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File:	184031152	Date:	October 28, 2019

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**Reference: Bee Canyon Greenery Recycled Water System Analysis – Revision 1**

## INTRODUCTION

Tetra Tech BAS (TTBAS) has been tasked with the design of a composting facility at the Frank R. Bowerman Landfill (FRB) for OC Waste & Recycling (OCWR). The facility is the Bee Canyon Greenery. One of the main components of the project is the water supply for operations and fire protection. The County has requested that recycled water be used for this project. Currently, the site uses approximately 60,000 gpd. However, due to the new operations being implemented, the amount of recycled water required is anticipated to increase by more than 260,000 gpd. The proposed recycled water requirement is then 320,000 gpd.

The existing recycled water supply comes from IRWD's recycled water system and the existing Bee Canyon Pump Station. Supply to the Bee Canyon Pump Station comes from IRWD's Zone C pressure zone through a 10-inch pipeline in Bee Canyon Access Road from Portola Parkway. The existing Bee Canyon Pump Station has a design capacity of 750 gpm with one pump. The pump station is equipped with a second or backup pump of the same size and could be called upon to operate if needed.

From the Bee Canyon Pump Station, the County maintains a 10-inch pipelines that is routed along Bee Canyon Access Road to the existing 100,000-gallon tank located at the site's headquarters near the entrance scales and fee station.

Based on communication between OCWR and IRWD, it was unclear if the current waterline has the capacity to accommodate the increased demand in operations and fire water. Therefore, a hydraulic analysis was requested and Stantec was retained by TTBAS to perform the hydraulic analysis of the existing and proposed recycled water facilities to verify capacity and system recommendations.

## PROPOSED RECYCLED WATER REQUIREMENTS AND PHASING

The proposed Bee Canyon Greenery composting facility will be constructed in two phases. For each phase, recycled water be supplied for both normal operations and for fire protection. Table 1 shows the proposed recycled water demand required for the facility for each phase, including the existing water requirements. Table 2 provides the fire flow requirements.

Reference: Bee Canyon Greenery Recycled Water System Analysis – Revision 1

**Table 1 – Bee Canyon Greenery Operations Water Demand**

Phase	Total Maximum Daily Demand	Total Maximum Daily Flow Rate <sup>1</sup>
Existing Landfill Operations Only	60,000 gpd	100 gpm
Phase 1 <sup>2</sup>	186,238 gpd	310 gpm
Phase 2 <sup>3</sup>	322,476 gpd	537 gpm

<sup>1</sup> Total Daily Flow Rate is based on a 10-hour operations period between 8 am to 6 pm

<sup>2</sup> Phase 1 demands include the existing 60,000 gpd plus the proposed 126,000 gpd for Phase 1.

<sup>3</sup> Phase 2 demands include the existing 60,000 gpd plus the proposed Phase 1 and 2 demands of 262,000 gpd.

**Table 2 – Bee Canyon Greenery Fire Flow Requirements**

Parameter	Requirement
Minimum Fire Flow Storage <sup>1</sup>	60,000 gallons
Minimum Fire Flow (per hydrant) <sup>1</sup>	500 gpm
Minimum Fire Flow Residual Pressure	20 psi
Minimum Fire Flow Duration <sup>1</sup>	2 hours

<sup>1</sup> In accordance with Section 2808.12 of the Orange County Amendment to the 2016 California Fire Code.

## PROPOSED SYSTEM

The proposed recycled water system is shown in Figure 1. A new pipeline will be connected to the existing 10-inch pipeline near the headquarters, just prior to the entrance to the scales. The exact location of this point of connection will need to be determined during final design. However, the location is recommended to be located downstream of the existing 100,000-gallon tank.

From this location a new pump station will be required to convey the water up the hill to the proposed Bee Canyon Greenery site, which is approximately 200-ft higher in elevation than the existing tank. The existing tank has a high-water elevation of approximately 819-ft.

From this pump station, new pipeline will convey both the operations water and fire flow water supply to the proposed storage tank at the compost site, which is proposed to be 100,000 gallons.

From the proposed storage tank, two separate systems are proposed. An operations supply will convey the normal daily operations water to a J Stand located approximately 250-ft north of the tank. A separate fire line be routed parallel to this pipeline to four proposed fire hydrants surrounding the site as shown in Figure 1.

## HYDRAULIC ANALYSIS

IRWD's non-potable water system model, created in InfoWater modeling software, was used for the hydraulic analysis. This model contains the existing Frank R. Bowerman Landfill supply pipeline and pump station along the Bee Canyon Access Road to the existing 100,000-gallon tank. The model was updated to include the proposed facilities as described above and shown in Figure 2. For purposed of understanding the pump and

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storage impacts, a 24-hour extended period simulation analysis was performed based on maximum day demands for the existing IRWD system.

## PHASE 1 – NORMAL OPERATIONS ANALYSIS

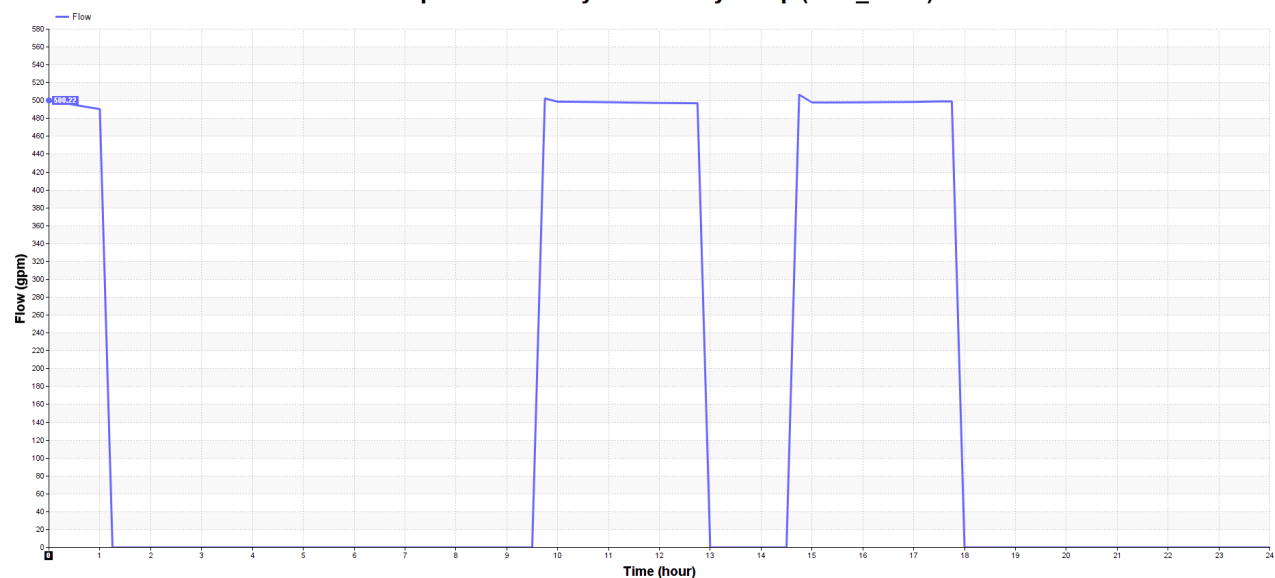
A hydraulic analysis was conducted for the Phase 1 water demand requirements to verify the proposed 100,000-gallon storage is sufficient for the proposed operational demand requirements, which is 310 gpm at the proposed J Stand, and fire flow requirements. The results of the model analysis show that a 10-inch pipeline is sufficient from the point of connection to the existing 10-inch pipeline and to the proposed 100,000-gallon storage tank. The operations supply pipeline can be 6-inch diameter. The fire water pipeline will need to be a minimum 8-inch diameter to the each of the hydrants.

