Pennsylvania Department of Environmental Protection

Southwest Regional Office
CLEAN WATER PROGRAM

Application Type	**Renewal**	Application No.	**PA0254584**
Facility Type	**Industrial**	APS ID	**1012768**
Major / Minor	**Minor**	Authorization ID	**1307919**

NPDES PERMIT FACT SHEET INDIVIDUAL INDUSTRIAL WASTE (IW) AND IW STORMWATER

Applicant and Facility Information

Applicant Name	**Befesa Zinc US, Inc.**	Facility Name	**Monaca Landfill**
Applicant Address	3000 GSK Drive Suite 201	Facility Address	300 Frankfort Road
	Moon Township, PA 15108-1383		Monaca, PA 15061-2210
Applicant Contact	Eric Hunsberger	Facility Contact	***same as applicant***
Applicant Phone	(412) 258-0765	Facility Phone	***same as applicant***
Applicant Email	eric.hunsberger@befesa.com	Facility Email	***same as applicant***
Client ID	81829	Site ID	102360
SIC Code	4953 (NAICS 562212)	Municipality	Potter Township
SIC Description	Refuse Systems (Solid Waste Landfill)	County	Beaver
Date Application Received	March 4, 2020	EPA Waived?	Yes
Date Application Accepted	March 6, 2020	If No, Reason	

Purpose of Application: NPDES permit renewal for discharges from a solid waste landfill.

Summary of Review

On March 4, 2020, American Zinc Recycling Corp. (AZR) submitted an application to renew NPDES Permit PA0254584 for discharges from AZR's Monaca Landfill (formerly Horsehead Corporation Landfill). The current permit was issued on August 7, 2015 with an effective date of September 1, 2015 and an expiration date of August 31, 2020. The renewal application was due by March 4, 2020 and was received by DEP on March 4, 2020. The application was timely, so the terms and conditions of the current permit were continued automatically past the expiration date.

The Monaca Landfill was used as a captive landfill for hazardous refractory bricks, fly ash, bottom ash, coal mill reject, and slag from the secondary zinc smelting facilities and power plant that were located on an adjacent site. The smelting facilities and power plant were shut down and demolished in 2014/2015 and that property was sold to Shell Chemical Appalachia LLC while Horsehead retained the landfill property. Horsehead Corporation changed its name to American Zinc Recycling Corp. in 2017 and then was sold to Befesa S.A. in 2021 and renamed Befesa Zinc US, Inc. (Befesa).

PA0254584 authorizes discharges from one outfall, Outfall 006, which discharges leachate and storm water runoff from the landfill. The wastewaters are collected in a sedimentation pond, which discharges to Raccoon Creek, a warm water fishery. The design leachate discharge volume for the landfill is 4,660,000 gallons/year or slightly less than 8.9 gpm. The sedimentation pond has a design volume of 1,720,400 gallons, which provides a design retention time of 6.3 days. The sedimentation pond also is designed to safely pass the peak runoff from a 25-year, 24-hour design storm event (105 cfs). The outlet structures are designed to pass a minimum of 2 cfs per acre of tributary area or 78 cfs.

Discharges from the landfill's sedimentation pond are controlled by three vertically placed valves on the pond's discharge standpipe. Once the water level in the pond reaches a predetermined level, the pond is drained by opening one or more of the standpipe's valves. Since the pond collects storm water and leachate, the frequency of discharge varies with the amount of precipitation. However, the pond is generally emptied once per month over a period of about five days.

Approve	Deny	Signatures	Date
✓		Ryan C. Decker, P.E. / Environmental Engineer	August 23, 2024
X		Michael E. Fifth, P.E. / Environmental Engineer Manager	August 23, 2024

Summary of Review

The long-term average discharge rate is 0.104 MGD with a maximum design discharge rate of 0.216 MGD (150 gpm) that attenuates to zero over the duration of a discharge. Befesa has reported peak flows in excess of 150 gpm.

