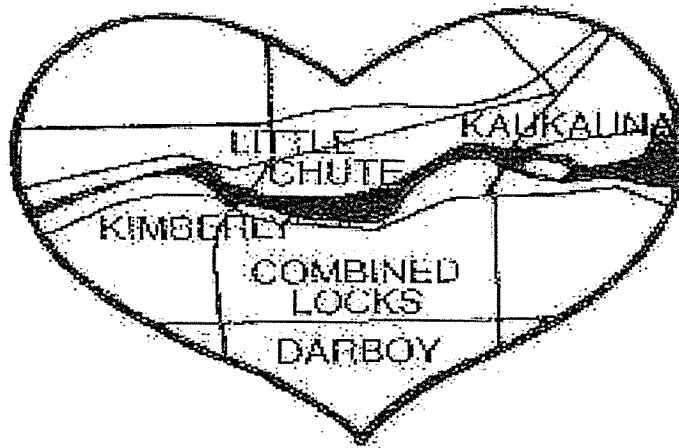


2019

Heart of the Valley Metropolitan Sewerage District

WPDES Permit WI-0031232-09-0



OPERATIONAL EVALUATION REPORT

OPERATIONAL EVALUATION REPORT CONTENTS

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BACKGROUND INFORMATION

PURPOSE

This report was prepared to satisfy the requirement of Heart of the Valley Metropolitan Sewerage District's (HOVMSD) NPDES compliance schedule related to removal of phosphorus in accordance with Permit Number WI-0031232-09-1. HOVMSD is subject to a compliance schedule within the permit that requires the preparation and submission of an Operation Evaluation Report as part of its process to address final compliance with a phosphorus WQBEL for its discharge into the Fox River. As a Fox River discharger, HOVMSD is subject to a 1.0 mg/L interim limit along with a TMDL load limit of 10.5 lbs/day as a 6-month average and 31.5 lbs./day on monthly average.

FACILITY AND TREATMENT PROCESS

HOVMSD provides treatment of domestic, commercial and industrial wastewater from the municipalities of Combined Locks, Kaukauna, Kimberly, Little Chute and Darboy. Member community sewerage flow is transported from their sanitary sewer collection systems via the HOVMSD Interceptor to the treatment facility located in Kaukauna. The Interceptor receives flow through 10 metering stations where it is totalized and a composite sampler collects representative samples for individual community billings.

The combined influent wastewater first passes thru the Headworks where it is metered and the influent is flow proportionally composite sampled. Influent flows in excess of 25 MGD are diverted to the peak flow headworks which has an additional 35 MGD design. Each of the headworks are equipped with 36" Parshall flumes and all influent flow measurement, sampling and screening is conducted at these two locations.

Flows exiting the both headworks are pumped to a splitter box, which feeds dual, 30 MGD Vortex-grit removal systems. The grit is processed through a Coanda grit washer and deposited into a dumpster and landfilled. After exiting the grit removal system, the effluent flows to the Actiflo Ballasted Sedimentation System. The two Actiflo treatment trains use ferric sulfate and polymer to rapidly coagulate and settle suspended solids. The primary sludge is pumped and further dewatered prior to solids handling.

The Actiflo effluent flows by gravity to the Biostyr Biological Aerated Filter system (BAF). Where flows in excess of 26.4 MGD are automatically diverted to the peak flow chlorine contact tanks. The BAF system is an up-flow biological aerated filter technology which removes suspended solids, BOD and Ammonia nitrogen, with up to eight cells available for biological treatment. Accumulated biological solids are periodically backwashed from each BAF cell and pumped back to the Actiflo process for removal. Flow to the secondary treatment (BAF) system is measured by a magnetic meter and continues on to the normal flow chlorine contact tank. Seasonal disinfection is achieved using liquid sodium-hypochlorite that is introduced just ahead of both the normal flow and peak flow contact tanks with sodium-bisulfite added downstream of each tank to neutralize any residual chlorine. Effluent flow from the contact tanks is blended during high flow events

and is discharged through the 48-inch outfall 001, to a backwater segment of the Fox River, which is just downstream from the Kaukauna Govt. Lock #5.

The comingled primary and secondary biological solids are pumped from the gravity thickener to one of two Dissolved Air Floatation units where it is further thickened and pumped to a batch day tank prior to conditioning and digestion. HOVMSD utilizes the Autothermal Aerobic Digestion (ATAD) process that when complete, produces a Class A biosolids that is land applied.

PHOSPHORUS REMOVAL

The addition of ferric sulfate is integral to the Actiflo process, that in conjunction with polymer produces floc that is settled out and sent to the solids handling portion of the facility. The Actiflo building houses two 10,500-gallon chemical storage tanks and a total of 5 chemical metering pumps dedicated to ferrous addition in the Actiflo process.

HOVMSD DESIGN

	Flow (mgd)	BOD5 lbs/day	TSS lbs/day	Ammonia lbs/day	Phosphorus lbs/day
Design Avg	8.5	12,209	13,565	1,600	339
Max month (1.2:1)	11.9	14,651	16,278	1,920	407
Max day (2.4:1)	26.4	29,302	32,556	3,005	1,017

PHOSPHORUS MONITORING

The HOVMSD permit requires effluent phosphorus analysis reporting on a 5x per week basis. HOVMSD does analysis of both effluent and influent phosphorus on a daily basis for process control purposes and to ensure data to report for effluent in the event a sampler fails or the sample is inadvertently spilled and its result lost. The table below shows the average values for flow, concentration, and influent load in pounds for the past year.

FLOW AND PHOSPHORUS LOAD

The table below is the compilation of daily flow data and results of influent analysis for total phosphorus conducted at HOVMSD. The influent loads are calculated using the monthly average flow and influent concentrations.

Month	Influent	Influent	Influent
	WWTP	Avg. TP	Avg. TP
	Avg. Flow	Conc.	Load
(2018-2019)	(MGD)	(mg/L)	(lbs/day)
November	5.6	4.5	210.2
December	5.5	4.7	215.6
January	5.8	4.6	222.5
February	4.7	5.2	203.8
March	7.3	4.1	249.6
April	8.0	3.3	220.2
May	8.2	3.2	218.8
June	6.5	4.0	216.8
July	5.6	4.4	205.5
August	5.2	4.9	212.5
September	7.7	3.8	244.0
October	7.6	3.5	221.8
Average	6.5	4.2	220.1

While flow and influent concentration do vary from month to month, the calculated mass load of phosphorus entering the plant is fairly consistent. A simple calculation based on the average annual load of 220.1 lbs per day shows that the District would have to average 95.2% removal to meet its 10.5 lbs per day TMDL allocation for its 6-month average.

SOURCE REDUCTION MEASURES

As a treatment facility with greater than 5 MGD capacity, HOVMSD has an industrial pretreatment program covering categorical dischargers and significant industrial contributors. As part of its review, HOVMSD proactively monitors influent phosphorus and can quantify total phosphorus concentrations and phosphorus load in comparison to the load from permitted SIU's. (Significant Industrial User).

