TETRA TECH

TECHNICAL MEMORANDUM

To:	Nevada Environmental Response Trust
Cc:	Dan Pastor, Tetra Tech, Inc.
From:	April Hussey
Date:	July 24, 2018
Subject:	Operation and Maintenance Summary –June 2018 Weir Dewatering Treatment Plant Nevada Environmental Response Trust; Henderson, Nevada

The Southern Nevada Water Authority (SNWA) is completing two weir construction projects in the Las Vegas Wash, the Sunrise Mountain Weir and Historic Lateral Weir. SNWA has hired a construction company, Las Vegas Paving (LVP) to perform weir construction activities. This includes constructing diversion channels to divert the Las Vegas Wash and perform construction dewatering activities. The Nevada Environmental Response Trust (NERT or Trust) has been ordered by the Nevada Division of Environmental Protection (NDEP) to treat the groundwater from the construction dewatering activities to remove perchlorate before discharging the treated water to the Las Vegas Wash.

To manage and treat groundwater from the construction activities, Tetra Tech, Inc. (Tetra Tech) designed and constructed two pump stations and a central water treatment plant (CWTP), collectively referred to as the SNWA Weir Dewatering Treatment Plant (Treatment Plant). The Treatment Plant will operate on a temporary basis, and operations will cease once groundwater dewatering associated with the SNWA weir construction projects is complete.

At the direction of NERT, Tetra Tech has prepared this summary of the operation and maintenance (O&M) activities performed during June 2018 for the Treatment Plant. The system was operated and maintained in accordance with the *NERT – SNWA Weir Dewatering Water Treatment Plant Operation and Maintenance Manual*.

SUMMARY OF O&M ACTIVITIES

During June 2018, the Treatment Plant continued to receive water from weir construction dewatering activities at Sunrise Mountain Weir. The Treatment Plant received water from weir construction dewatering activities at Historic Lateral Weir for a portion of the month. On June 4, 2018 at approximately 2:00 pm, Historic Lateral Pump Station (HLPS) was placed in standby mode following Las Vegas Paving's completion of dewatering activities at Historic Lateral Weir. For the remainder of the month of June, the Treatment Plant did not receive water from Historic Lateral Weir.

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OPERATIONS

Operations in the first four days of June 2018 were characterized by intervals of high influent total suspended solids (TSS) concentrations as a result of LVP construction activities disturbing soils in or near dewatering trenches and pits during completion of dewatering work at the Historic Lateral Weir. Steady flow and low concentrations of TSS were consistently observed from dewatering operations at the Sunrise Mountain Weir construction site during the period dewatering activities were active at this location. Treatment Plant National Pollutant Discharge Elimination System (NPDES) water quality samples and influent flowrate monitoring confirmed the operations were in compliance with permit limits during the June 2018 reporting period.

Flow Rates

Flow rates for June 2018 are summarized in Table 1. This includes a summary of the flow rate into the HLPS, into the Sunrise Mountain Pump Station (SMPS), and out of the Treatment Plant.

Historic Lateral Pump Station

From June 1, 2018 through June 4, 2018 flow rates into the HLPS were fairly consistent, reflecting consistent dewatering operations by LVP at the Historic Lateral Weir construction site using two dewatering pumps. As noted above, HLPS was placed in standby mode on June 4, 2018. From June 4, 2018 to June 30, 2018 HLPS, did not receive water from the Historic Lateral Weir construction site.

Sunrise Mountain Pump Station

Flow rates into the SMPS were fairly consistent over the reporting period, reflecting consistent dewatering operations by LVP at the Sunrise Mountain Weir construction site using four dewatering pumps.

Influent Parameters

Influent water quality parameters are measured daily for the water coming into each pump station. Influent water quality parameters measured include:

- Perchlorate
- Chlorate
- Total Dissolved Solids (TDS)
- Sulfate
- Nitrate

Perchlorate, chlorate, and TDS are analyzed at a certified laboratory (Test America) in accordance with the Operations and Maintenance Agreement, executed December 31, 2017. Sulfate and nitrate are also analyzed to capture a complete evaluation of these influent parameters. Beginning March 16, 2018, both nitrate and sulfate were analyzed exclusively by the in-house laboratory. Both nitrate and sulfate are analyzed according to EPA method 300.0. These in-house procedures meet the standards specified in the approved NERT project Quality Assurance Project Plan as described in previous monthly reports.

