribute flow directly to the Pajaro River floodplain upstream of the project area. This is in contrast to the San Benito River, which joins the Pajaro River downstream from the project area, but can provide indirect effects by reducing outflow from the floodplain by backing up the Pajaro River.

2.2 Flow Frequency

A flow frequency analysis was performed using the U.S. Army Corps of Engineers, Hydrologic Engineering Center's (HEC) Statistical Software Package (HEC-SSP) with methods based on Bulletin 17C. Annual peak discharges at the USGS gauge stations were supplemented with the peak discharge found in the instantaneous flow data from October 1, 2022 to March 14, 2023.

A weighted skew methodology was used in the analysis. A regional skew of -0.548 and regional skew mean square error of 0.13 was used for the Pajaro River, Pacheco Creek, and Llagas Creek gauges. A regional skew of -0.479 and regional skew mean square error of 0.13 was used for the San Benito River gauge. The regional skew was based on Parrett et al. (2011), which evaluated regional skew and flood frequency for various gauges in California.

Calculated flood flows for the gauging stations are summarized in Table 2 and the flow frequency plots are shown on Figures 4 through 7. The estimated return period for peak winter 2023 flows are as follows:

- The peak flow occurring in March 2023 on the Pajaro River at Chittenden (11,900 cfs) is estimated between a 5-year and a 10-year event;
- The peak flow occurring in March 2023 on the San Benito River at SR-156 (7,910 cfs) is estimated between a 10-year and a 20-year event;
- The peak flow occurring in January 2023 on Pacheco Creek near Dunneville (15,700 cfs) is estimated between a 20-year and a 50-year event; and
- The peak flow occurring in January 2023 on Llagas Creek near Gilroy (4,840 cfs) is estimated between a 20-year and a 50-year event.

3. Conclusions

This analysis found that the January 2023 storm was a large event (an approximate 30-year storm) in the smaller watersheds directly contributing to the flood basin in the vicinity of the project area. In contrast, the March 2023 storm was the larger event for the San Benito River watershed, which contributes to the Pajaro River downstream of the project area. In general, the January and March 2023 storms, which caused flooding throughout the region, can be characterized as having peak flows with a return interval between the 5-year event and those in excess of the 20-year event.

4. References

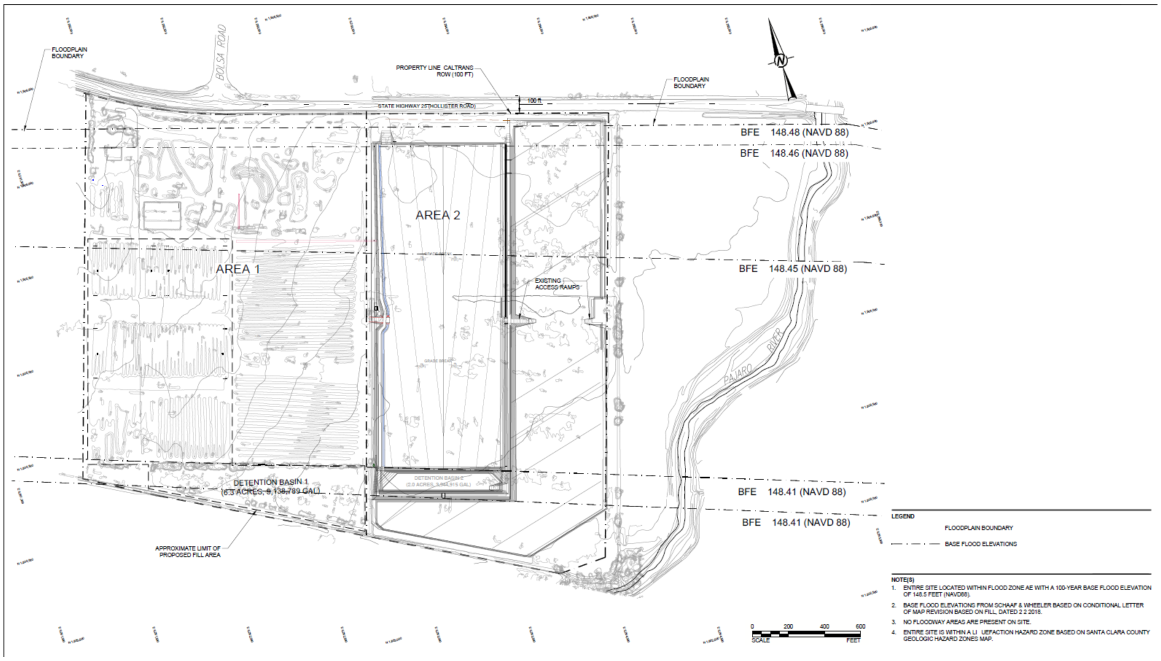
Golder Associates Inc. (Golder), 2022. Aerated Static Pile Composting Permit Package. Project No. 133-97640. County File No. 6498-81-11-09G 08P 08A 08EA. April 2022.