PERMITTED PRETREATMENT SITES

PHOSPHORUS DATA

	2018-2019			2018-2019	
	PHOS mg/L	Gallons Per Day		Avg Pounds Day	Plant Design % Criteria
		Avg Flow	MGD		
VANZEELAND MFG	1.3	50	0.00005	0.001	0.000
U.S.VENTURE	0.71	380	0.0004	0.002	0.001
ALBANY INT	0.63	833	0.0008	0.004	0.001
LOCKS MILL LANDFILL #00030	0.95	9,300	0.009	0.07	0.018
LOCKS MILL LANDFILL #03036	0.95	3,500	0.0035	0.03	0.007
Agropur (Varies from 1.5 to 25.0)	0.61	100,000	0.100	0.51	0.125
BEL Brands	69	21,000	0.021	12.08	2.969
LAMERS' DAIRY	4.5	9,000	0.009	0.34	0.083
NESTLES FOODS	4.5	67,000	0.067	2.51	0.618
OUTAGAMIE COUNTY LANDFILL	10.5	43,000	0.043	3.77	0.925
SAFETY KLEEN(Varies from 0.5 to 50)	26	3,980	0.004	0.87	0.213
THILMANY RED HILLS LANDFILL	2.5	55,000	0.055	1.15	0.282
BERNATELLO'S	10.6	2,700	0.0027	0.24	0.059
CE LANDFILL	0.67	3,416	0.0034	0.02	0.005
Total:				21.58	5.305

In review of recent data, only three sites discharge phosphorus at a concentration that is greater than encountered in the HOVMSD influent. Collectively, the permitted industries mass discharge amounts to just over 5% of the rated capacity of the treatment facility. This data suggests that permitted industries are not major source of phosphorus in the daily load received at the treatment facility.

OPERATIONAL IMPROVEMENTS AND MINOR FACILITY MODIFICATIONS

The current treatment process train utilizes nearly all of the available tankage and infrastructure on the constricted HOVMSD site. Multi point chemical addition could be a strategy to improve removal efficiencies and has been used elsewhere, but absent feed lines and metering pumps and suitable location this minor facility modification is not viable. The HOVMSD site is space constricted and any opportunities to repurpose tankage or pilot operational/process changes that may improve phosphorus removal or solids/liquids separation are not available.

HOVMSD does have one option and has been provided information from its current chemical supplier, Chemtrade, about their Hyperion 1997 product. Chemtrade performed bench testing and at its conclusion recommended HOVMSD perform a full-scale demo of Hyperion 1997 in the Actiflo process. The primary advantage is the effectiveness of the product with the ability to feed less product than the ferric sulfate that has been in long term use at HOVMSD. This is an option that could be piloted and monitored and would be viable for study in 2020.

The District will plan for, and demo this product and closely monitor its effectiveness in the Actiflo effluent and ultimately the HOVMSD effluent discharge. If proven more effective in the HOVMSD process, a chemical change may be a strategy that could be implemented permanently to meet the HOVMSD TMDL phosphorus allocation.

Chemtrade did jar testing on HOVMSD effluent in February 2017 and provided the results on anticipated chemical feed rates and the effluent phosphorus results. The Chemtrade report is included in this report in attachments/data section of the report.

EVALUATION OF EFFLUENT DATA

HOVMSD has compiled its effluent discharge data along with its effluent flow data to calculate its mass discharge for use in this evaluation for TMDL compliance. The District has a long-standing effluent reuse agreement with Fox Energy Center which further treats HOVMSD effluent and uses the majority for both non-contact cooling purposes and smaller amount that is further purified for steam/condensate in its electrical generation power plant. This effluent reuse agreement is unique among POTW's resulting in a portion of what enters the plant as influent to be diverted after treatment and not be discharged under the HOVMSD WPDES permit. Fox Energy is under no obligation to continuously pump effluent and at times shuts down its effluent pumping for planned/unplanned maintenance shut downs each year. From a compliance and planning standpoint, HOVMSD must evaluate its effluent TMDL obligations based on both its actual phosphorus mass discharge and under a worst-case scenario where effluent is not diverted and all inbound sewage is treated and discharged under its NPDES permit. This evaluation is consistent with the approach taken in evaluating TMDL compliance with suspended solids and the resultant TSS trade that HOVMSD executed in 2018.

Two data tables have been prepared that summarize daily effluent results in comparison to TMDL mass allocations. The HOVMSD permit contains two mass limits that are based on the average phosphorus mass discharged in a given month and another based on a 6-month average.

The HOVMSD monthly mass allocation limit is 31.5 lbs./day and is in place each of the 12 months of the year. The mass limit does not vary by month or season or is it indexed based on the receiving water temperature like some other common effluent parameters.

The other phosphorus TMDL mass limit is a 6-month average of the phosphorus mass discharged specific to the months of November thru April and May thru October. The HOVMSD mass allocation for the 6-month phosphorus limit is an average of 10.5 lbs./day.

TMDL COMPLIANCE

Total Phosphorus Pounds

Summary Table for (Influent Flow)

<u>Date</u>	<u>Monthly Avg #'s</u>	<u>Limit Exceeded</u>	<u>Date</u>	<u>6 Month Avg #'s</u>	<u>Limit Exceeded</u>
18-Nov	9.26	no	18-Nov	9.26	no
18-Dec	10.38	no	18-Dec	9.83	no
18-Jan	12.15	no	18-Jan	10.61	Yes
18-Feb	9.06	no	18-Feb	10.25	no
18-Mar	22.87	no	18-Mar	12.69	yes
18-Apr	25.91	no	18-Apr	11.09	yes
		no			
19-May	11.66	no	19-May	11.66	yes
19-Jun	11.59	no	19-Jun	11.62	yes
19-Jul	12.78	no	19-Jul	12.01	yes
19-Aug	12.48	no	19-Aug	12.13	yes
19-Sep	23.95	no	19-Sep	14.45	yes
19-Oct	20.86	no	19-Oct	15.53	yes

Limits

Monthly Avg TP	31.5 lbs/day	6-month Avg TP	10.5 lbs/day
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HOVMSD data over the past year shows the treatment facility produced effluent that is compliant with the monthly 31.5 lbs./day TMDL allocation. The treatment facility was most efficient in February when the monthly average was just 28.8% of its allocation with the month of April being far closer to the allocation limit using 82.3% of the HOVMSD allocation. After review of the past years monthly effluent load mass, with the assumption that all influent is discharged, it appears that the 31.5 lbs./day monthly limit is consistently achievable.

Review of effluent mass data in terms of the 6 month 10.5 lbs./day mass limit is a different story. The table shows limited ability to achieve consistent compliance when looking on a monthly basis with neither the November – April, nor the May- October periods showing compliance. HOVMSD effluent consistently exceeds its TMDL allocation of 10.5 lbs./day and even with a 6-month averaging period, the data suggests

that if no effluent is reused and sent to Fox Energy, the 6 Month TMDL mass limit cannot be met at this time.