The proposed pump station is assumed to be located on the north side of the entrance scales. Based on the analysis the design capacity of this pump station can be 500 gpm from a single pump. A second pump should be provided as backup pump and to provide additional redundancy. It is recommended that the pumps will operate in a lead/lag alternating sequence in order to exercise both pumps and reduce maintenance. Table 3 provides a summary of the pump station modeling results. The chart below the table shows the pumping operations

**Table 3 – Bee Canyon Greenery Proposed Pump Station Model Results – Phase 1**

No of Pumps Operating	Pump Operating Flow Range	Pump Operating TDH Range	Pump Suction Pressure	Pump Discharge Pressure
1	491-507 gpm	254-260 ft	8-12 psi	119-123 psi

**Proposed Bee Canyon Greenery Pump (PMP\_FRB1)**



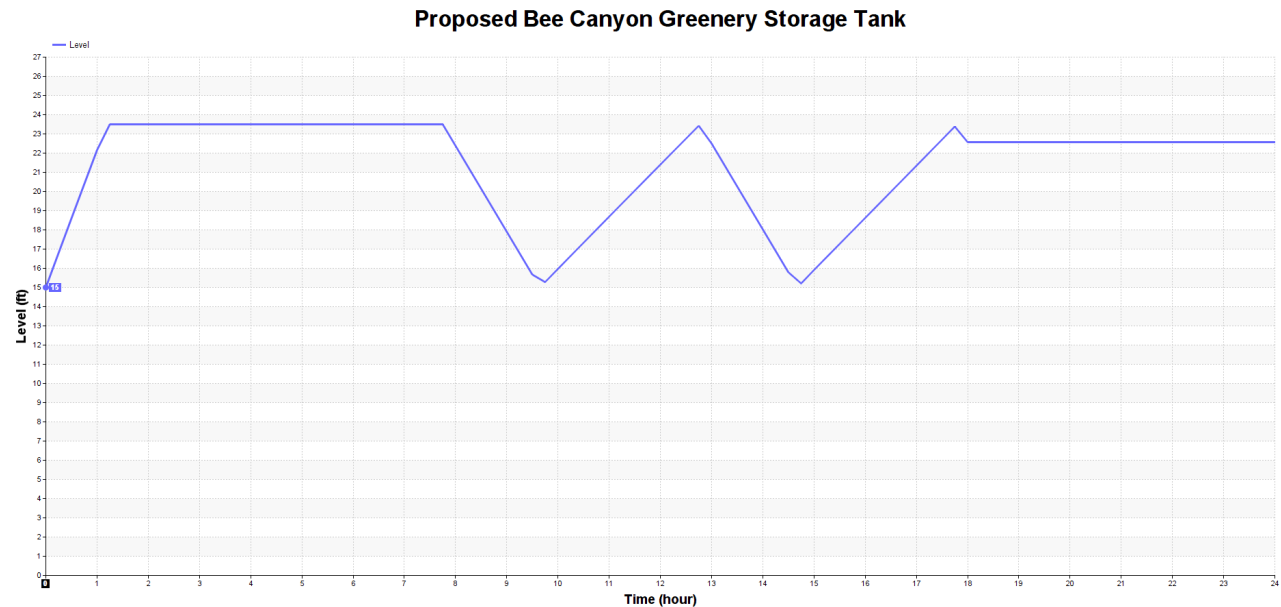
October 28, 2019

Greg Saul

Page 4 of 16

**Reference:**      **Bee Canyon Greenery Recycled Water System Analysis – Revision 1**

The pump station was controlled to turn on when the proposed storage tank water level dropped below 15-ft. This will maintain a minimum volume of 60,000 gallons as required for the fire flow volume. The results of the tank storage water levels during the model analysis is shown below.



### Existing IRWD Bee Canyon Landfill Pump Station – Phase 1

The model results show that the existing pump station and pipeline along the Bee Canyon Access Road have capacity for the Phase 1 water requirements. The maximum velocity in the existing 10-inch pipeline is 3.3 fps, based on a maximum flow rate of 848 gpm from the existing pump station. The table and chart below show the results for the existing Bee Canyon Pump Station.

**Table 4 – Existing Bee Canyon Landfill Pump Station Model Results – Phase 1**

No of Pumps Operating	Pump Operating Flow Range	Pump Operating TDH Range	Pump Suction Pressure	Pump Discharge Pressure
1	717-848 gpm	253-290 ft	85-117 psi	190-220 psi