Compliance History

Befesa and its predecessors have reported violations for total selenium regularly since the previous permit took effect on September 1, 2015 with 52% of average monthly total selenium results reported between September 2015 and February 2024 (46 of 88 results) exceeding the average monthly total selenium limit of 0.07 mg/L. The average of the total selenium results exceeding the limit is 0.088 mg/L with a maximum of 0.115 mg/L. Befesa and its predecessors also have reported TSS violations intermittently with 26% of average monthly TSS results reported between September 2015 and February 2024 (23 of 88 results) exceeding the average monthly TSS limit of 30 mg/L. The average of the results exceeding the limit is 40.7 mg/L with a maximum of 64.3 mg/L.

On September 19, 2015, in compliance with a June 11, 2015 Consent Order and Agreement (2015 COA) by and between Horsehead and DEP, Horsehead submitted a request to modify its Solid Waste Permit (301097) for the landfill to include a revised closure plan. According to Horsehead's analysis, a substantial reduction in leachate generation (about 97%) was expected to result from closure of the landfill. Pursuant to the anticipated reduction in leachate volume, Horsehead also expected selenium concentrations to be reduced such that NPDES permit compliance would be achieved. Horsehead and AZR maintained that position in reports due under the 2015 COA in response to effluent exceedances up through the expiration of the 2015 COA on June 11, 2020. DEP considers it quite possible that, while leachate volumes would decrease as a result of closure, the leachate that remained would be more concentrated and thus less likely to comply with effluent limits without additional remedies (*e.g.*, wastewater treatment).

Notwithstanding Horsehead's request to modify its Solid Waste Permit and continued correspondence with DEP during the intervening years regarding acceptable closure planning, a revised closure plan has not been approved by DEP's Waste Management Program. Therefore, noncompliance with the NPDES permit has continued unabated as summarized at the beginning of this section.

To facilitate renewal of the NPDES permit, DEP requested Befesa to perform the following actions:

- Expeditiously install a synthetic liner in the sedimentation pond to prevent exfiltration of leachate and contact storm water from the pond.
- Submit a major permit modification for the Solid Waste Permit to install the synthetic liner in the pond
- Apply for a Water Quality Management permit for the existing wastewater treatment systems (holding pond and pH adjustment system) and any changes to those systems, including the synthetic liner
- Expedited implementation of interim measures to address NPDES permit effluent limit exceedances while permanent remedies are implemented.
- Evaluate the use of additional wastewater treatment systems

DEP intends to enter into a new Consent Order and Agreement with Befesa to resolve outstanding noncompliance that will enable the NPDES permit to be renewed.

Public Participation

DEP will publish notice of the receipt of the NPDES permit application and a tentative decision to issue the individual NPDES permit in the *Pennsylvania Bulletin* in accordance with 25 Pa. Code § 92a.82. Upon publication in the *Pennsylvania Bulletin*, DEP will accept written comments from interested persons for a 30-day period (which may be extended for one additional 15-day period at DEP's discretion), which will be considered in making a final decision on the application. Any person may request or petition for a public hearing with respect to the application. A public hearing may be held if DEP determines that there is significant public interest in holding a hearing. If a hearing is held, notice of the hearing will be published in the *Pennsylvania Bulletin* at least 30 days prior to the hearing and in at least one newspaper of general circulation within the geographical area of the discharge.