TMDL COMPLIANCE

Total Phosphorus Pounds

Summary Table for (Final Effluent)

<u>Date</u>	<u>Monthly Avg #'s</u>	Limit Exceeded	
18-Nov	7.87	no	
18-Dec	6.62	no	
18-Jan	7.25	no	
18-Feb	6.16	no	
18-Mar	16.51	no	
18-Apr	16.72	no	
		no	
19-May	9.26	no	
19-Jun	6.53	no	
19-Jul	5.44	no	
19-Aug	4.71	no	
19-Sep	14.69	no	
19-Oct	15.12	no	

<u>Date</u>	<u>6 Month Avg #'s</u>	Limit Exceeded	
18-Nov	7.87	no	
18-Dec	7.23	no	
18-Jan	7.24	no	
18-Feb	6.76	no	
18-Mar	8.65	no	
18-Apr	9.99	no	
		no	
19-May	9.26	no	
19-Jun	8.68	no	
19-Jul	7.27	no	
19-Aug	6.13	no	
19-Sep	7.9	no	
19-Oct	9.28	no	

Limits

Monthly Avg TP	31.5 lbs/day
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6 month Avg TP	10.5 lbs/day
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The table summarizes the effluent data on a monthly basis with reported effluent flows discharged under the HOVMSD permit. The phosphorus mass discharged for both the TMDL monthly limit and the 6-month average are met for the most recent year that was reviewed. The maximum mass discharge on a monthly basis was in April and was 53% of the mass limit. The review of only one year's data is not nearly enough to make any predictions with absolute certainty but initially the monthly mass limit for effluent discharged does not appear to threaten HOVMSD NPDES permit compliance.

The 6-month mass limit was just barely met for the two compliance periods summarized in the data. Both of the compliance periods 6-month averages are over 9 pounds per

day leaving very little room for absorbing any process upsets and/or prolonged high flow periods that the District may encounter. For the time period studied, it would appear that the plant and processes currently used are adequate in meeting the phosphorus TMDL. Looking forward, the District is seeing increases in sewage flows and organic loadings from its member communities and consistent new connections being made to its overall sewer service area. The District's TMDL limitations are mass based and if the increased flow and loadings continue, meeting the TMDL obligations will only become more troublesome in the future.

In conclusion, the District will use 2020 to further plan and evaluate all the options available to it for meeting the phosphorus TMDL requirements. We will continue to strive for improvements in existing processes and study a change in chemical product that is fed as part of the Actiflo process. The compliance schedule in place will allow time for projecting future conditions and for the District to make informed decisions related to compliance and the infrastructure necessary to remain in compliance with present and future permit requirements.

PHOSPHORUS DATA

November 2018 – October 2019 HOVMSD Data

TMDL Compliance worksheets – Based on Influent data

TOTAL PHOSPHORUS LIMITS

MONTH: November

YEAR:2018

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	5.07	0.21	8.88
2	5.13	0.23	9.85
3	4.95	0.19	7.84
4	6.66	0.22	12.21
5	7.12	0.16	9.50
6	8.26	0.3	20.66
7	7.23	0.15	9.04
8	6.84	0.14	7.99
9	6.62	0.14	7.72
10	6.05	0.14	7.06
11	6.24	0.13	6.77
12	5.89	0.18	8.85
13	5.77	0.15	7.22
14	5.38	0.26	11.66
15	5.52	0.14	6.45
16	5.25	0.16	7.01
17	4.97	0.12	4.97
18	5.29	0.19	8.38
19	5.09	0.19	8.07
20	4.90	0.18	7.36
21	5.25	0.19	8.32
22	4.71	0.23	9.03
23	4.83	0.22	8.86
24	5.50	0.19	8.72
25	5.34	0.21	9.35
26	4.90	0.19	7.76
27	4.67	0.3	11.69
28	4.83	0.27	10.87
29	4.75	0.43	17.02
30	4.67	0.22	8.56

6 Month Avg
(Nov-April)
9.26

Monthly Avg
#'s
9.26

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		168		278
AVERAGE:		5.59	0.201	9.26
MAXIMUM:		8.26		277.66
MINIMUM:		4.67		4.97

TOTAL PHOSPHORUS LIMITS

MONTH: December

YEAR: 2018

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	5.11	0.24	10.22
2	7.43	0.18	11.16
3	7.10	0.18	10.65
4	6.55	0.2	10.92
5	6.14	0.17	8.70
6	6.00	0.2	10.00
7	5.49	0.21	9.61
8	5.46	0.25	11.39
9	5.59	0.21	9.79
10	5.25	0.22	9.63
11	4.90	0.24	9.81
12	4.80	0.29	11.61
13	5.05	0.3	12.64
14	4.90	0.28	11.44
15	5.00	0.22	9.17
16	5.09	0.25	10.62
17	4.83	0.24	9.67
18	4.86	0.25	10.12
19	4.93	0.26	10.69
20	5.12	0.26	11.10
21	5.15	0.2	8.58
22	5.26	0.22	9.65
23	5.04	0.25	10.51
24	4.90	0.25	10.22
25	4.43	0.24	8.87
26	4.79	0.39	15.59
27	6.28	0.22	11.52
28	6.76	0.2	11.28
29	6.30	0.16	8.41
30	6.11	0.16	8.16
31	5.76	0.21	10.09

6 Month Avg
(Nov-April)
9.83

Monthly Avg
#'s
10.38

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		170		322
AVERAGE:		5.50	0.230645	10.38
MAXIMUM:		7.43		321.82
MINIMUM:		4.43		8.16

TOTAL PHOSPHORUS LIMITS

MONTH: January

YEAR:2019

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	5.64	1.78	83.73
2	5.40	0.23	10.36
3	5.34	0.29	12.92
4	5.41	0.18	8.12
5	5.60	0.21	9.81
6	5.76	0.21	10.08
7	14.43	0.3	36.09
8	10.86	0.18	16.30
9	8.56	0.14	9.99
10	7.58	0.14	8.85
11	6.93	0.15	8.67
12	6.47	0.15	8.09
13	6.38	0.19	10.10
14	6.03	0.12	6.03
15	5.55	0.17	7.86
16	5.41	0.18	8.13
17	5.33	0.23	10.22
18	5.01	0.29	12.11
19	4.93	0.21	8.63
20	5.02	0.2	8.37
21	4.90	0.19	7.76
22	4.81	0.23	9.22
23	4.56	0.24	9.13
24	4.59	0.16	6.12
25	4.30	0.23	8.25
26	4.45	0.15	5.57
27	4.51	0.18	6.76
28	4.38	0.26	9.50
29	4.20	0.11	3.86
30	4.34	0.23	8.32
31	4.39	0.21	7.69

6 Month Avg
(Nov-April)
10.61

Monthly Avg
#'s
12.15

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		181		377
AVERAGE:		5.84	0.249677	12.15
MAXIMUM:		14.43		376.65
MINIMUM:		4.20		3.86

TOTAL PHOSPHORUS LIMITS

MONTH: FEBRUARY

YEAR:2019

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	4.24	0.27	9.55
2	4.36	0.26	9.46
3	6.42	0.25	13.39
4	7.70	0.27	17.35
5	5.74	0.26	12.45
6	5.14	0.17	7.28
7	4.89	0.25	10.20
8	4.42	0.24	8.85
9	4.40	0.39	14.32
10	4.58	0.25	9.54
11	4.33	0.24	8.67
12	4.41	0.2	7.36
13	4.16	0.19	6.60
14	4.53	0.17	6.42
15	4.28	0.23	8.20
16	3.98	0.18	5.97
17	4.16	0.15	5.20
18	4.05	0.22	7.44
19	4.11	0.15	5.14
20	3.95	0.28	9.21
21	3.92	0.26	8.49
22	3.96	0.26	8.58
23	5.58	0.25	11.63
24	6.49	0.22	11.90
25	5.10	0.18	7.66
26	4.76	0.24	9.53
27	4.52	0.21	7.91
28	4.29	0.15	5.37