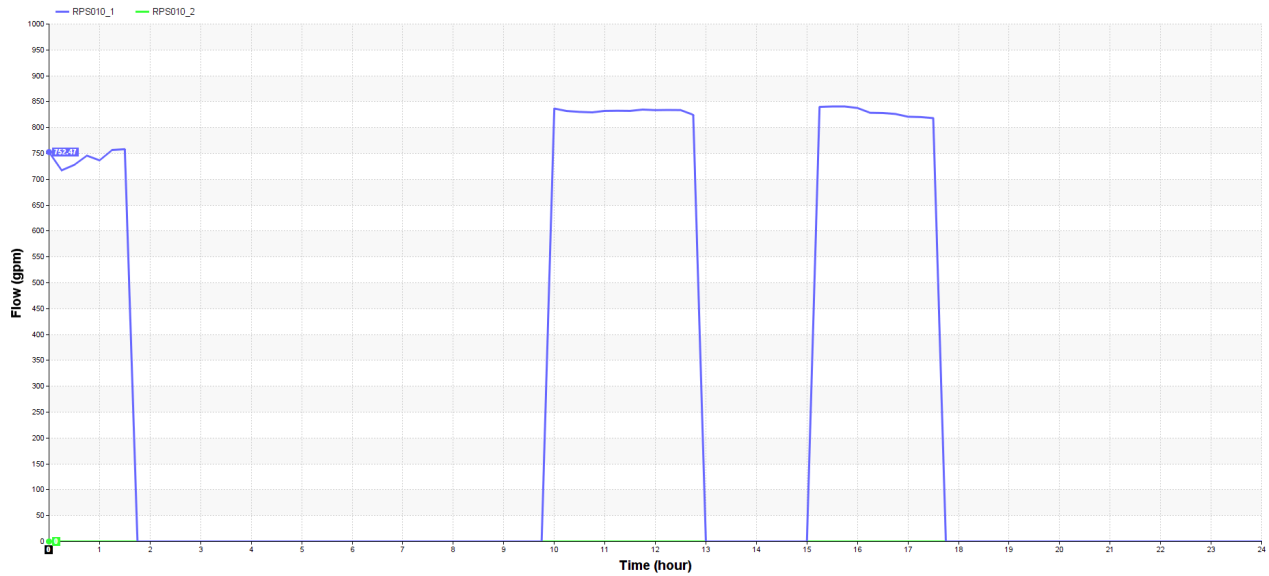
October 28, 2019

Greg Saul

Page 5 of 16

**Reference:** Bee Canyon Greenery Recycled Water System Analysis – Revision 1

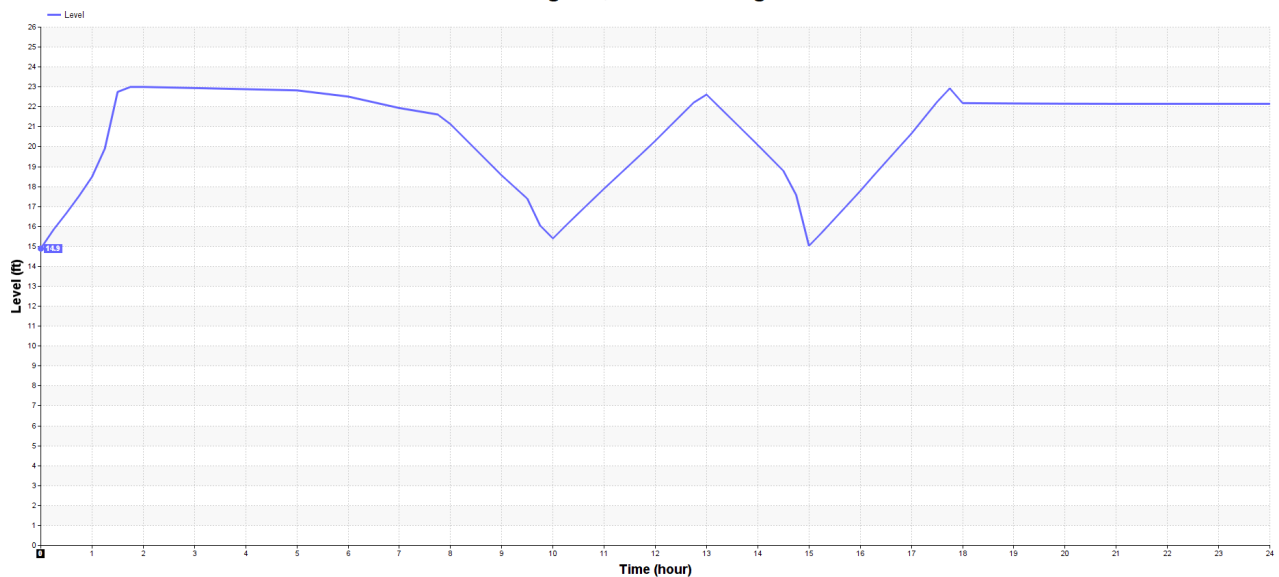
### Existing Bee Canyon Landfill Pump - Phase 1



### Existing 100,000 Gallon Storage Tank – Phase 1

The chart below shows the results for the operating levels of the existing 100,000-gallon tank based on the Phase 1 water requirements.

### Existing 100,000 Gal Storage Tank



**Reference:** Bee Canyon Greenery Recycled Water System Analysis – Revision 1

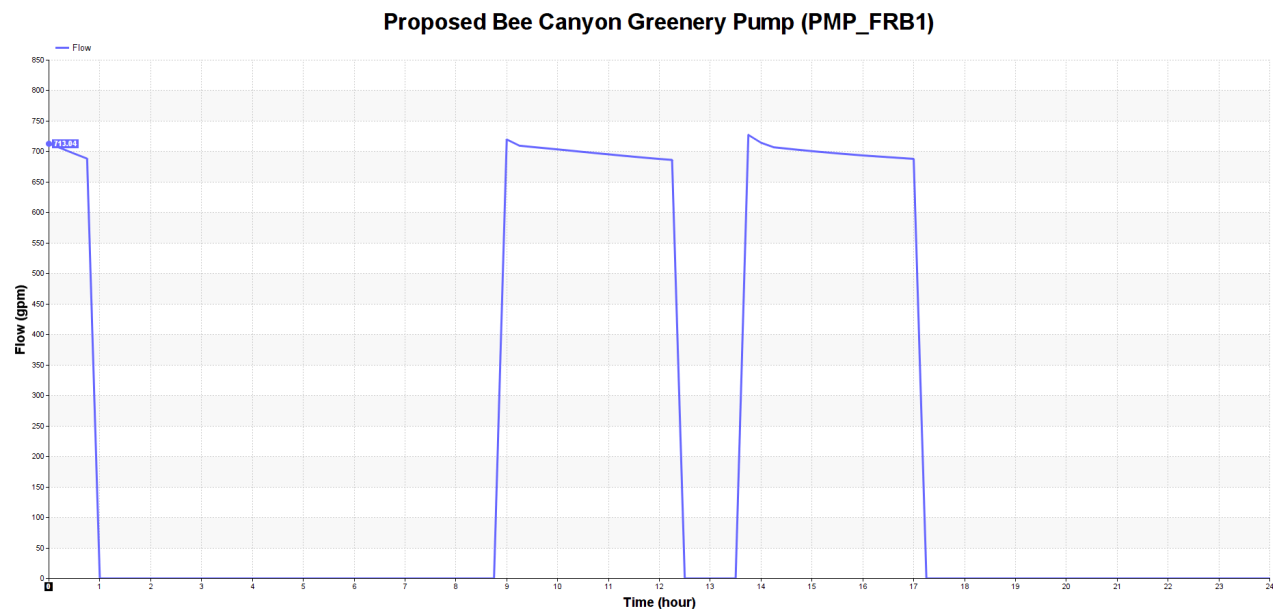
## PHASE 2 – NORMAL OPERATIONS

A hydraulic analysis was conducted for the Phase 2 water demand requirements, which is 537 gpm at the proposed J Stand. The results of the model analysis show that a 10-inch pipeline is sufficient from the point of connection to the existing 10-inch pipeline and to the proposed 100,000-gallon storage tank. The operations supply pipeline can be 6-inch diameter. The fire water pipeline will need to be a minimum 8-inch diameter to the each of the hydrants.

Based on the analysis the design capacity of this pump station for Phase 2 is recommended to be 700 gpm from a single pump. A second pump should be provided as backup pump and to provide additional redundancy. It is recommended that the pumps will operate in a lead/lag alternating sequence in order to exercise both pumps and reduce maintenance. Table 5 provides a summary of the pump station modeling results. The chart below the table shows the pumping operations

**Table 5 – Bee Canyon Greenery Proposed Pump Station Model Results – Phase 2**

No of Pumps Operating	Pump Operating Flow Range	Pump Operating TDH Range	Pump Suction Pressure	Pump Discharge Pressure
1	683-727 gpm	260-270 ft	8-10 psi	122-125 psi