The range and average of perchlorate concentrations observed into each pump station during the reporting period were:

- HLPS: 59 to 159 µg/L, average: 119 µg/L
- SMPS: 918 to 1,340 µg/L, average: 1,065 µg/L

Table 2 contains the summary data from the daily influent parameter measurements.

Perchlorate Mass Removal Estimates

Daily perchlorate mass removal estimates were calculated from the recorded total influent flow to the SMPS and HLPS and daily measurements of perchlorate (analyzed at Test America by Method 314.0). The mass removed was calculated based on an effluent perchlorate concentration of zero (0) µg/L. The estimated mass of perchlorate removed during June 2018 is:

- HLPS: 6 pounds
- SMPS: 817 pounds
- Total: 823 pounds

Perchlorate removal estimates have been tabulated since the startup period ended January 17, 2018. The estimated total perchlorate mass removed from January 18, 2018 through June 30, 2018 is:

- HLPS: 387 pounds
- SMPS: 4,565 pounds
- Total: 4,952 pounds

A graph showing the estimated removal of perchlorate from January 18 through June 30, 2018 is presented in the attached Figure 1.

Suspended Solids Removal and Management

The Treatment Plant was designed to remove the majority of suspended solids from the influent waters via hydrocyclones and multimedia filters (MMF). High TSS waste from the hydrocyclones are stored in the 20,000-gallon cyclone waste tank. High TSS waste from the MMFs is generated during the MMF backwash process and is stored in two 20,000-gallon backwash waste tanks. The system is designed to slowly blend in backwash waste and cyclone waste water into the treated effluent stream in small quantities to ensure the concentrations do not exceed the NPDES permit discharge limits for perchlorate (18 µg/L) and TSS (135 mg/L).

To address the ongoing significant solids loading in the waters produced from weir construction, continued use of external tanks for cyclone and backwash waste surge and storage capacity and associated decanting system occurred in June 2018. These external surge tanks are connected to the permanent cyclone and backwash waste tanks with a semi-permanent hard-pipe system to reduce the potential for releases outside of containment. The piping system maintains all pumps and connections within secondary containment, and includes a pumping circuit to decant the water overlying settled solids from these tanks back into the SMPS influent tanks. In the month of June:

- 5 tanker truckloads of solids slurry were sent to the landfill, or 25,000 gallons of tanker capacity; and
- 315,300 gallons of water overlying settled solids were decanted from the surge tanks and routed back through the Treatment Plant (4,338,400 total gallons since start of decanting process).

MAINTENANCE

Maintenance performed at the Treatment Plant during the reporting period included both routine maintenance activities and non-routine maintenance activities as described in the following sections.

Routine Maintenance

Routine maintenance activities included the following:

- Generators supplying power to the SMPS, HLPS, and CWTP require service approximately every 250 hours of generator run time. Generators were serviced during the reporting period as follows:
    - XQ350 – Unit 14-161 (at HLPS), service conducted on June 6, 2018.

  - XQ350 – Unit 14-162 (at HLPS), service conducted on June 5, 2018.
  - XQ500 – Unit 14-165 (at CWTP), service conducted on June 7 and June 20, 2018.
  - XQ350 – Unit 17-248 (at SMPS), service conducted on June 7 and June 20, 2018.
  - XQ350 – Unit 17-249 (at HLPS), service conducted on June 5, 2018.
  - XQ350 – Unit 17-250 (at SMPS), service conducted on June 2, June 14, and June 29, 2018.
  - XQ350 – Unit 17-251 (at SMPS), service conducted on June 14, 2018.
  - XQ350 – Unit 17-252 (at SMPS), service conducted on June 20, 2018.
- Wye strainer was flushed periodically to clear solids accumulation.
- Cyclone underflow lines were flushed periodically to clear solids accumulation.
- Cyclone valves were greased.
- Tank level sensors were cleaned.
- Polymer injection system was cleaned.