6 Month Avg
(Nov-April)
10.25

Monthly Avg
#'s
9.06

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		132		254
AVERAGE:		4.73	0.228214	9.06
MAXIMUM:		7.70		253.67
MINIMUM:		3.92		5.14

TOTAL PHOSPHORUS LIMITS

MONTH: MARCH

YEAR:2019

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	4.27	0.16	5.70
2	4.29	0.19	6.80
3	4.40		
4	4.12	0.17	5.84
5	4.04	0.13	4.38
6	3.97	0.16	5.29
7	3.96	0.2	6.61
8	4.23	0.26	9.17
9	4.15	0.24	8.30
10	4.52	0.21	7.91
11	4.42	0.18	6.63
12	6.59	0.17	9.34
13	13.90	0.29	33.62
14	23.97	0.54	107.95
15	11.76	2.6	254.90
16	8.83	0.24	17.66
17	8.58	0.19	13.60
18	8.26	0.19	13.09
19	8.77	0.19	13.90
20	8.62	0.19	13.65
21	8.95	0.3	22.39
22	8.52	0.22	15.63
23	8.14	0.09	6.11
24	8.14	0.33	22.41
25	7.33	0.2	12.22
26	6.95	0.12	6.96
27	7.03	0.17	9.96
28	7.00	0.17	9.92
29	6.83	0.29	16.51
30	6.25	0.17	8.86
31	6.17	0.21	10.80

6 Month Avg
(Nov-April)
12.69

Monthly Avg
#'s
22.87

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		227		686
AVERAGE:		7.32	0.292333	22.87
MAXIMUM:		23.97		
MINIMUM:		3.96		4.38

TOTAL PHOSPHORUS LIMITS

MONTH: APRIL

YEAR:2019

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	5.98	0.14	6.98
2	5.87	0.13	6.37
3	5.89	0.22	10.81
4	5.85	0.22	10.74
5	5.84	2.81	136.86
6	5.64	0.26	12.24
7	6.49	0.32	17.32
8	6.83	0.29	16.53
9	6.55	0.24	13.11
10	6.17	0.25	12.85
11	7.02	0.25	14.63
12	10.26	0.39	33.37
13	9.52	2.33	184.96
14	8.77	0.21	15.36
15	7.78	0.19	12.32
16	8.10	0.17	11.48
17	10.13	0.24	20.27
18	10.40	0.19	16.48
19	8.95	0.25	18.66
20	8.05	0.25	16.78
21	7.52	0.14	8.78
22	12.19	0.915	93.05
23	12.97	0.3	32.44
24	9.59	0.13	10.40
25	9.11	0.1	7.60
26	8.29	0.11	7.61
27	7.63	0.11	7.00
28	7.22	0.13	7.82
29	7.41	0.11	6.80
30	7.13	0.13	7.73

6 Month Avg
(Nov-April)
11.09

Monthly Avg
#'s
25.91

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		239			777
AVERAGE:		7.97		0.384167	25.91
MAXIMUM:		12.97			
MINIMUM:		5.64			6.37

TOTAL PHOSPHORUS LIMITS

MONTH: MAY

YEAR: 2019

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	9.43	0.21	16.51
2	8.41	0.14	9.82
3	7.67	0.08	5.11
4	7.02	0.12	7.02
5	7.19	0.19	11.40
6	6.60	0.13	7.16
7	6.17	0.09	4.63
8	8.40	0.18	12.61
9	9.61	0.21	16.82
10	8.18	0.15	10.23
11	7.60	0.11	6.97
12	7.24	0.10	6.04
13	6.81	0.11	6.24
14	6.44	0.13	6.98
15	6.38	0.11	5.86
16	6.48	0.13	7.02
17	6.10	0.16	8.14
18	6.04	0.17	8.56
19	8.85	0.17	12.54
20	7.93	0.14	9.26
21	7.53	0.15	9.41
22	7.91	0.18	11.88
23	7.12	0.16	9.50
24	6.93	0.13	7.51
25	8.32	0.13	9.02
26	7.07	0.12	7.07
27	17.22	0.42	60.88
28	15.88	0.25	33.10
29	10.88	0.15	13.60
30	9.19	0.15	11.50
31	8.26	0.13	8.96

6 Month Avg
(May-Oct)
11.66

Monthly Avg
#'s
11.66

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:	255		361.36
AVERAGE:	8.22	0.154968	11.66
MAXIMUM:	17.22		
MINIMUM:	6.04		

TOTAL PHOSPHORUS LIMITS

MONTH: JUNE

YEAR: 2019

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	7.98	0.13	8.65
2	7.96	0.14	9.30
3	6.81	0.21	11.93
4	6.90	0.26	14.96
5	6.78	0.2	11.30
6	6.28	0.19	9.95
7	6.19	0.23	11.88
8	5.74	0.2	9.57
9	5.83	0.22	10.70
10	5.76	0.18	8.65
11	5.78	0.23	11.08
12	6.44	0.3	16.12
13	6.39	0.24	12.78
14	7.13	0.22	13.09
15	6.32	0.21	11.07
16	6.36	0.17	9.02
17	6.10	0.17	8.65
18	6.26	0.22	11.48
19	5.60	0.19	8.88
20	6.33	0.23	12.14
21	5.42	0.2	9.05
22	5.11	0.24	10.23
23	5.53	0.25	11.53
24	7.09	0.22	13.01
25	6.45	0.19	10.22
26	6.00	0.24	12.01
27	7.04	0.25	14.68
28	8.79	0.26	19.06
29	7.03	0.21	12.32
30	8.25	0.21	14.44

6 Month Avg
(May-Oct)
11.62

Monthly Avg
#s
11.59

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		196		348
AVERAGE:		6.52	0.21	11.59
MAXIMUM:		8.79		
MINIMUM:		5.11		8.65

TOTAL PHOSPHORUS LIMITS

MONTH: July

YEAR: 2019

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	7.47	0.2	12.46
2	10.13	0.19	16.05
3	7.86	0.17	11.14
4	6.54	0.19	10.37
5	6.38	0.22	11.71
6	5.72	0.24	11.46
7	6.00	0.3	15.02
8	5.72	0.27	12.88
9	5.46	0.25	11.39
10	5.50	0.25	11.47
11	5.20	0.25	10.84
12	5.15	0.28	12.03
13	4.66	0.28	10.88
14	4.92	0.29	11.90
15	4.97	0.33	13.68
16	4.67	0.33	12.85
17	4.56	0.34	12.93
18	4.82	0.36	14.46
19	6.11	0.29	14.78
20	6.80	0.3	17.01
21	6.07	0.27	13.68
22	5.37	0.28	12.55
23	5.16	0.3	12.92
24	4.97	0.34	14.09
25	4.96	0.25	10.34
26	4.57	0.26	9.92
27	4.35	0.31	11.25
28	4.81	0.52	20.86
29	4.83	0.25	10.06
30	4.61	0.35	13.46
31	4.56	0.31	11.79