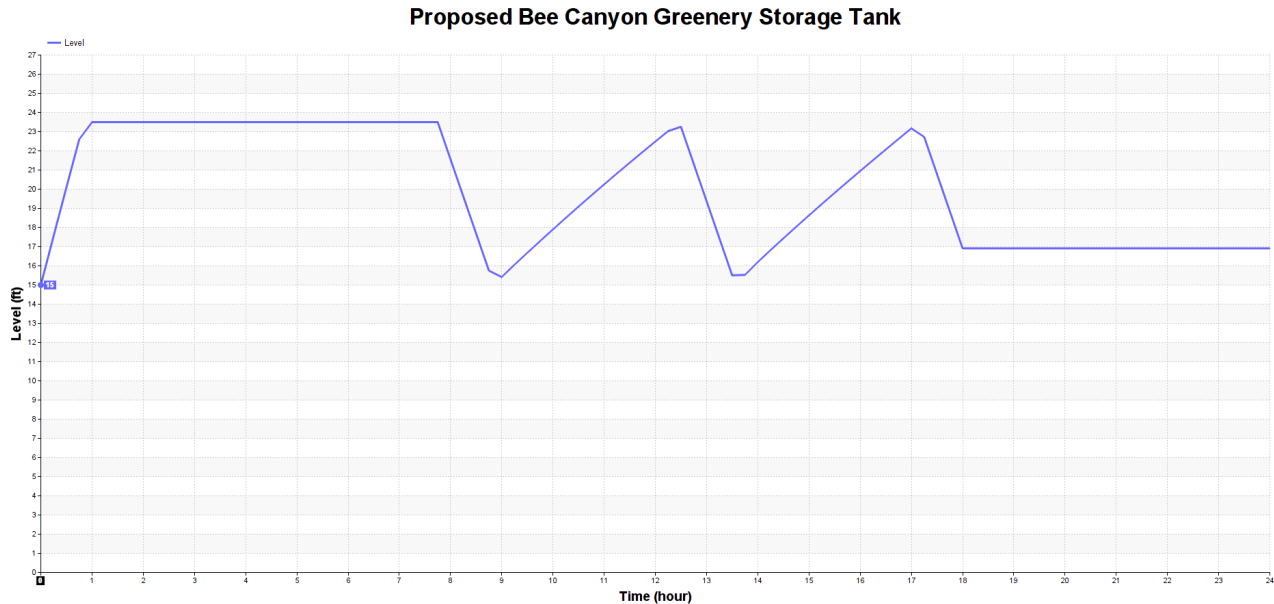
The pump station was controlled to turn on when the proposed storage tank water level dropped below 15-ft. This will maintain a minimum volume of 60,000 gallons as required for the fire flow volume. The results of the tank storage water levels during the model analysis is shown below.

October 28, 2019

Greg Saul

Page 7 of 16

**Reference:** Bee Canyon Greenery Recycled Water System Analysis – Revision 1



### Existing IRWD Bee Canyon Landfill Pump Station – Phase 2 Normal Operations

The model results show that the existing pump station and pipeline along the Bee Canyon Access Road have capacity for the Phase 2 water requirements. The maximum velocity in the existing 10-inch pipeline is 3.3 fps, based on a maximum flow rate of 845 gpm from the existing pump station. The table and chart below show the results for the existing Bee Canyon Pump Station.

**Table 4 – Existing Bee Canyon Landfill Pump Station Model Results – Phase 2**

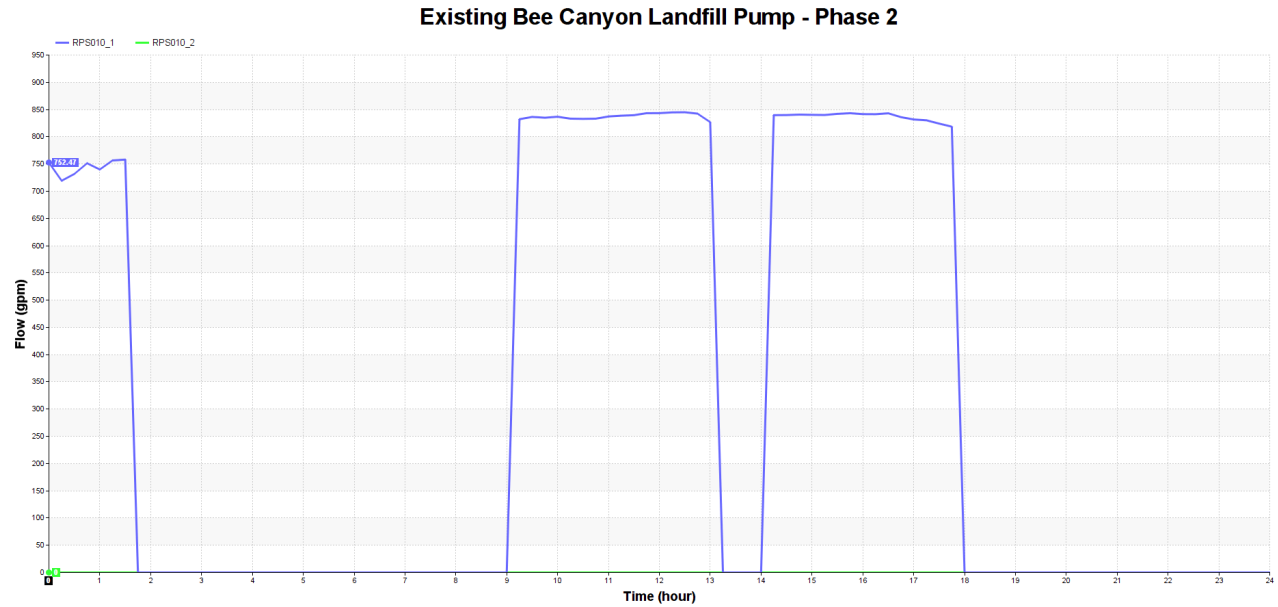
No of Pumps Operating	Pump Operating Flow Range	Pump Operating TDH Range	Pump Suction Pressure	Pump Discharge Pressure
1	722-845 gpm	254-291 ft	85-117 psi	190-220 psi