Discharge, Receiving Waters and Water Supply Information

Outfall No.	006	Design Flow (MGD)	0.216
Latitude	40° 39' 10.00"	Longitude	80° 20' 38.00"
Quad Name	Beaver	Quad Code	1303
Wastewater Description:	Residual waste landfill leachate and storm water runoff		

Receiving Waters	Raccoon Creek	Stream Code	33564
NHD Com ID	99680646	RMI	1.28
Drainage Area	183.59	Yield (cfs/mi²)	0.052
Q_{7-10} Flow (cfs)	9.6	Q_{7-10} Basis	USGS Gage 03108000 (1998 – 2024) – see below
Elevation (ft)	685	Slope (ft/ft)	0.0017
Watershed No.	20-D	Chapter 93 Class.	WWF
Existing Use		Existing Use Qualifier	
Exceptions to Use		Exceptions to Criteria	
Assessment Status	Attaining Use(s)		
Cause(s) of Impairment			
Source(s) of Impairment			
TMDL Status	Final, 04/07/2005	Name	Raccoon Creek Watershed TMDL

Background/Ambient Data		Data Source
pH (SU)	8	Median pH; WQN Station 903 (1998 – 2022)
Temperature (°F)	54.9	Mean temp; WQN Station 903 (1998 – 2022)
Hardness (mg/L)	382.7	Mean hardness; WQN Station 903 (1998 – 2022)
Other:		

Nearest Downstream Public Water Supply Intake		Midland Borough Municipal Authority	
PWS Waters	Ohio River	Flow at Intake (cfs)	4,730
PWS RMI	945.38	Distance from Outfall (mi)	7.32

USGS Hydrologic Toolbox v.1.1.0 Results

RESULTS: USGS 03108000 Raccoon Creek at Moffatts Mill, PA

File Edit View Help

All available data from Apr 1, 1999 through Mar 31, 2024 are included in analysis
Climatic year defined as Apr 1 - Mar 31.

Display Options: 03108000 Copy to Clipboard

Seasonal Calculation?	No		
Season Or Year Start	1-Apr		
Season Or Year End	31-Mar		
Years Included in Calculations	1998~2023		
Start	1998		
End	2024		
Flow Statistic	Flow Value	Percentile	x-day avg. Excur. per 3 yr.
1B3	8.7573	0.35%	0.6
4B3	9.2644	0.53%	0.99
30B3	13.929	2.46%	0.912
Flow Statistic	Flow Value	Percentile	1-day Excur. per 3 yr.
7Q10	9.6	0.64%	1.32
Harmonic Mean	62.194	30.61%	N/A
Harmonic Mean, Adjusted	62.194	30.61%	N/A

Double-click on biological flow value (xBy column) to view excursion analysis result for a gage

Photographs

Outflow Structure

View of inside of the outflow structure

Discharge point at Outfall 006 from headwall to Raccoon Creek

Outfall 006 (No Discharge)

Source and Date: DEP's April 16, 2021 Inspection Report.

Compliance History

DMR Data for Outfall 006 (from April 1, 2023 to March 31, 2024)