Pajaro River Watershed Flood Prevention Authority, 2005. Soap Lake Floodplain Preservation Project Final Initial Study and Negative Declaration. Prepared by RMC. March. Online at: https://www.pajaroriverwatershed.org/sites/default/files/2021-04/Soap_Lake_Floodplain_Preservation_Project_Fina.pdf

Parrett, C., Veilleux, A., Stedinger, J.R., Barth, N.A., Knifong, D.L., and Ferris, J.C., 2011, Regional skew for California, and flood frequency for selected sites in the Sacramento–San Joaquin River Basin, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2010–5260, 94 p. Online at: https://pubs.usgs.gov/sir/2010/5260/

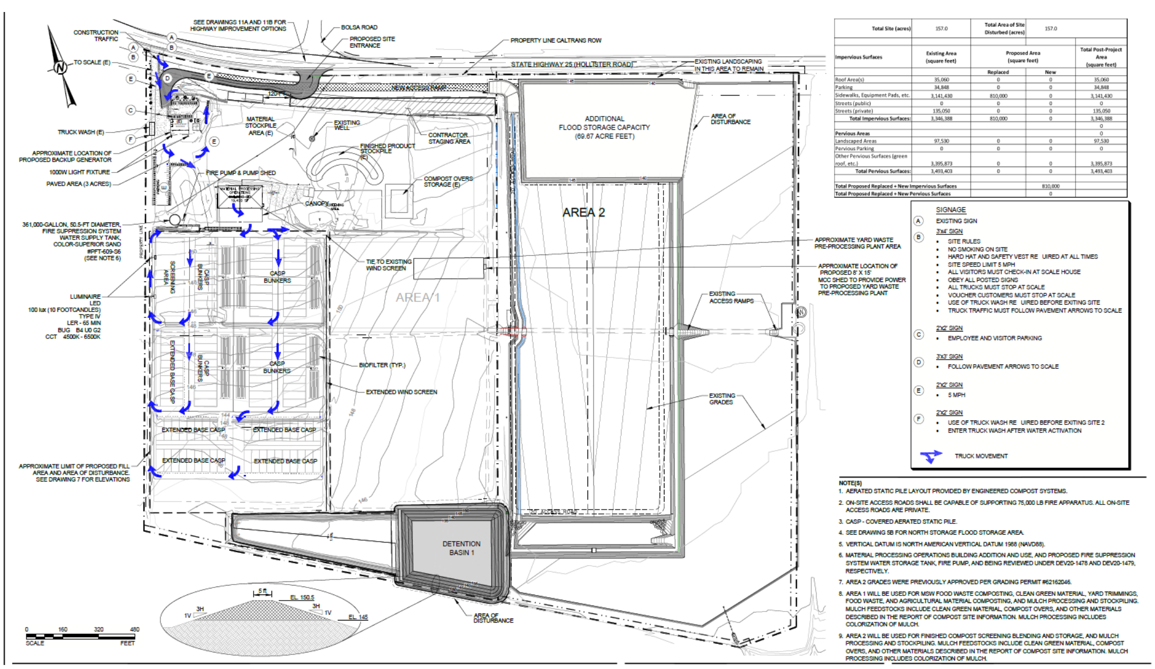
U.S. Geological Survey (USGS), 2023. USGS 11159000, Pajaro River at Chittenden, CA; USGS 11158600, San Benito River at State Highway 156, near Hollister, CA; USGS 11153000, Pacheco Creek near Dunneville, CA; and USGS 11153650, Llagas Creek near Gilroy, CA. National Water Information System. Online at: https://maps.waterdata.usgs.gov/mapper/index.html