Non-Routine Maintenance

Non-routine maintenance was performed during June 2018 to improve Treatment Plant operation, including:

- Installed 2-inch flow meters and valve on the decant system pipelines on June 5, 2018.
- Replaced mechanical seal on Pump 7B on June 6, 2018.
- Replaced coupler on Pump 6B on June 6, 2018.
- Replaced gearbox and repaired Mixer 1F and 1G on June 8, 2018.
- Replaced pressure transmitter for Multi Media Filter 2 on June 8, 2018.
- Changed ion exchange resin in vessel 2B on June 9, 2018.
- Welded cyclone underflow port on June 11, 2018.
- Installed InTrac housings for TSS meters AIT-2010, 4010, 6010, 7010, 8040 and 8060 on June 14, 2018.
- Replaced the Wye Strainer and Bypass Wye Strainer with spare straining elements and gaskets on June 14, 2018.
- Replaced an 8-inch gasket on Multi Media Filter 1B on June 14, 2018.
- Replaced hose and camlocks for decant system on June 15, 2018.
- Installed new manway gasket on Multi Media Filter 1A on June 18, 2018.
- Installed new trash pump on decant line on June 19, 2018.
- Installed new UPS and A/C unit for Multi Media Filter interface display panel on June 20, 2018.
- Installed safety chains on treated water tank manways on June 28, 2018.
- Installed new 16-inhc flexible coupling on Multi Media Filter 1B on June 29, 2018.
- Installed new piezoelectric board for torque on Cyclone Valve XV505 on June 29, 2018.

O&M Costs

At the direction of the Trust, Tetra Tech has summarized cost data for the reporting period. The following table summarizes project charges in accordance with the Operations and Maintenance Agreement, executed December 31, 2017. This section only captures project charges consistent with the O&M agreement or agreed upon charges for items supplied by/through Tetra Tech and billed to the Trust.

Table 3: O&M Cost Summary

Item	Payment Details	Unit[1]	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
Monthly Base Cost	Lump sum payable to Tetra Tech	$297,500 /month	$297,500	$1,785,000
Ion Exchange Resin	Lump sum direct pay from Trust to Evoqua for turn key resin delivery, replacement, transportation and disposal services	$135,755 /vessel which includes: $109,750 /vessel for resin $26,005 /vessel for changeout services and disposal	$104,020[2]	$460,433
Tankage	Actual usage charges direct pay from Trust to vendor	Baker Corp: $20,074 /month plus variable maintenance fees as necessary Rain for Rent: Variable costs	$0[3] $32,531	$177,543
Generator Rental / Maintenance	Actual usage charges direct pay from Trust to Cashman	$625 every 250 run hours per XQ350 Generator $1,250 every 250 run hours per XQ500 plus Backup generator rental costs as required to support maintenance	$11,250[4]	$41,875
Generator Fuel	Actual usage charges direct pay from Trust to Cashman	Adjusts per market	$120,001	$563,726

[1] Unit rates do not include applicable taxes.

[2] The equivalent of 9 vessel changeouts were paid by the Trust as part of the construction contract. This credit has been exhausted. These charges reflect additional vessel changeouts payable directly by the Trust.

[3] The Trust pre-paid a sum during Treatment Plant Construction for project tankage to obtain a discount on long-term equipment cost. As of June 30, 2018, the remaining credit balance is $75,967.72. Additional payment by the Trust will not be required until this prepayment credit is exhausted.

[4] The Trust pre-paid a sum during Treatment Plant Construction for generator rental to obtain a discount on long-term equipment cost. As of June 30, 2018, the remaining rental credit balance is $10,497.49. Additional payment by the Trust for rental will not be required until this prepayment credit is exhausted. Maintenance costs are separate from the pre-paid sum for rental and are included in the table above.

Item	Payment Details	Unit[1]	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
Solids Disposal	Lump sum payable to Tetra Tech for off-site transportation and disposal	$4,150 /3,000-gallon tanker $6,917 /5,000-gallon tanker	$161,856	$1,474,694
Decanting	Daily charge payable to Tetra Tech	$10,000 /day	$40,000	$390,000
Repairs	Cost of Equipment replacement plus 5% markup payable to Tetra Tech	Pumping Systems Inc: Variable Costs Pioneer Equipment Inc: Variable Costs	$8,216 $3,479	$11,695
		TOTAL	$778,853	$4,904,966

No other items were supplied by/through Tetra Tech and billed to the Trust during this reporting period.

CERTIFICATION

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been prepared in a manner consistent with the current standards of the profession, and to the best of my knowledge, comply with all applicable federal, state, and local statutes, regulations, and ordinances. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.