Parameter	MAR-24	FEB-24	JAN-24	DEC-23	NOV-23	OCT-23	SEP-23	AUG-23	JUL-23	JUN-23	MAY-23	APR-23
Flow (MGD) Average Monthly	0.0294	0.0294	0.0220	0.0078	0.0100	0.0120	0.0401	0.0327	0.0220	0.0179		0.1130
Flow (MGD) Daily Maximum	0.0392	0.0392	0.0508	0.0146	0.0146	0.0146	0.0508	0.0508	0.0795	0.0392		0.1619
pH (S.U.) Minimum	8.90	8.77	7.43	8.11	8.58	8.19	8.92	8.12	7.98	7.07		8.79
pH (S.U.) Maximum	8.94	8.90	8.28	8.95	8.67	8.90	8.96	8.87	8.61	8.05		8.96
TRC (mg/L) Average Monthly	< 0.060	0.040	0.050	0.015	< 0.040	0.16	< 0.020	0.075	0.045	< 0.020		< 0.025
TRC (mg/L) Daily Maximum	< 0.060	0.050	0.060	0.020	0.070	0.16	< 0.020	0.080	0.080	0.030		0.040
TSS (mg/L) Average Monthly	10.6	19	9.7	4.7	7.5	3.0	14.5	8.6	4.7	6.0		31
TSS (mg/L) Daily Maximum	13	22	11	4.9	8.4	3.4	17	10	5.2	9.5		33
Total Dissolved Solids (mg/L) Average Monthly	2150	2350	1967	2800	3400	3450	3000	2150	2250	3050		2500
Total Dissolved Solids (mg/L) Daily Maximum	2200	2400	2100	2800	3400	3600	3100	2300	2300	3200		2600
Total Aluminum (mg/L) Average Monthly	1.8	2.6	1.9	0.80	3.40	0.83	0.7	3.1	2.9	0.58		1.0
Total Aluminum (mg/L) Daily Maximum	2.0	2.9	2.4	1.0	3.70	0.87	0.7	3.1	2.9	0.83		1.1
Total Antimony (mg/L) Average Monthly	0.12	0.13	0.11	0.12	0.100	0.11	0.11	0.14	0.14	0.11		0.13
Total Antimony (mg/L) Daily Maximum	0.12	0.13	0.14	0.12	0.11	0.11	0.11	0.15	0.14	0.11		0.13
Total Arsenic (mg/L) Average Monthly	0.062	0.082	0.055	0.041	0.050	0.034	0.064	0.10	0.12	0.049		0.072
Total Arsenic (mg/L) Daily Maximum	0.069	0.085	0.071	0.042	0.054	0.038	0.065	0.11	0.13	0.065		0.077
Total Iron (mg/L) Average Monthly	0.080	< 0.041	0.138	< 0.020	< 0.36	0.104	< 0.034	< 0.035	< 0.048	< 0.16		0.08
Total Iron (mg/L) Daily Maximum	0.089	< 0.041	0.31	< 0.020	< 0.41	0.11	< 0.047	< 0.050	< 0.048	0.21		0.10

Parameter	MAR-24	FEB-24	JAN-24	DEC-23	NOV-23	OCT-23	SEP-23	AUG-23	JUL-23	JUN-23	MAY-23	APR-23
Total Lead (mg/L) Average Monthly	0.0087	0.014	0.0112	0.0056	0.020	0.0045	0.0031	0.012	0.0087	0.0033		0.0044
Total Lead (mg/L) Daily Maximum	0.010	0.016	0.014	0.0072	0.021	0.0047	0.0032	0.013	0.0094	0.0039		0.0048
Total Manganese (mg/L) Average Monthly	0.0062	< 0.0050	0.0090	0.010	0.074	0.026	< 0.0043	0.0026	< 0.0036	0.036		0.017
Total Manganese (mg/L) Daily Maximum	0.0071	< 0.0050	0.016	0.012	0.085	0.033	0.0050	0.0031	0.0037	0.049		0.025
Total Selenium (mg/L) Average Monthly	0.081	0.088	0.082	0.076	0.054	0.067	0.059	0.067	0.063	0.056		0.082
Total Selenium (mg/L) Daily Maximum	0.081	0.093	0.094	0.077	0.057	0.068	0.059	0.073	0.066	0.058		0.086
Dissolved Selenium (mg/L) Average Monthly	0.084	0.095	0.081	0.079	0.053	0.069	0.057	0.069	0.059	0.054		0.081
Dissolved Selenium (mg/L) Daily Maximum	0.084	0.096	0.089	0.083	0.056	0.069	0.060	0.075	0.060	0.058		0.084
Sulfate (mg/L) Average Monthly	1370	1370	1193	1675	2190	2240	1855	1260	1215	1835		1600
Sulfate (mg/L) Daily Maximum	1390	1390	1270	1690	2290	2350	1940	1340	1260	1980		1620
Total Thallium (mg/L) Average Monthly	< 0.00038	< 0.00038	< 0.00030	< 0.00013	< 0.00038	< 0.00013	< 0.00017	< 0.00013	< 0.00034	< 0.00060		< 0.00020
Total Thallium (mg/L) Daily Maximum	< 0.00038	< 0.00038	< 0.00038	< 0.00013	< 0.00038	< 0.00013	< 0.00020	< 0.00013	0.00047	< 0.0010		< 0.00020
Total Zinc (mg/L) Average Monthly	0.21	0.16	0.18	0.088	0.58	0.18	0.073	0.17	0.085	0.17		0.12
Total Zinc (mg/L) Daily Maximum	0.25	0.17	0.21	0.093	0.62	0.20	0.075	0.17	0.097	0.26		0.14
Chloride (mg/L) Average Monthly	25.6	26.2	24.2	40.2	48.4	51.1	46.0	29.1	30.4	43.4		34.3
Chloride (mg/L) Daily Maximum	25.9	26.6	25.3	42.5	51.5	53.4	46.2	30.3	31.3	45.5		35.5
Bromide (mg/L) Average Monthly	< 0.0530	< 0.106	< 0.0530	< 0.133	< 0.093	< 0.053	< 6.03	< 3.46	< 0.133	< 0.093		< 5.467
Bromide (mg/L) Daily Maximum	< 0.0530	< 0.106	< 0.0530	< 0.133	< 0.133	< 0.053	12.0	6.78	< 0.133	< 0.133		10.8