October 28, 2019

Greg Saul

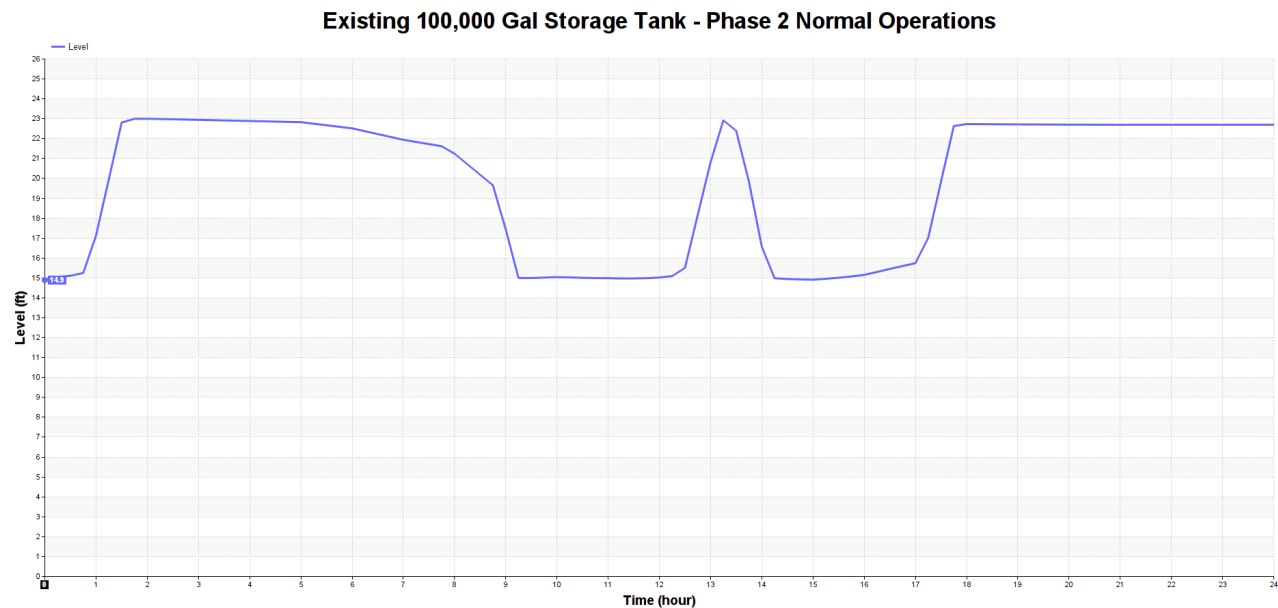
Page 8 of 16

**Reference:**      **Bee Canyon Greenery Recycled Water System Analysis – Revision 1**



### Existing 100,000 Gallon Storage Tank – Phase 2 Normal Operations

The chart below shows the results for the operating levels of the existing 100,000-gallon tank based on the Phase 2 water requirements.





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## PHASE 2 – FIRE FLOW ANALYSIS

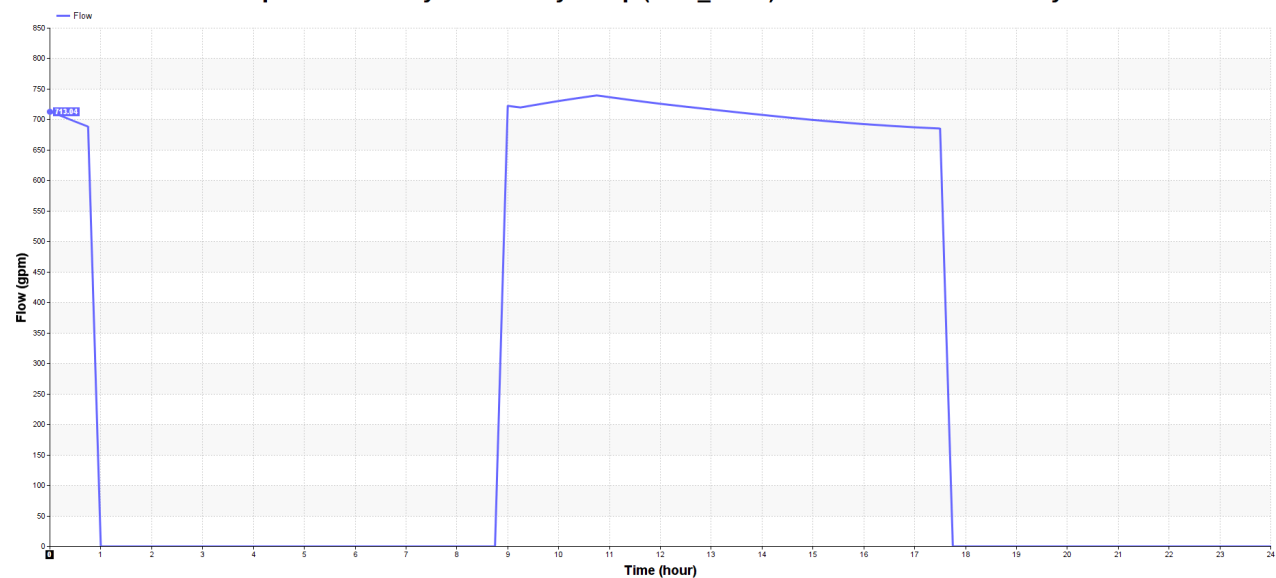
A fire flow analysis was performed to verify storage and pumping will be adequate. The analysis applied 500 gpm to a single hydrant at 9 am for a 2-hour duration. This time was selected as it represents the hour when the storage tank is at its lowest level during normal operations. The results showed that each hydrant will meet the minimum pressure residual requirement of 20 psi based on the proposed pipe diameters. A minimum 8-inch diameter pipe is required between the storage tank and the fire hydrants.

The following tables and charts show the results for the pump stations and storage tanks. The pump capacity does not increase, however, the number of hours the pump operates does increase as can be seen from the chart.

**Table 6 – Bee Canyon Greenery Proposed Pump Station Model Results – Phase 2 – Fire Flow Analysis**

No of Pumps Operating	Pump Operating Flow Range	Pump Operating TDH Range	Pump Suction Pressure	Pump Discharge Pressure
1	685-740 gpm	256-270 ft	7-9 psi	118-125 psi