Description of Services Provided: Prepared Weir Dewatering Treatment Plant Operation and Maintenance Summary for June 2018.

July 24, 2018

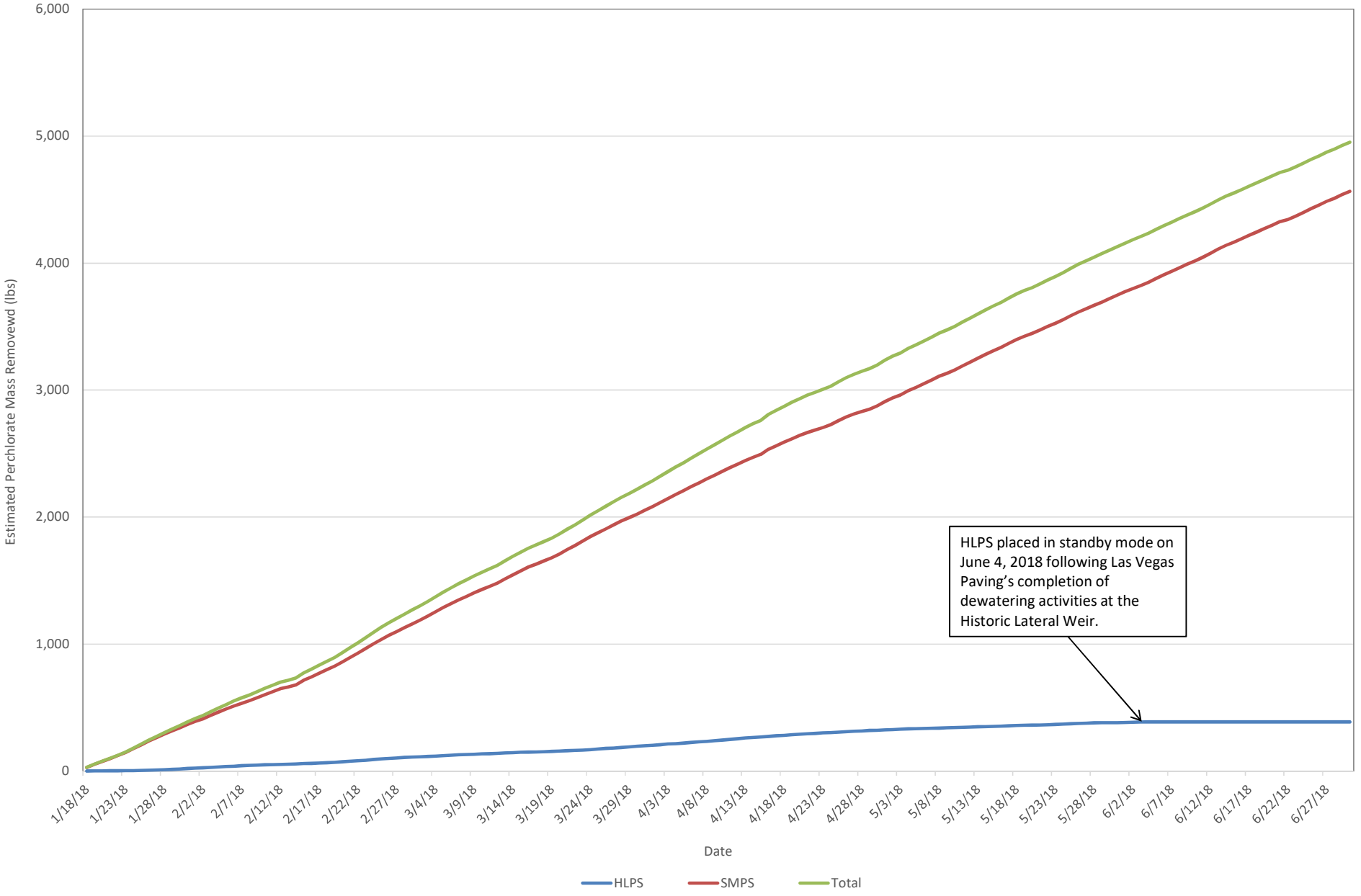
Kyle Hansen, CEM
Field Operations Manager/Geologist
Tetra Tech, Inc.