6 Month Avg
(May-Oct)
12.01

Monthly Avg
#'s
12.78

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		173		396
AVERAGE:		5.58	0.282903	12.78
MAXIMUM:		10.13		396.21
MINIMUM:		4.35		9.92

TOTAL PHOSPHORUS LIMITS

MONTH: August

YEAR:2019

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	4.53	0.29	10.96
2	4.26	0.35	12.42
3	4.56	0.36	13.68
4	4.85	0.3	12.13
5	7.73	0.33	21.27
6	6.66	0.22	12.22
7	8.74	0.22	16.03
8	7.81	0.33	21.49
9	6.56	0.2	10.93
10	5.56	0.22	10.21
11	5.57	0.28	13.01
12	5.31	0.41	18.14
13	5.04	0.23	9.66
14	4.85	0.29	11.72
15	4.69	0.25	9.78
16	4.94	0.23	9.48
17	4.72	0.33	12.98
18	4.83	0.28	11.27
19	4.64	0.26	10.06
20	4.74	0.34	13.44
21	4.33	0.3	10.83
22	4.31	0.31	11.15
23	4.12	0.3	10.31
24	3.96	0.33	10.90
25	4.22	0.31	10.91
26	5.60	0.29	13.54
27	5.48	0.22	10.06
28	4.84	0.31	12.52
29	4.80	0.24	9.61
30	4.50	0.37	13.89
31	4.21	0.35	12.28

6 Month Avg
(May-Oct)
12.13

Monthly Avg
#'s
12.48

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		161		387
AVERAGE:		5.19	0.291935	12.48
MAXIMUM:		8.74		386.88
MINIMUM:		3.96		9.48

TOTAL PHOSPHORUS LIMITS

MONTH: September

YEAR: 2019

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	4.04	0.41	13.80
2	4.79	0.42	16.79
3	5.49	0.38	17.38
4	4.80	0.39	15.61
5	4.72	0.48	18.90
6	4.45	0.36	13.37
7	4.31	0.34	12.22
8	4.51	0.31	11.67
9	5.89	0.29	14.25
10	11.12	0.3	27.82
11	21.16	0.27	47.64
12	15.05	0.31	38.92
13	13.36	0.24	26.75
14	9.10	0.24	18.22
15	7.87	0.3	19.70
16	6.89	0.32	18.39
17	6.64	0.37	20.47
18	5.98	0.32	15.96
19	7.84	0.31	20.27
20	7.13	1.82	108.27
21	6.57	0.34	18.63
22	10.05	0.32	26.81
23	9.05	0.31	23.41
24	8.02	0.35	23.40
25	7.36	0.36	22.09
26	6.73	0.58	32.57
27	7.51	0.25	15.65
28	6.62	0.32	17.66
29	7.34	0.35	21.42
30	6.65	0.37	20.52

6 Month Avg
(May-Oct)
14.45

Monthly Avg
#'s
23.95

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		231		719
AVERAGE:		7.70	0.391	23.95
MAXIMUM:		21.16		718.55
MINIMUM:		4.04		11.67

TOTAL PHOSPHORUS LIMITS

MONTH: October

YEAR:2019

DATE	INF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	13.76	0.3	34.43
2	15.77	0.29	38.13
3	12.00	0.28	28.02
4	9.48	0.29	22.92
5	8.90	0.29	21.53
6	8.64	0.32	23.07
7	7.61	0.31	19.68
8	6.90	0.33	18.99
9	6.26	0.33	17.22
10	6.45	0.2	10.76
11	8.85	0.34	25.08
12	7.43	0.32	19.82
13	7.09	0.3	17.73
14	6.78	0.3	16.96
15	6.79	0.41	23.22
16	6.60	0.38	20.92
17	6.28	0.15	7.86
18	5.93	0.38	18.79
19	5.83	0.53	25.75
20	5.88	0.46	22.56
21	6.58	0.41	22.50
22	7.75	0.4	25.84
23	6.66	0.35	19.45
24	6.36	0.43	22.81
25	5.95	0.41	20.35
26	5.98	0.35	17.47
27	6.63	0.26	14.38
28	6.06	0.32	16.18
29	6.56	0.34	18.61
30	6.20	0.29	14.99
31	6.50	0.38	20.61

6 Month Avg
(May-Oct)
15.53

Monthly Avg
#'s
20.86

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		234		647
AVERAGE:		7.56	0.337097	20.86
MAXIMUM:		15.77		646.59
MINIMUM:		5.83		7.86

PHOSPHORUS DATA

November 2018 – October 2019 HOVMSD Data

TMDL Compliance worksheets – Based on Effluent data

TOTAL PHOSPHORUS LIMITS

MONTH: November

YEAR:2018

DATE	EFFL FLOW (MGD)	FINAL TP mg/L	TP #'s
1	5.07	0.21	8.88
2	5.13	0.23	9.85
3	4.95	0.19	7.84
4	6.66	0.22	12.21
5	7.12	0.16	9.50
6	8.26	0.3	20.66
7	7.23	0.15	9.04
8	6.84	0.14	7.99
9	6.62	0.14	7.72
10	6.05	0.14	7.06
11	6.24	0.13	6.77
12	5.89	0.18	8.85
13	5.62	0.15	7.02
14	4.55	0.26	9.87
15	4.44	0.14	5.18
16	5.25	0.16	7.01
17	4.97	0.12	4.97
18	5.29	0.19	8.38
19	4.28	0.19	6.79
20	3.28	0.18	4.93
21	3.69	0.19	5.84
22	3.99	0.23	7.66
23	4.11	0.22	7.54
24	4.95	0.19	7.84
25	5.34	0.21	9.35
26	3.58	0.19	5.68
27	2.36	0.3	5.91
28	2.08	0.27	4.69
29	1.92	0.43	6.87
30	2.30	0.22	4.21

6 Month Avg
(Nov-April)
7.87

Monthly Avg
#'s
7.87

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		148		236
AVERAGE:		4.93	0.201	7.87
MAXIMUM:		8.26		
MINIMUM:		1.92		4.21

TOTAL PHOSPHORUS LIMITS

MONTH: December

YEAR:2018

DATE	EFFL FLOW (MGD)	FINAL TP mg/L	TP #'s
1	4.15	0.24	8.30
2	6.72	0.18	10.09
3	6.38	0.18	9.58
4	5.19	0.2	8.66
5	3.30	0.17	4.68
6	3.26	0.2	5.44
7	2.93	0.21	5.13
8	2.96	0.25	6.18
9	4.18	0.21	7.33
10	2.36	0.22	4.33
11	2.10	0.24	4.21
12	2.10	0.29	5.07
13	2.84	0.3	7.10
14	3.49	0.28	8.15
15	3.88	0.22	7.11
16	3.38	0.25	7.04
17	2.27	0.24	4.55
18	2.24	0.25	4.67
19	2.24	0.26	4.86
20	3.01	0.26	6.53
21	2.57	0.2	4.29
22	3.47	0.22	6.36
23	3.33	0.25	6.95
24	3.83	0.25	7.98
25	3.71	0.24	7.42
26	3.30	0.39	10.72
27	4.08	0.22	7.48
28	4.48	0.2	7.46
29	4.23	0.16	5.64
30	4.04	0.16	5.39
31	3.69	0.21	6.46