Compliance History

Effluent Violations for Outfall 006, from: September 1, 2015 To: March 31, 2024

Parameter	Date	SBC	DMR Value	Units	Limit Value	Units
Total Suspended Solids	9/30/2015	Avg Mo	35	mg/L	30	mg/L
Selenium, Total	10/31/2015	Avg Mo	0.09	mg/L	0.07	mg/L
Total Suspended Solids	10/31/2015	Avg Mo	41.3	mg/L	30	mg/L
Selenium, Total	11/30/2015	Avg Mo	0.115	mg/L	0.07	mg/L
Total Suspended Solids	11/30/2015	Avg Mo	32	mg/L	30	mg/L
Aluminum, Total	12/31/2015	Avg Mo	3.99	mg/L	3.8	mg/L
Aluminum, Total	1/31/2016	Avg Mo	6.935	mg/L	3.8	mg/L
Aluminum, Total	1/31/2016	Daily Max	7.96	mg/L	7.0	mg/L
Selenium, Total	1/31/2016	Avg Mo	0.076	mg/L	0.07	mg/L
Aluminum, Total	2/29/2016	Avg Mo	5.24	mg/L	3.8	mg/L
Total Suspended Solids	2/29/2016	Avg Mo	32.5	mg/L	30	mg/L
Aluminum, Total	3/31/2016	Avg Mo	4.42	mg/L	3.8	mg/L
Selenium, Total	3/31/2016	Avg Mo	0.088	mg/L	0.07	mg/L
Total Suspended Solids	3/31/2016	Avg Mo	32.2	mg/L	30	mg/L
Selenium, Total	4/30/2016	Avg Mo	0.097	mg/L	0.07	mg/L
Total Suspended Solids	4/30/2016	Avg Mo	34.3	mg/L	30	mg/L
pH	5/31/2016	Maximum	10.6	S.U.	9.0	S.U.
Selenium, Total	5/31/2016	Avg Mo	0.083	mg/L	0.07	mg/L
Total Suspended Solids	5/31/2016	Avg Mo	64	mg/L	30	mg/L
Selenium, Total	6/30/2016	Avg Mo	0.075	mg/L	0.07	mg/L