Date

Nevada CEM Certificate Number: 2167
Nevada CEM Expiration Date: September 18, 2018

Figures

Figure 1
Estimated Perchlorate Mass Removed January 18 - June 30, 2018



Tables

Weir Dewatering Treatment Plant
Monthly Flow Summary
June 2018
Table 1

Date	Influent						Effluent[3]	
	HLPS		SMPS		Combined Flow[1]			
	Average[2] (FIT3010) gpm	Total (FIT3010) Gallons	Average[2] (FIT2010) gpm	Total (FIT2010) Gallons	Average[2] (FIT4010) gpm	Total (FIT4010) Gallons	Average[2] (FIT8060) gpm	Total (FIT8060) Gallons
6/1/2018	1,302	1,874,900	2,211	3,184,400	3,518	5,066,600	3,808	5,483,400
6/2/2018	1,204	1,734,100	2,180	3,138,700	3,403	4,900,200	3,706	5,336,700
6/3/2018	1,346	1,938,700	1,969	2,835,400	3,327	4,790,700	3,595	5,176,600
6/4/2018	577	831,100	2,197	3,164,200	2,850	4,103,400	3,168	4,561,900
6/5/2018	0	0	2,150	3,095,800	2,208	3,179,500	2,527	3,639,400
6/6/2018	0	0	2,147	3,091,700	2,144	3,087,900	2,514	3,619,600
6/7/2018	0	0	2,141	3,082,800	2,160	3,109,700	2,455	3,534,500
6/8/2018	0	0	2,160	3,110,500	2,206	3,176,100	2,517	3,624,700
6/9/2018	0	0	2,153	3,100,000	2,173	3,128,800	2,457	3,538,100
6/10/2018	0	0	2,134	3,072,600	2,146	3,090,400	2,445	3,521,100
6/11/2018	0	0	2,139	3,079,900	2,139	3,079,900	2,419	3,483,400
6/12/2018	0	0	2,065	2,973,500	2,063	2,970,200	2,326	3,348,900
6/13/2018	0	0	2,100	3,024,000	2,108	3,035,400	2,399	3,454,200
6/14/2018	0	0	2,092	3,012,500	2,089	3,007,800	2,208	3,180,200
6/15/2018	0	0	2,176	3,132,900	2,189	3,152,400	2,271	3,270,400
6/16/2018	0	0	2,127	3,063,400	2,140	3,081,500	2,233	3,216,100
6/17/2018	0	0	2,123	3,056,800	2,131	3,068,200	2,237	3,220,800
6/18/2018	0	0	2,128	3,063,900	2,120	3,053,000	2,267	3,265,100
6/19/2018	0	0	2,133	3,071,000	2,130	3,067,000	2,270	3,268,300
6/20/2018	0	0	2,125	3,060,600	2,141	3,082,400	2,286	3,292,300
6/21/2018	0	0	2,119	3,051,100	2,115	3,045,400	2,116	3,047,600
6/22/2018	0	0	1,598	2,300,500	1,610	2,319,000	1,613	2,323,200
6/23/2018	0	0	2,036	2,932,400	2,043	2,941,900	2,041	2,938,700
6/24/2018	0	0	2,258	3,251,200	2,251	3,241,300	2,238	3,223,000
6/25/2018	0	0	2,205	3,175,400	2,196	3,161,900	2,218	3,194,500
6/26/2018	0	0	2,217	3,192,700	2,215	3,189,600	2,197	3,163,100
6/27/2018	0	0	2,132	3,069,900	2,134	3,072,900	2,154	3,102,400
6/28/2018	0	0	2,161	3,111,500	2,159	3,108,700	2,145	3,088,600
6/29/2018	0	0	2,161	3,111,300	2,156	3,104,400	2,156	3,104,300
6/30/2018	0	0	2,175	3,132,600	2,181	3,140,100	2,173	3,129,200

Notes:
HLPS = Historic Lateral Pump Station.
SMPS = Sunrise Mountain Pump Station.
FIT numbers presented in column headers correlate with Flow Instrument Transmitter tag numbers for particular flow meters.
Combined flow totals recorded on 6/4 - 6/5, 6/8 - 6/9, 6/15 and 6/20 inclusive of bypass of flowmeter for maintenance or recirculated flow through plant decant process.
Dewatering operations at the Historic Lateral Weir construction site ceased on June 4, 2018 at approximately 2:00pm. No flows were sent to the HLPS after that time.
1 - The combined feed is measured by flow indicator FIT4010. This is not equal to the sum of flows from HLPS (FIT3010) and SMPS (FIT2010) due to fluctuating volumes in influent storage tanks.
2 - Average calculated by dividing total gallons by 1,440 (minutes per 24 hours).
3 - Effluent flow meter data is higher than the combined influent flows due to inherent flowmeter variability and is compounded by batch processing operations. Air drawn into piping (as designed for vacuum breaks) at the end of each pumping batch has been observed to result in transient, short duration high flow readings that are not representative of actual flows.