Figures



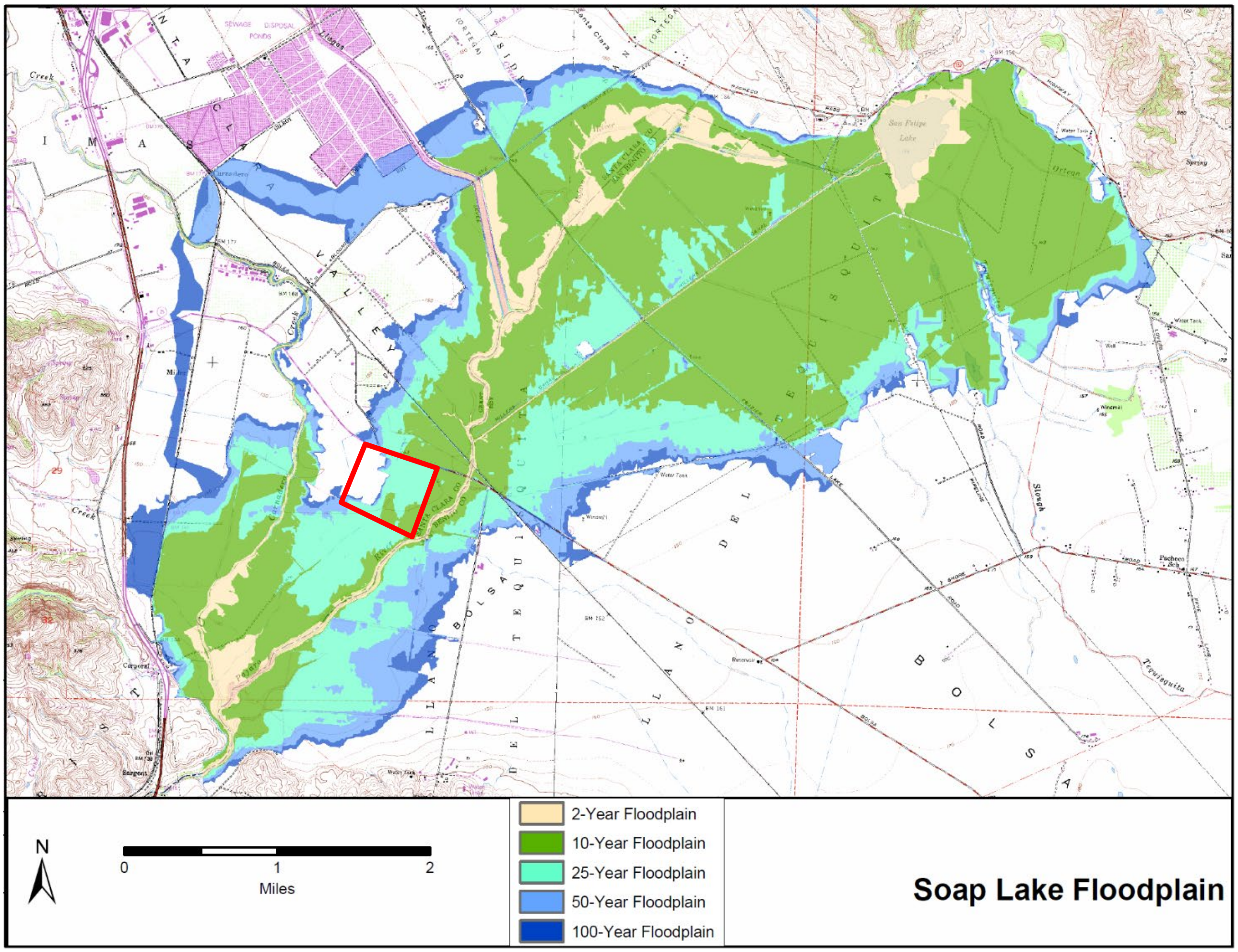
Source: Golder 2022

Figure 1. Existing Site



Source: Golder 2022

Figure 2. Proposed Site Plan



Source: Pajaro River Watershed Flood Prevention Authority, 2005