6 Month Avg
(Nov-April)
7.23

Monthly Avg
#'s
6.62

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		110		205
AVERAGE:		3.54	0.230645	6.62
MAXIMUM:		6.72		
MINIMUM:		2.10		4.21

TOTAL PHOSPHORUS LIMITS

MONTH: January

YEAR: 2019

DATE	EFFL FLOW (MGD)	FINAL TP mg/L	TP #'s
1	3.26	1.78	48.43
2	2.94	0.23	5.64
3	2.55	0.29	6.17
4	2.85	0.18	4.28
5	3.46	0.21	6.05
6	3.83	0.21	6.71
7	12.42	0.3	31.06
8	8.73	0.18	13.10
9	6.97	0.14	8.13
10	5.02	0.14	5.86
11	4.12	0.15	5.15
12	3.62	0.15	4.53
13	3.53	0.19	5.59
14	3.18	0.12	3.18
15	2.67	0.17	3.79
16	2.52	0.18	3.78
17	2.72	0.23	5.22
18	2.96	0.29	7.15
19	2.94	0.21	5.15
20	2.47	0.2	4.12
21	3.32	0.19	5.25
22	3.74	0.23	7.18
23	2.12	0.24	4.25
24	1.88	0.16	2.50
25	1.59	0.23	3.05
26	1.77	0.15	2.21
27	1.83	0.18	2.74
28	2.68	0.26	5.80
29	1.53	0.11	1.40
30	1.61	0.23	3.08
31	2.40	0.21	4.19

6 Month Avg
(Nov-April)
7.24

Monthly Avg
#'s
7.25

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		107		225
AVERAGE:		3.46	0.249677	7.25
MAXIMUM:		12.42		
MINIMUM:		1.53		1.40

TOTAL PHOSPHORUS LIMITS

MONTH: FEBRUARY

YEAR: 2019

DATE	EFFL FLOW (MGD)	FINAL TP mg/L	TP #'s
1	3.26	0.27	7.35
2	3.37	0.26	7.31
3	5.73	0.25	11.95
4	7.02	0.27	15.80
5	5.41	0.26	11.73
6	5.14	0.17	7.28
7	4.26	0.25	8.87
8	2.12	0.24	4.25
9	1.40	0.39	4.54
10	2.25	0.25	4.70
11	2.05	0.24	4.10
12	2.13	0.2	3.56
13	1.37	0.19	2.17
14	1.50	0.17	2.13
15	1.26	0.23	2.42
16	1.02	0.18	1.53
17	1.39	0.15	1.73
18	2.01	0.22	3.68
19	2.01	0.15	2.51
20	1.22	0.28	2.84
21	1.08	0.26	2.35
22	1.06	0.26	2.29
23	2.75	0.25	5.74
24	4.12	0.22	7.56
25	3.01	0.18	4.52
26	2.57	0.24	5.13
27	2.01	0.21	3.52
28	2.44	0.15	3.05

6 Month Avg
(Nov-April)
6.76

Monthly Avg
#'s
5.16

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		75		145
AVERAGE:		2.68	0.228214	5.16
MAXIMUM:		7.02		
MINIMUM:		1.02		1.53

TOTAL PHOSPHORUS LIMITS

MONTH: MARCH

YEAR:2019

DATE	EFF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	2.47	0.16	3.29
2	2.19	0.19	3.47
3	2.71		
4	2.72	0.17	3.85
5	2.62	0.13	2.84
6	1.85	0.16	2.46
7	1.82	0.2	3.04
8	1.64	0.26	3.56
9	1.64	0.24	3.28
10	1.61	0.21	2.81
11	1.44	0.18	2.17
12	3.85	0.17	5.46
13	11.65	0.29	28.18
14	21.97	0.54	98.95
15	8.93	2.6	193.55
16	6.19	0.24	12.40
17	5.99	0.19	9.49
18	5.67	0.19	8.98
19	6.17	0.19	9.78
20	5.96	0.19	9.44
21	6.09	0.3	15.23
22	5.68	0.22	10.43
23	5.29	0.09	3.97
24	5.29	0.33	14.57
25	4.48	0.2	7.46
26	4.10	0.12	4.10
27	4.13	0.17	5.85
28	4.15	0.17	5.88
29	4.07	0.29	9.85
30	3.50	0.17	4.96
31	3.41	0.21	5.97

6 Month Avg
(Nov-April)
8.65

Monthly Avg
#'s
16.51

<u>Limits</u>		
6 Month Avg TP		10.5 lbs/day
Monthly Avg TP		31.5 lbs/day

TOTAL:		149		495.29
AVERAGE:		4.82	0.292333	16.51
MAXIMUM:		21.97		
MINIMUM:		1.44		2.17

TOTAL PHOSPHORUS LIMITS

MONTH: APRIL

YEAR:2019

DATE	EFF FLOW (MGD)	FINAL TP mg/L	TP #'s
1	3.04	0.14	3.55
2	2.94	0.13	3.18
3	2.90	0.22	5.33
4	2.87	0.22	5.26
5	3.26	2.81	76.40
6	3.07	0.26	6.66
7	3.92	0.32	10.45
8	4.26	0.29	10.29
9	3.57	0.24	7.14
10	2.83	0.25	5.90
11	3.92	0.25	8.18
12	7.36	0.39	23.94
13	6.63	2.33	128.84
14	5.90	0.21	10.33
15	4.92	0.19	7.79
16	5.19	0.17	7.36
17	7.08	0.24	14.16
18	7.26	0.19	11.50
19	5.81	0.25	12.11
20	5.13	0.25	10.69
21	4.49	0.14	5.24
22	9.02	0.915	68.86
23	9.68	0.3	24.23
24	6.32	0.13	6.86
25	7.24	0.1	6.04
26	5.14	0.11	4.71
27	4.48	0.11	4.11
28	4.06	0.13	4.40
29	4.24	0.11	3.89
30	3.98	0.13	4.31

6 Month Avg
(Nov-April)
9.99

Monthly Avg
#'s
16.72

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		150		501.71
AVERAGE:		5.02	0.384167	16.72
MAXIMUM:		9.68		
MINIMUM:		2.83		3.18

TOTAL PHOSPHORUS LIMITS

MONTH: MAY

YEAR:2019

DATE	EFFL FLOW (MGD)	FINAL TP mg/L	TP #'s
1	6.52	0.21	11.42
2	5.94	0.14	6.93
3	5.07	0.08	3.38
4	4.27	0.12	4.28
5	4.27	0.19	6.77
6	3.64	0.13	3.95
7	3.19	0.09	2.39
8	5.40	0.18	8.11
9	6.60	0.21	11.55
10	5.16	0.15	6.45
11	4.59	0.11	4.21
12	4.29	0.10	3.57
13	3.87	0.11	3.55
14	3.56	0.13	3.86
15	3.72	0.11	3.42
16	4.48	0.13	4.86
17	4.56	0.16	6.08
18	5.18	0.17	7.34
19	8.44	0.17	11.96
20	7.93	0.14	9.26
21	7.53	0.15	9.41
22	7.91	0.18	11.88
23	7.12	0.16	9.50
24	6.93	0.13	7.51
25	8.32	0.13	9.02
26	7.07	0.12	7.07
27	16.26	0.42	57.49
28	13.85	0.25	28.88
29	7.96	0.15	9.96
30	5.72	0.15	7.16
31	5.43	0.13	5.89