Weir Dewatering Treatment Plant
Influent Parameter Summary
June 2018

		Parameter:	Perchlorate		Chlorate		Total Dissolved Solids		Nitrate as NO3		Sulfate		
		Units:	ug/L		ug/L		mg/L		mg/L		mg/L		
Location	Collection Date	Lab Sample ID	Result	LQ	Result	LQ	Result	LQ	Result	LQ	Result	LQ	Comment
HLPS Influent	6/1/2018	440-212629-1	59.2		31.9	J	1560		40.1		559		
	6/2/2018	440-212798-1	101		46.5		1600		40.7		555		
	6/3/2018	440-212806-1	159		113		1560		39.4		552		
	6/4/2018	440-212803-1	157		145		1550		38.6		551		No flow after HLPS placed in standby mode at 14:07 June 4.
SMPS Influent	6/1/2018	440-212629-2	1030		196		2750		29.1		1180		
	6/2/2018	440-212798-2	938		160		2610		28.6		1150		
	6/3/2018	440-212806-2	973		169		2650		27.5		1170		
	6/4/2018	440-212803-2	933		130		2530		28.9		1070		
	6/5/2018	440-212893-1	1200		201		2760		28.1		1200		
	6/6/2018	440-213048-1	1140		158		2620		28.2		1140		
	6/7/2018	440-213122-1	1040		150		2660		28.6		1150		
	6/8/2018	440-213208-1	1070		161		2710		29.2		1090		
	6/9/2018	440-213330-1	1060		169		2640		28.0		1130		
	6/10/2018	440-213328-1	1070		170		2700		27.6		1140		
	6/11/2018	440-213327-1	1050		174		2660		28.3		1130		
	6/12/2018	440-213510-1	1280		169		2640		28.4		1130		
	6/13/2018	440-213565-1	1340		178		2810		28.1		1150		
	6/14/2018	440-213712-1	1160		144		2410		27.9		1120		
	6/15/2018	440-213792-1	929		157		2690		27.9		1150		
	6/16/2018	440-213871-1	1060		162		2590		28.1		1140		
	6/17/2018	440-213874-1	1050		167		2630		27.6		1120		
	6/18/2018	440-213876-1	1050		162		2590		28.3		1100		
	6/19/2018	440-213954-1	1080		166		2730		28.3		1120		
	6/20/2018	440-214087-1	1040		165	F1	2620		28.2		1130		
	6/21/2018	440-214244-1	1060		173		2560		28.3		1110		
	6/22/2018	440-214305-1	918		128		2390		28.8		1020		
	6/23/2018	440-214438-1	1080		147		2570		28.0		1080		
	6/24/2018	440-214441-1	1060		180		2670		28.2		1150		
	6/25/2018	440-214444-1	1130		179		2660		27.2		1140		
	6/26/2018	440-214509-1	988		178		2710		27.8		1140		
	6/27/2018	440-214611-1	1180		187		2640		28.0		1130		
	6/28/2018	440-214691-1	948		185		2600		26.7		1130		
	6/29/2018	440-214801-1	1120		189		2730		27.1		1150		
	6/30/2018	440-214869-1	985		177		2650		26.8		1130		

Notes:

ug/L	micrograms per liter (parts per billion)
mg/L	milligrams per liter (parts per million)
J	Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
F1	Matrix Spike and/or Matrix Spike Duplicate Recovery is outside acceptance limits.
HLPS	Historic Lateral Pump Station
SMPS	Sunrise Mountain Pump Station
n/a	Not currently available.

Nitrate data presented as NO_3 consistent with terms of O&M agreement.

Nitrate and sulfate analyzed exclusively by In-House Laboratory beginning 3/16/18.

HLPS placed in standby mode beginning 14:07 6/4/2018. If the pump station is taken out of standby mode and returned to service, sampling will resume for any days (including partial days) where flow is received