Red polygon indicates approximate location of Z-Best property.

Figure 3. Soap Lake Floodplain

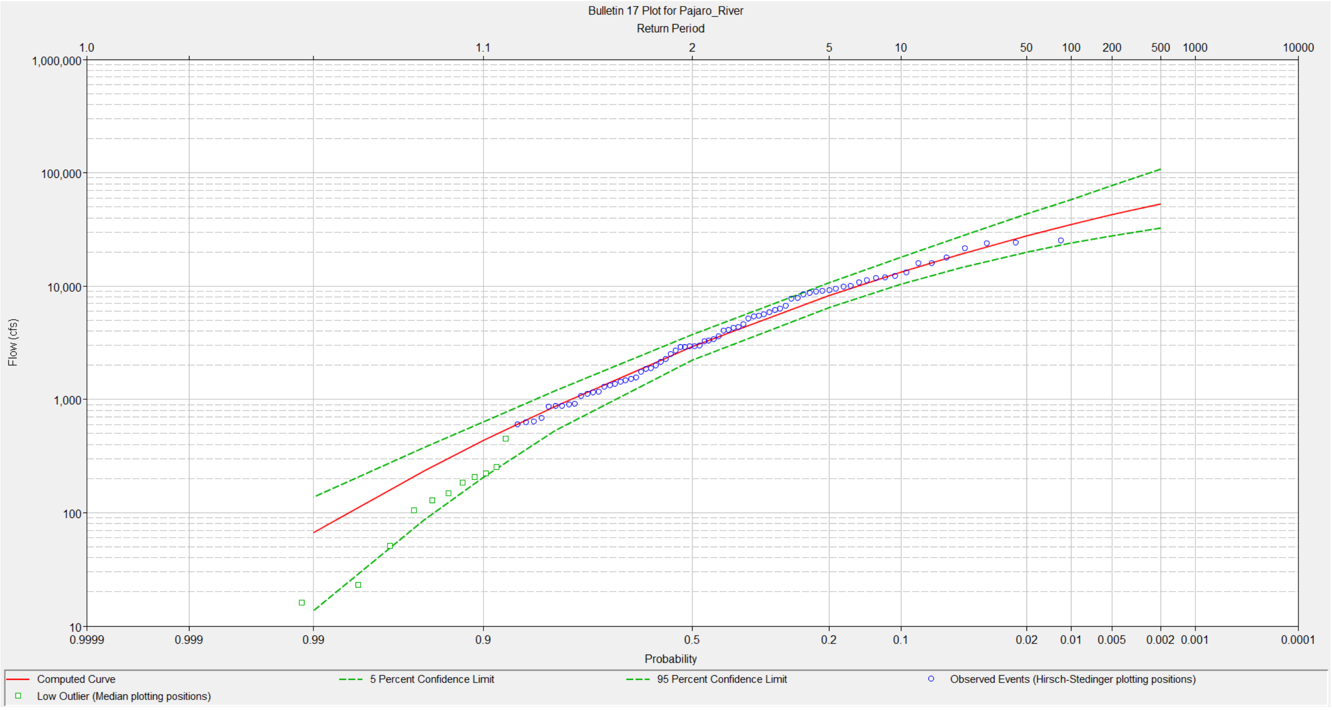


Figure 4. Flow Frequency for USGS Gauge No. 11159000, Pajaro River at Chittenden, CA