6 Month Avg
(May-Oct)
9.26

6 Month Avg
(Nov-April)

Monthly Avg
#'s
9.26

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		195		287.11
AVERAGE:		6.28	0.154968	9.26
MAXIMUM:		16.26		
MINIMUM:		3.19		

TOTAL PHOSPHORUS LIMITS

MONTH: JUNE

YEAR: 2019

DATE	EFFL FLOW (MGD)	FINAL TP mg/L	TP #'s
1	6.88	0.13	7.46
2	5.59	0.14	6.53
3	3.90	0.21	6.83
4	3.44	0.26	7.45
5	3.27	0.2	5.45
6	2.78	0.19	4.40
7	3.06	0.23	5.87
8	2.74	0.2	4.57
9	2.85	0.22	5.22
10	3.17	0.18	4.76
11	3.06	0.23	5.87
12	3.33	0.3	8.34
13	4.29	0.24	8.59
14	7.13	0.22	13.09
15	5.12	0.21	8.96
16	4.33	0.17	6.14
17	2.72	0.17	3.86
18	3.27	0.22	6.00
19	2.67	0.19	4.22
20	3.39	0.23	6.50
21	1.93	0.2	3.23
22	1.56	0.24	3.12
23	2.20	0.25	4.59
24	4.05	0.22	7.43
25	4.00	0.19	6.33
26	2.92	0.24	5.85
27	3.43	0.25	7.16
28	5.34	0.26	11.59
29	3.92	0.21	6.87
30	5.42	0.21	9.50

6 Month Avg
(May-Oct)
7.92

6 Month Avg
(Nov-April)

Monthly Avg
#'s
6.53

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		112		196
AVERAGE:		3.73	0.21	6.53
MAXIMUM:		7.13		
MINIMUM:		1.56		3.12

TOTAL PHOSPHORUS LIMITS

MONTH: July

YEAR: 2019

DATE	EFFL FLOW (MGD)	FINAL TP mg/L	TP #'s
1	4.16	0.2	6.93
2	7.28	0.19	11.53
3	4.83	0.17	6.85
4	3.06	0.19	4.85
5	3.27	0.22	6.00
6	2.61	0.24	5.22
7	2.89	0.3	7.23
8	2.42	0.27	5.45
9	2.01	0.25	4.19
10	2.04	0.25	4.26
11	1.75	0.25	3.64
12	1.73	0.28	4.05
13	1.25	0.28	2.91
14	1.42	0.29	3.43
15	1.43	0.33	3.92
16	1.12	0.33	3.08
17	0.97	0.34	2.75
18	1.23	0.36	3.68
19	2.58	0.29	6.24
20	4.21	0.3	10.54
21	2.66	0.27	5.99
22	2.47	0.28	5.77
23	2.31	0.3	5.79
24	2.12	0.34	6.01
25	2.11	0.25	4.40
26	1.72	0.26	3.73
27	1.50	0.31	3.89
28	1.97	0.52	8.53
29	2.11	0.25	4.39
30	2.36	0.35	6.90
31	2.52	0.31	6.51

6 Month Avg
(May-Oct)
7.08

6 Month Avg
(Nov-April)

Monthly Avg
#'s
5.44

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		76		169
AVERAGE:		2.46	0.282903	5.44
MAXIMUM:		7.28		
MINIMUM:		0.97		2.75

TOTAL PHOSPHORUS LIMITS

MONTH: August

YEAR: 2019

DATE	EFFL FLOW (MGD)	FINAL TP mg/L	TP #'s	
1	4.34	0.29	10.51	6 Month Avg (May-Oct) 6.48
2	1.81	0.35	5.27	
3	1.43	0.36	4.31	6 Month Avg (Nov-April)
4	1.72	0.3	4.30	
5	4.39	0.33	12.07	
6	3.22	0.22	5.91	Monthly Avg #'s
7	5.19	0.22	9.53	4.71
8	4.24	0.33	11.66	
9	2.96	0.2	4.93	
10	1.96	0.22	3.60	
11	1.98	0.28	4.61	
12	1.71	0.41	5.85	
13	1.77	0.23	3.39	
14	1.60	0.29	3.87	
15	1.57	0.25	3.27	
16	2.00	0.23	3.83	
17	1.87	0.33	5.15	
18	1.38	0.28	3.22	
19	1.07	0.26	2.33	
20	1.34	0.34	3.81	
21	0.86	0.3	2.14	
22	0.53	0.31	1.36	
23	1.89	0.3	4.73	
24	0.63	0.33	1.72	
25	0.95	0.31	2.46	
26	2.22	0.29	5.36	
27	2.10	0.22	3.85	
28	1.41	0.31	3.65	
29	1.39	0.24	2.78	
30	1.22	0.37	3.76	
31	0.92	0.35	2.69	

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		62		146
AVERAGE:		1.99	0.291935	4.71
MAXIMUM:		5.19		
MINIMUM:		0.53		1.36

TOTAL PHOSPHORUS LIMITS

MONTH: September

YEAR: 2019

DATE	EFFL FLOW (MGD)	FINAL TP mg/L	TP #'s
1	0.75	0.41	2.57
2	2.70	0.42	9.45
3	2.35	0.38	7.45
4	1.67	0.39	5.42
5	1.46	0.48	5.84
6	1.04	0.36	3.13
7	0.90	0.34	2.56
8	1.39	0.31	3.58
9	2.83	0.29	6.83
10	8.45	0.3	21.13
11	18.54	0.27	41.76
12	12.25	0.31	31.66
13	10.55	0.24	21.12
14	6.46	0.24	12.93
15	5.31	0.3	13.29
16	4.31	0.32	11.51
17	3.71	0.37	11.46
18	3.01	0.32	8.04
19	4.81	0.31	12.43
20	3.89	1.82	59.00
21	3.18	0.34	9.02
22	6.36	0.32	16.96
23	5.48	0.31	14.17
24	4.48	0.35	13.07
25	3.79	0.36	11.39
26	3.29	0.58	15.91
27	4.90	0.25	10.22
28	6.34	0.32	16.93
29	7.34	0.35	21.42
30	6.65	0.37	20.52

6 Month Avg
(May-Oct)
8.09

6 Month Avg
(Nov-April)

Monthly Avg
#'s
14.69

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		148		441
AVERAGE:		4.94	0.391	14.69
MAXIMUM:		18.54		
MINIMUM:		0.75		2.56