**Proposed Bee Canyon Greenery Pump (PMP\_FRB1) - Phase 2 - Fire Flow Analysis**



October 28, 2019

Greg Saul

Page 10 of 16

Reference: Bee Canyon Greenery Recycled Water System Analysis – Revision 1

### Proposed Bee Canyon Greenery Storage Tank - Phase 2 - Fire Flow Analysis

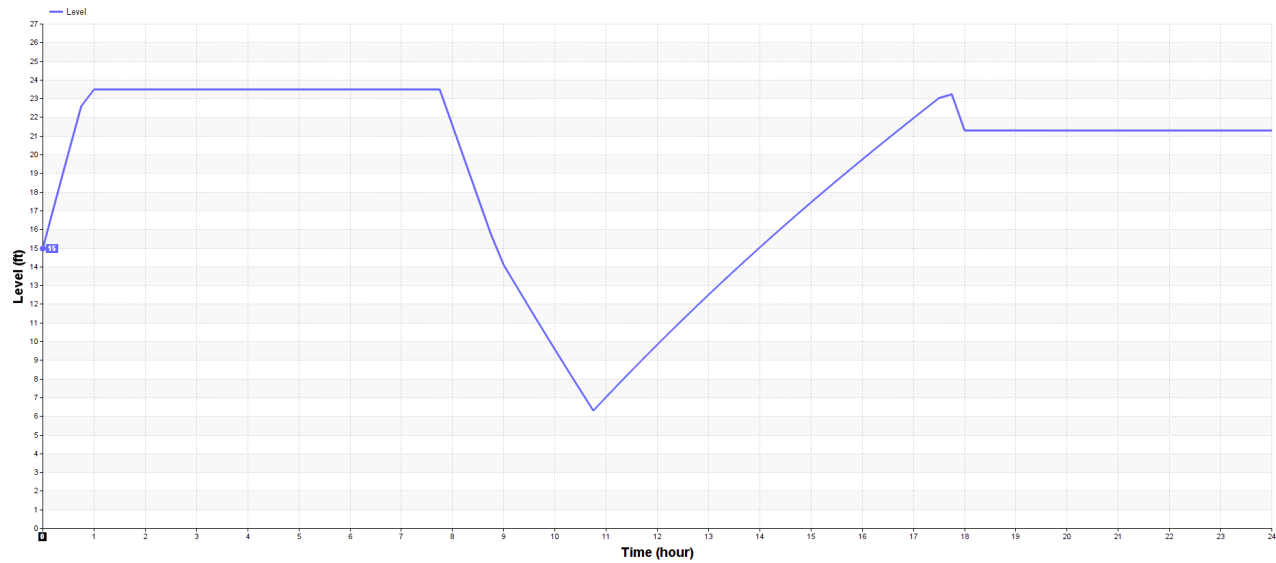
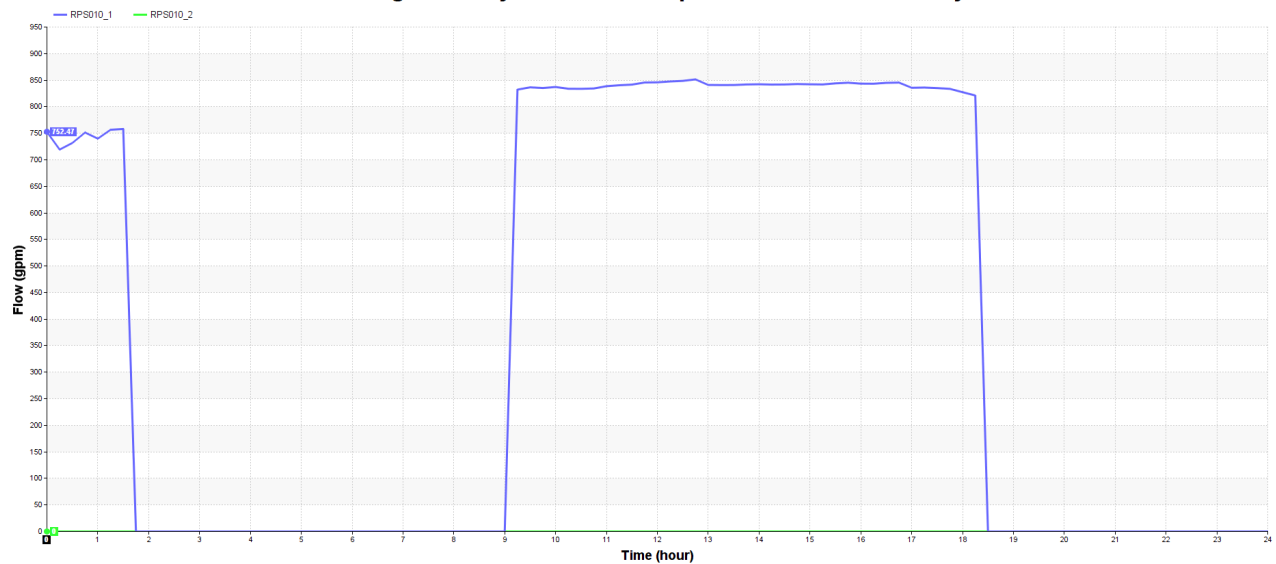


Table 7 – Existing Bee Canyon Landfill Pump Station Model Results – Phase 2 Fire Flow Analysis

No of Pumps Operating	Pump Operating Flow Range	Pump Operating TDH Range	Pump Suction Pressure	Pump Discharge Pressure
1	722-851 gpm	253-290 ft	85-117 psi	190-220 psi

### Existing Bee Canyon Landfill Pump - Phase 2 Fire Flow Analysis

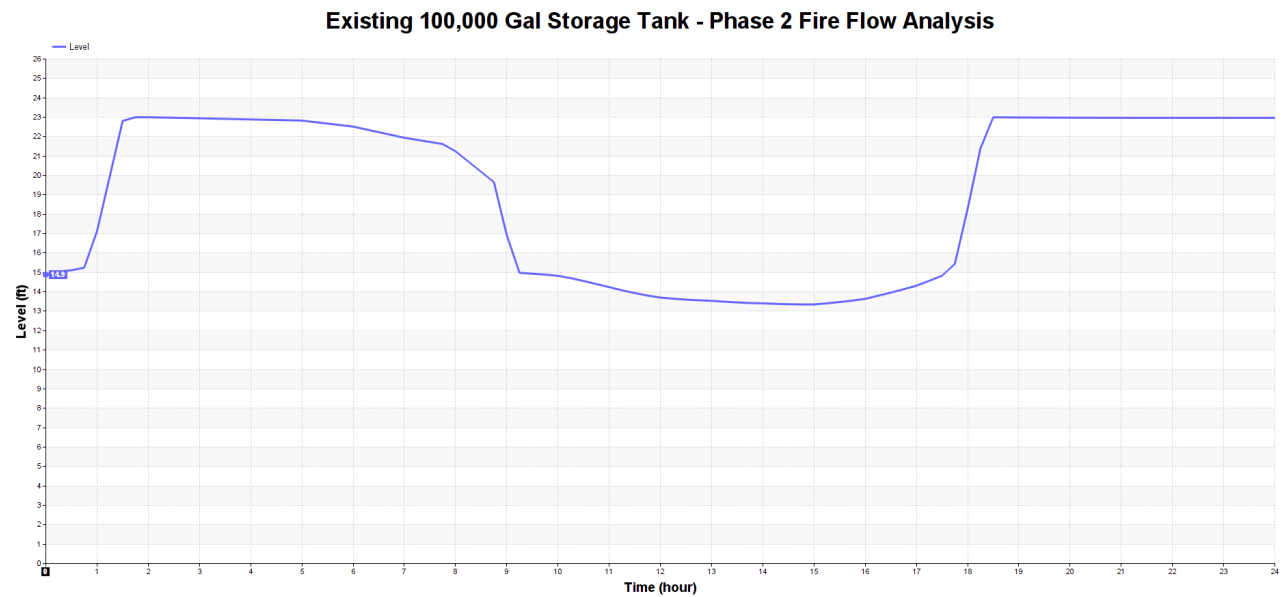


October 28, 2019

Greg Saul

Page 11 of 16

**Reference:**      **Bee Canyon Greenery Recycled Water System Analysis – Revision 1**



**Reference:**      **Bee Canyon Greenery Recycled Water System Analysis – Revision 1**

## **ADDITIONAL ANALYSIS**

Pursuant to IRWD review comments and discussions with IRWD staff, the following analysis was conducted assuming the following conditions and system operational verification/requirements in the model:

- The proposed 3,800-lf of the pipeline to be extended from the existing facilities will be a private pipeline, connecting from the existing onsite storage tank and proposed pump station to the proposed 130,000-gallon tanks.
- *Fire flow to be met entirely from storage* – this means that both of the pump stations, IRWD's existing Bee Canyon Landfill Pump Station and the proposed Bee Canyon Greenery Pump Station, will be off during the fire flow event. The fire flow event is 500 gpm for 2-hour duration.
- *The second pump in IRWD's pump station will not be allowed to be used as a normally operating pump* – this has been verified in the previously described analyses and will also be verified in the proposed additional analysis described below.
- *Apply the proposed demands during the peak demand periods* – the operation hours for the landfill facility are between 8 am and 5 pm. The IRWD's system peak demand period is between 12 am to 2 am. The proposed demands cannot be applied at the same time as the IRWD system peak demand period. However, to allow operational flexibility and verify system capacity in the existing IRWD system during a worst-case demand scenario, an analysis is conducted that assumes a fire flow event occurs in the evening and requires the pumps to turn on between 12 am to about 2 pm.