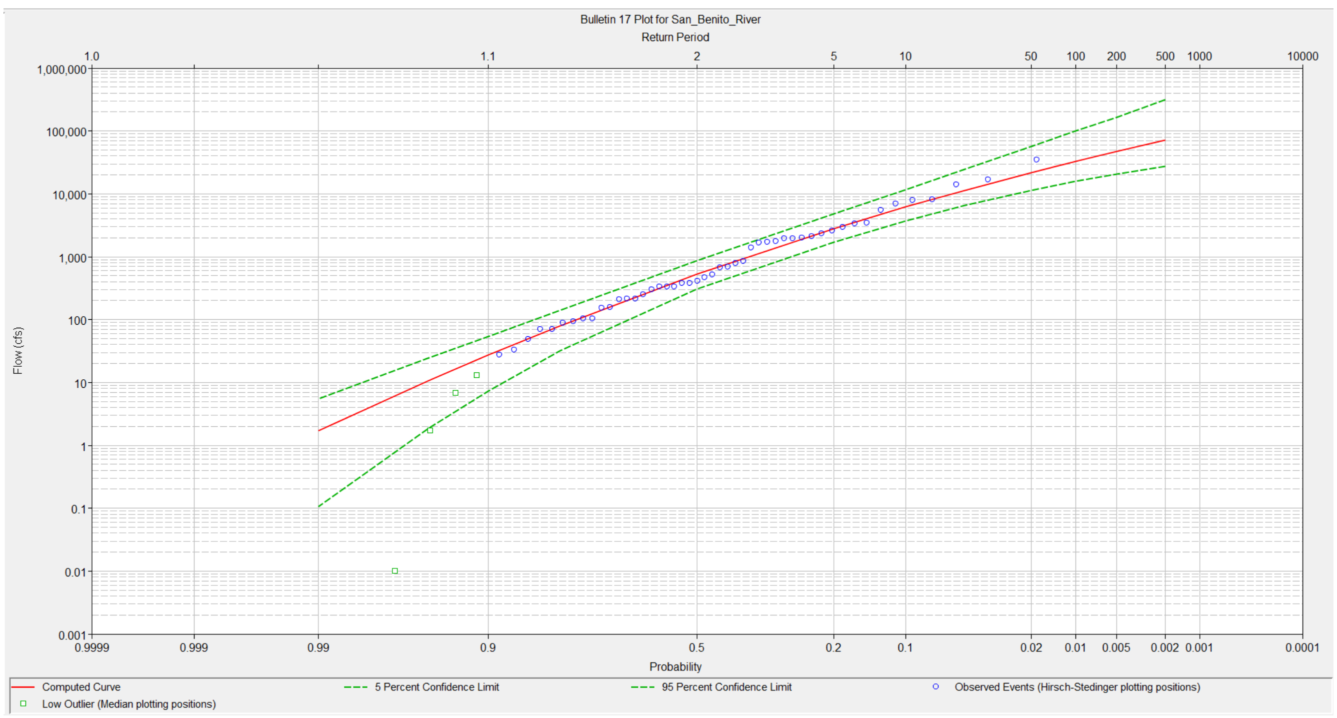


Figure 5. Flow Frequency for USGS Gauge No. 11158600, San Benito River at State Highway 156, near Hollister, CA