TOTAL PHOSPHORUS LIMITS

MONTH: October

YEAR:2019

DATE	EFFL FLOW (MGD)	FINAL TP mg/L	TP #'s
1	13.76	0.3	34.43
2	15.77	0.29	38.13
3	12.00	0.28	28.02
4	9.48	0.29	22.92
5	8.90	0.29	21.53
6	8.64	0.32	23.07
7	7.61	0.31	19.68
8	6.90	0.33	18.99
9	5.55	0.33	15.27
10	5.73	0.2	9.55
11	7.60	0.34	21.56
12	6.33	0.32	16.89
13	5.10	0.3	12.75
14	4.79	0.3	11.98
15	4.41	0.41	15.08
16	3.49	0.38	11.06
17	2.79	0.15	3.48
18	2.38	0.38	7.54
19	2.30	0.53	10.15
20	2.43	0.46	9.30
21	3.72	0.41	12.73
22	5.01	0.4	16.70
23	3.39	0.35	9.89
24	3.08	0.43	11.04
25	2.68	0.41	9.15
26	2.80	0.35	8.16
27	3.70	0.26	8.02
28	3.35	0.32	8.94
29	3.53	0.34	10.00
30	3.62	0.29	8.76
31	4.35	0.38	13.80

6 Month Avg
(May-Oct)
9.28

6 Month Avg
(Nov-April)

Monthly Avg
#'s
15.12

<u>Limits</u>	
6 Month Avg TP	10.5 lbs/day
Monthly Avg TP	31.5 lbs/day

TOTAL:		175		469
AVERAGE:		5.65	0.337097	15.12
MAXIMUM:		15.77		
MINIMUM:		2.30		3.48

To: Kevin Skogman
Heart of the Valley Metropolitan Sewerage District
CC: Karen Ruehl, Andrew Hoffman, Cory Krobot
From: Joseph Carlston
Subject: Heart of the Valley Jar Test Summary - 02/08/17

SUMMARY:

The Heart of the Valley Metropolitan Sewerage District is currently using ferric sulfate to reduce phosphorus in about 5 MGD of wastewater. The ferric sulfate is used in the Actiflo process prior to the Biostyr. No filtration is currently in use. While formerly used filters are available, they would require extensive rehabilitation prior to being used. Current phosphorus permits require a concentration below 1 mg/L, however future permits will require a phosphorus limit of 0.2 mg/L. Current ferric sulfate doses of 350 GPD result in a residual phosphorus concentration of 0.7-1 mg/L leaving the Actiflo unit. The Biostyr unit reduces the remaining phosphorus down to approximately 0.2 mg/L.

Chemtrade performed a series of jar tests using the raw water entering the Actiflo unit. These jar tests compared the ferric sulfate to Hyper+lon 1997.

RECOMMENDATIONS:

Chemtrade recommends performing a full-scale plant trial with Hyper+lon 1997 to confirm the performance observed in the jar tests.

JAR TEST RESULTS:

The results in Table 1 show the volumes required to achieve 0.5 mg/L total phosphorus leaving the Actiflo. While a product trial will be needed to determine the best phosphorus concentration leaving the Actiflo unit, this target is lower than what is currently being achieved. The results show that the volume required may be up to 50% less than that with ferric sulfate.

Note: The below coagulant doses were normalized to reflect the current dose of treating 5 MGD of wastewater in the Actiflo down to 0.8 mg/L using 350 GPD of ferric sulfate

Table 1: Chemtrade Jar Test Results - 02/08/17 Raw Water to Actiflo – 5 MGD Flowrate		
Coagulant	Coagulant Dosage (Gal/MGD)	Settled Total P (mg/L)
Hyper+lon 1997	70	0.5
Ferric sulfate (60%)	130	0.5

Table 2 below shows the current phosphorus removal performance. The effluent composite sample from 02/07 shows a final effluent total phosphorus concentration of 0.28 mg/L. Of that, 0.16 mg/L is due to particulate phosphorus. The most effective way to reduce total phosphorus below 0.2 mg/L is to reduce the particulate phosphorus either through better settling in the Biostyr, using filtration, or introduce a tertiary settling basin.

Table 2: Effluent Phosphorus Speciation Effluent Composite Sample from 02/07/17					
Sample	Total P (mg/L)	Soluble Total P (mg/L)	Soluble Ortho-P (mg/L)	Particulate P (mg/L) *calculated*	Soluble Non-Reactive P (mg/L) *calculated*
Final Effluent	0.28	0.12	0.08	0.16	0.04

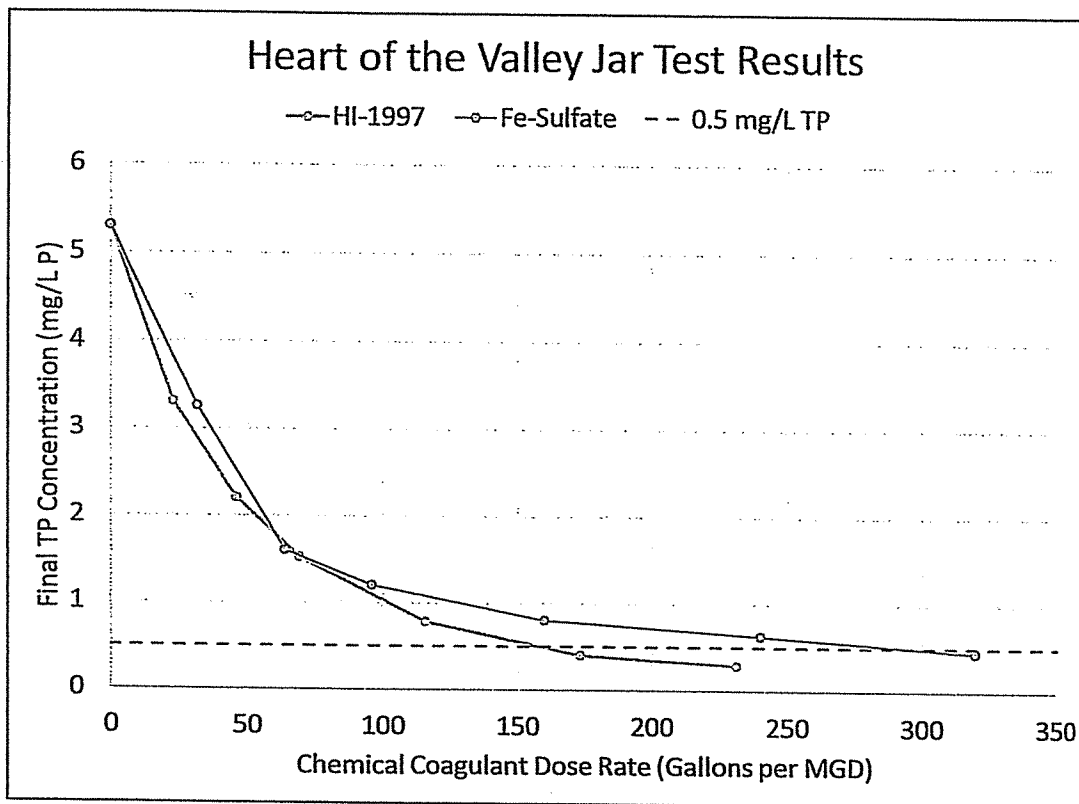


Figure 1 Dose response curve for ferric sulfate (60%)

JAR TEST PROCEDURE:

*The below jar test procedure used 3.5 g/L of sand and 1.5 mg/L of polymer

- Rapid Mix: 1 minutes @ 150 rpm
- Flocculation : 2 minutes @ 50 rpm
- Settling: 3 minutes @ 0 rpm

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