## **HYDRAULIC MODEL ANALYSIS ASSUMPTIONS**

The hydraulic model was modified to include the following assumptions:

1. The 2-hour fire flow event is assumed to occur on-site between 10 pm – 12 am. This assumes the pump stations are off and that the fire flow is entirely met by the storage tanks.
2. The storage tanks are required to be replenished immediately after the fire flow event. This requires the pump stations to operate between 12 am to 2 pm, during the IRWD system peak demand periods.
3. The onsite pump stations operate to maintain a minimum of 15-ft in the tanks, which is the minimum level required for fire storage.
4. The onsite storage tanks are allowed to maintain the minimum 15-ft prior to the fire flow event.
5. Analysis was conducted for Phase 2 conditions, which assume the highest system demands for both the onsite and offsite IRWD system demands.
6. A 48-hour EPS model analysis was conducted to verify pumping and storage operations. The EPS model analysis starts at 12 am, midnight on the day of maximum demand conditions.

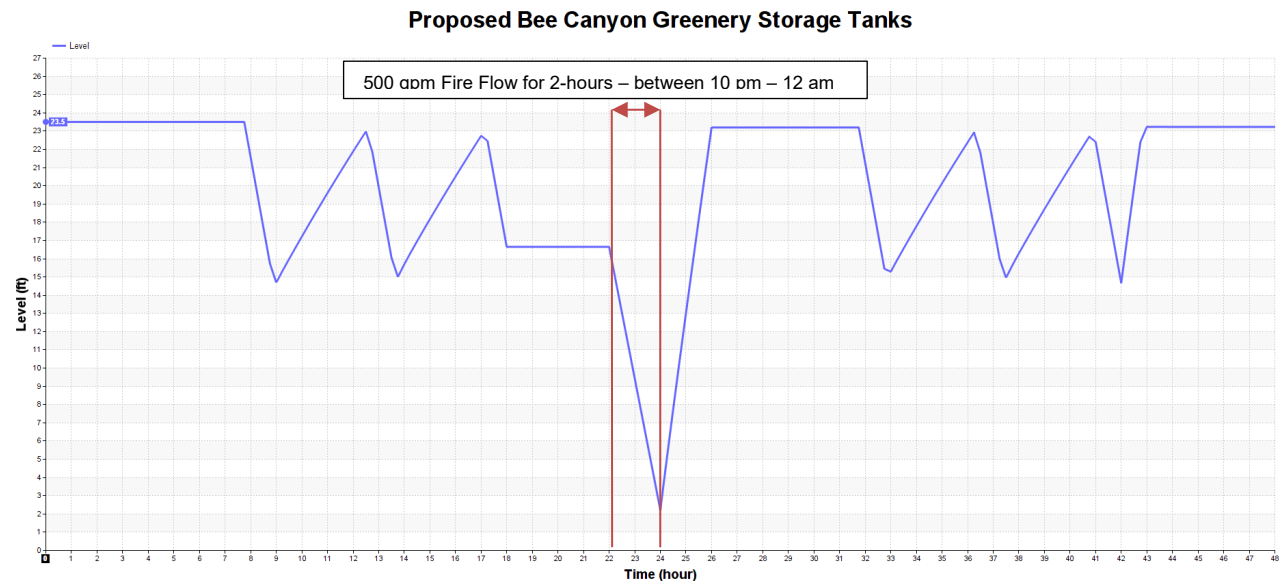
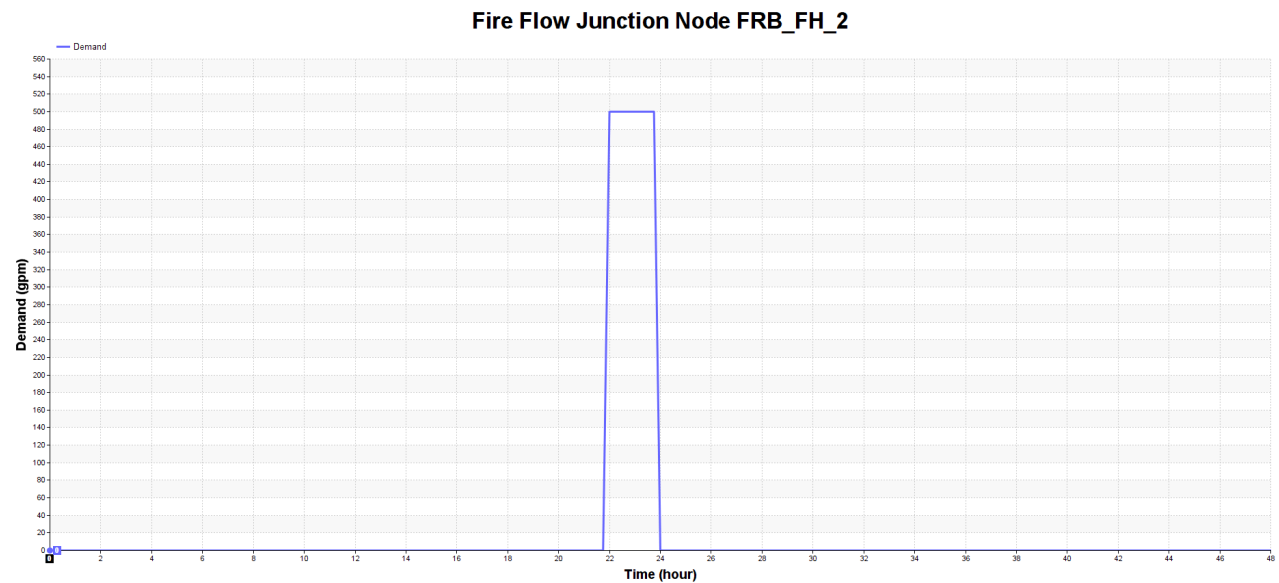
October 28, 2019