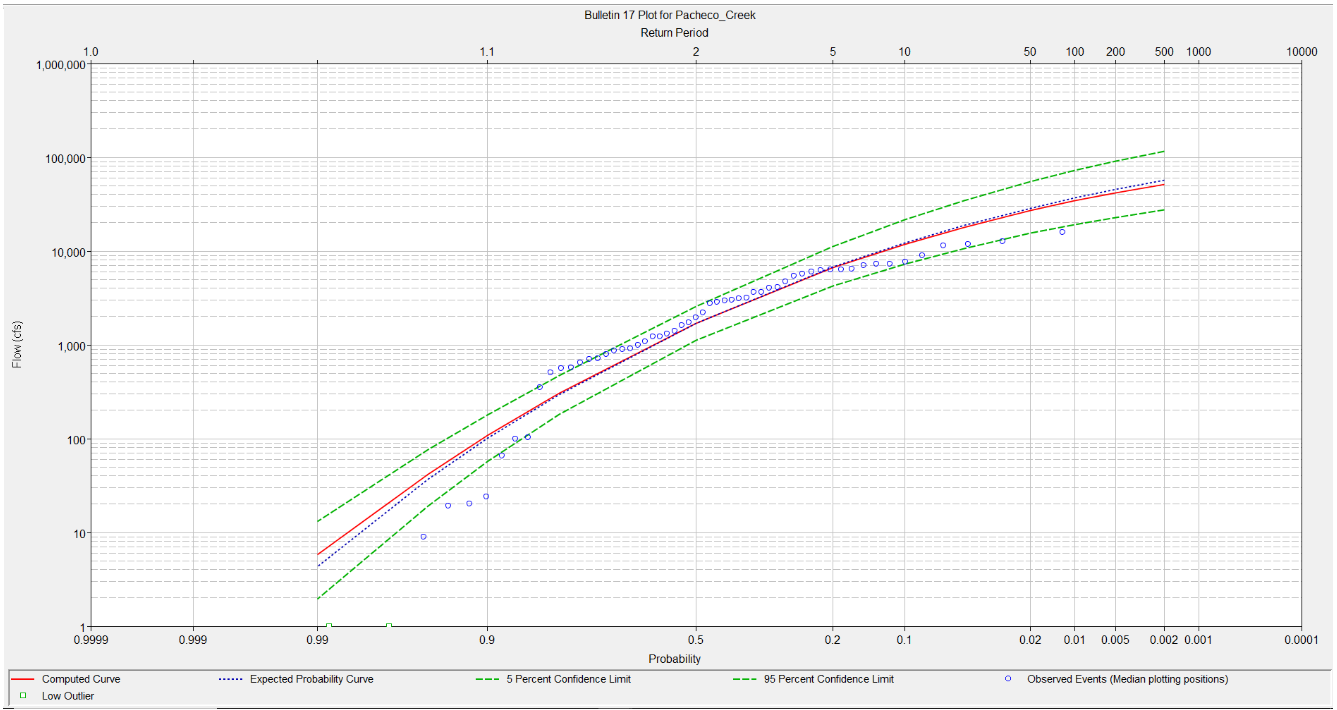


Figure 6. Flow Frequency for USGS Gauge No. 11153000, Pacheco Creek near Dunneville, CA

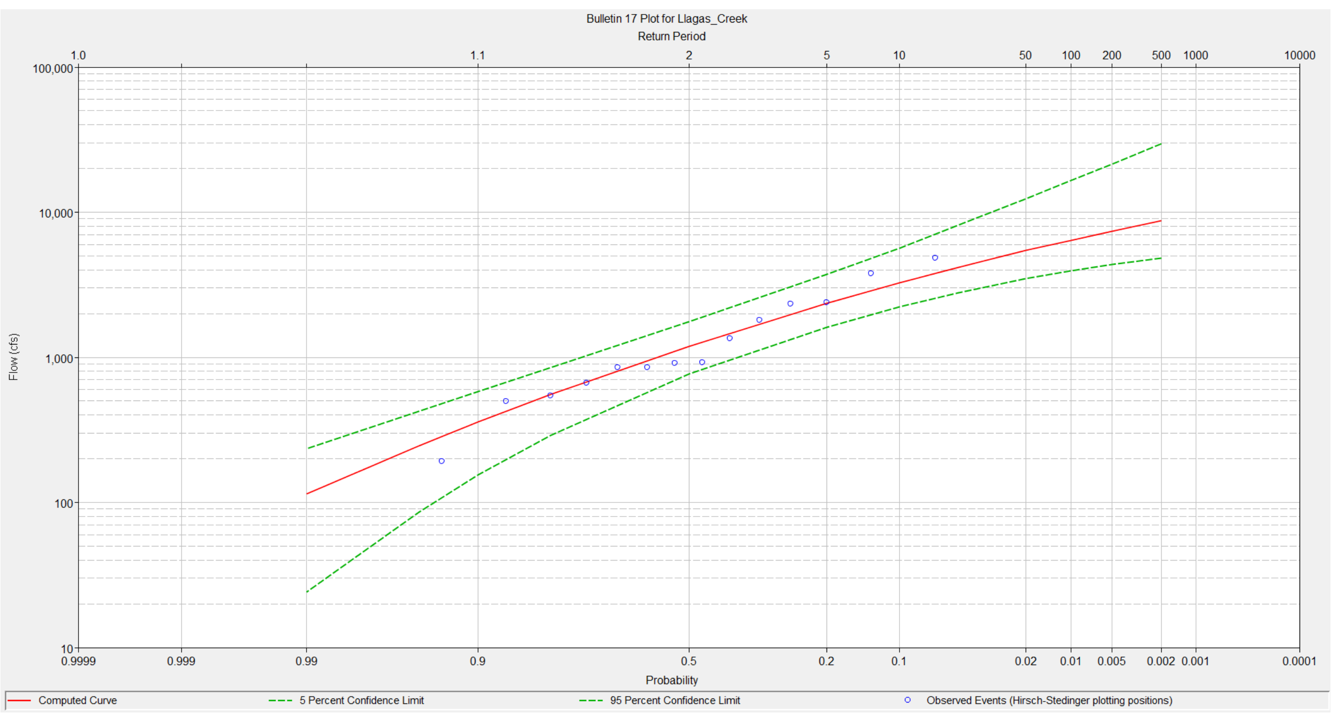


Figure 7. Flow Frequency for USGS Gauge No. 11153650, Llagas Creek near Gilroy, CA

Tables

Table 1. Flood Events in January and March 2023

Location	USGS Gauge No.	Drainage Area (square miles)	January 2023 peak flow (cfs)	March 2023 peak flow (cfs)
Pajaro River at Chittenden, CA	11159000	1,186	11,100	11,900
San Benito River at State Highway 156, near Hollister, CA	11158600	607	2,520	7,910
Pacheco Creek near Dunneville, CA	11153000	146	15,700	8,910
Llagas Creek near Gilroy, CA	11153650	84.2	4,840	4,310

Source: USGS 2023

Acronyms: CA = California; cfs = cubic feet per second; USGS = United States Geological Survey

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Table 2. Annual Peak Flows for USGS Gauge Locations using Bulletin 17C Procedures

USGS Gauge	Gauge No.	Drainage (square miles)	Period of record	Annual peak flow, in cfs, for recurrence interval, in years							
				2-yr	5-yr	10-yr	20-yr	50-yr	100-yr	200-yr	500-yr
Pajaro River at Chittenden, CA	11159000	1,186	1940-2023	2,930	8,262	13,313	19,121	27,796	35,001	42,670	53,393
San Benito River at State Highway 156, near Hollister, CA	11158600	607	1971-2023	526	2,798	6,184	11,438	21,907	32,978	47,161	71,256
Pacheco Creek near Dunneville, CA	11153000	146	1940-1982, 2007-2023	2,054	5,679	9,018	12,773	18,244	22,684	27,318	33,659
Llagas Creek near Gilroy, CA	11153650	84.2	2010-2023	1,196	2,362	3,258	4,180	5,434	6,408	7,400	8,733

Source: HEC-SSP, Bulletin 17C

Acronyms: CA = California; cfs = cubic feet per second; USGS = United States Geological Survey; yr = year
Note: Bulletin 17C analysis method weighted with a regional skew.