Greg Saul

Page 13 of 16

Reference: Bee Canyon Greenery Recycled Water System Analysis – Revision 1

## HYDRAULIC MODEL ANALYSIS RESULTS

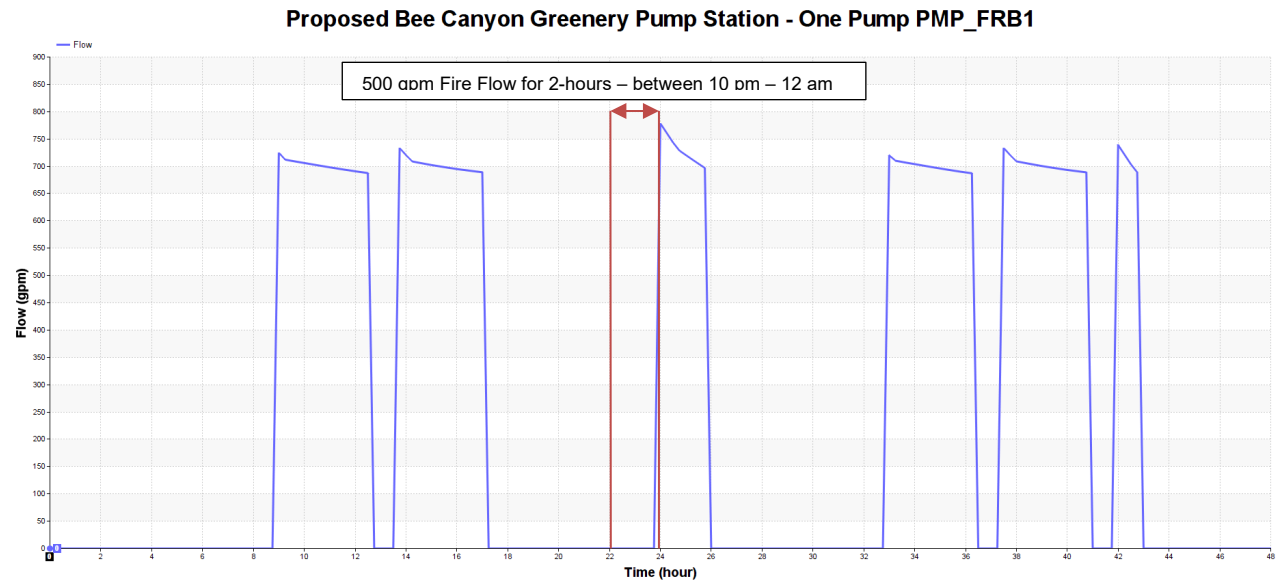


October 28, 2019

Greg Saul

Page 14 of 16

**Reference:**      **Bee Canyon Greenery Recycled Water System Analysis – Revision 1**



October 28, 2019

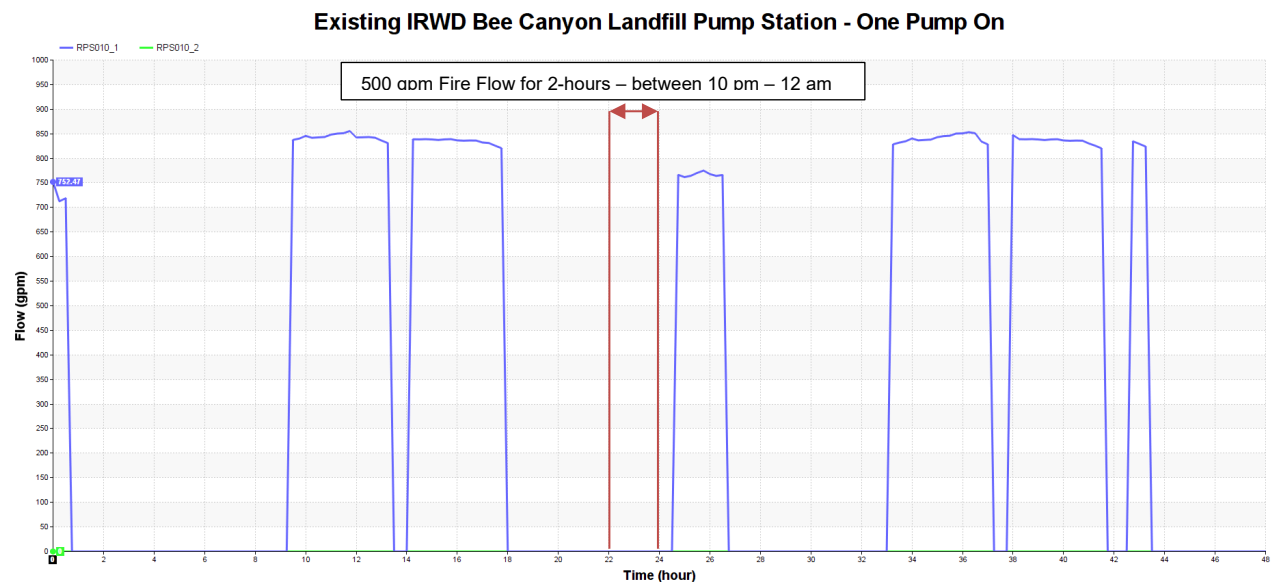
Greg Saul

Page 15 of 16

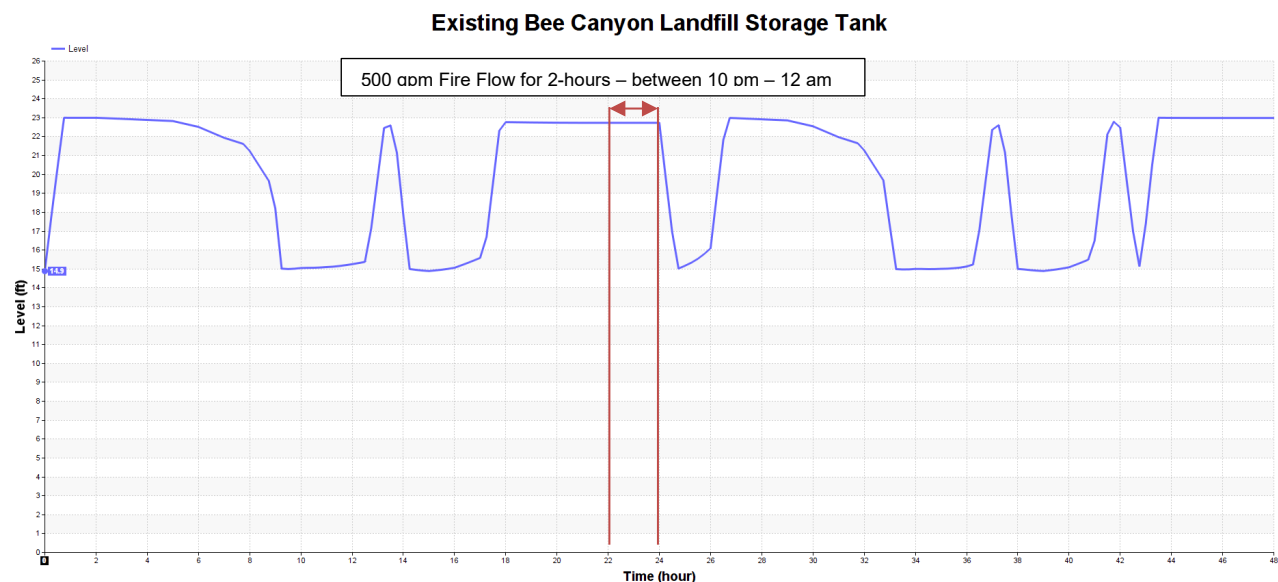
Reference: Bee Canyon Greenery Recycled Water System Analysis – Revision 1

## Existing IRWD Supply Facilities

The model shows that the existing IRWD supply facilities can provide the proposed Bee Canyon Greenery recycled water demands and fire flow requirements. The supply to the Bee Canyon Greenery is provided by IRWD's Zone C system and Bee Canyon Landfill Pump Station located along the Bee Canyon Access Road. The existing Bee Canyon Landfill is off during the fire flow event but operates during the peak irrigation demands in IRWD's system, as shown in the chart below.



Also shown in the chart below is that no fire flow storage is provided by the existing storage tank. All of the fire flow is provided by the proposed onsite tanks.



October 28, 2019

Greg Saul

Page 16 of 16

**Reference:**      **Bee Canyon Greenery Recycled Water System Analysis – Revision 1**

The existing Zone C storage is shown in the chart below to fully recover its operational storage on the day following the fire flow event at the Bee Canyon Greenery on a day of maximum recycled water demands. The model assumes the same pumps and pump station operations as has been assumed for previous planning studies for this pressure zone. Additionally, the model indicates that no negative impacts to the system pressures or pipeline velocities from previously proposed modeling results.