Parameter	Date	SBC	DMR Value	Units	Limit Value	Units
Selenium, Total	7/31/2016	Avg Mo	0.098	mg/L	0.07	mg/L
Total Suspended Solids	8/31/2016	Avg Mo	44.5	mg/L	30	mg/L
Selenium, Total	9/30/2016	Avg Mo	0.091	mg/L	0.07	mg/L
Aluminum, Total	10/31/2016	Avg Mo	4.322	mg/L	3.8	mg/L
Manganese, Total	10/31/2016	Avg Mo	0.94	mg/L	0.14	mg/L
Manganese, Total	10/31/2016	Daily Max	5.44	mg/L	0.22	mg/L
Total Suspended Solids	10/31/2016	Daily Max	164.0	mg/L	100	mg/L
Total Suspended Solids	10/31/2016	Avg Mo	64.3	mg/L	30	mg/L
Total Suspended Solids	11/30/2016	Avg Mo	53.5	mg/L	30	mg/L
Selenium, Total	12/31/2016	Avg Mo	0.098	mg/L	0.07	mg/L
Aluminum, Total	1/31/2017	Avg Mo	5.55	mg/L	3.8	mg/L
Selenium, Total	1/31/2017	Avg Mo	0.085	mg/L	0.07	mg/L
Total Suspended Solids	1/31/2017	Avg Mo	37.8	mg/L	30	mg/L
Aluminum, Total	2/28/2017	Avg Mo	4.34	mg/L	3.8	mg/L
Selenium, Total	2/28/2017	Avg Mo	0.107	mg/L	0.07	mg/L
Selenium, Total	4/30/2017	Avg Mo	0.106	mg/L	0.07	mg/L
Selenium, Total	5/31/2017	Avg Mo	0.08	mg/L	0.07	mg/L
Selenium, Total	6/30/2017	Avg Mo	0.08	mg/L	0.07	mg/L
Total Suspended Solids	6/30/2017	Avg Mo	39	mg/L	30	mg/L
Selenium, Total	7/31/2017	Avg Mo	0.09	mg/L	0.07	mg/L
Aluminum, Total	11/30/2017	Avg Mo	4.8	mg/L	3.8	mg/L
Selenium, Total	11/30/2017	Avg Mo	0.09	mg/L	0.07	mg/L

Parameter	Date	SBC	DMR Value	Units	Limit Value	Units
Total Suspended Solids	11/30/2017	Avg Mo	52	mg/L	30	mg/L
Selenium, Total	12/31/2017	Avg Mo	0.11	mg/L	0.07	mg/L
Selenium, Total	1/31/2018	Avg Mo	0.09	mg/L	0.07	mg/L
Aluminum, Total	2/28/2018	Avg Mo	4.5	mg/L	3.8	mg/L
Selenium, Total	2/28/2018	Avg Mo	0.10	mg/L	0.07	mg/L
Selenium, Total	3/31/2018	Avg Mo	0.10	mg/L	0.07	mg/L
Selenium, Total	4/30/2018	Avg Mo	0.09	mg/L	0.07	mg/L
Selenium, Total	5/31/2018	Avg Mo	0.08	mg/L	0.07	mg/L
Total Suspended Solids	5/31/2018	Avg Mo	35	mg/L	30	mg/L
Aluminum, Total	9/30/2018	Avg Mo	4.0	mg/L	3.8	mg/L
Selenium, Total	11/30/2018	Avg Mo	0.08	mg/L	0.07	mg/L
Selenium, Total	2/28/2019	Avg Mo	0.09	mg/L	0.07	mg/L
Selenium, Total	3/31/2019	Avg Mo	0.09	mg/L	0.07	mg/L
Total Suspended Solids	5/31/2019	Avg Mo	41	mg/L	30	mg/L
Selenium, Total	7/31/2019	Avg Mo	0.08	mg/L	0.07	mg/L
Selenium, Total	8/31/2019	Avg Mo	0.08	mg/L	0.07	mg/L
Total Suspended Solids	9/30/2019	Avg Mo	35	mg/L	30	mg/L
Aluminum, Total	11/30/2019	Avg Mo	4.0	mg/L	3.8	mg/L
Selenium, Total	11/30/2019	Avg Mo	0.08	mg/L	0.07	mg/L
Total Suspended Solids	11/30/2019	Avg Mo	45	mg/L	30	mg/L
Selenium, Total	12/31/2019	Avg Mo	0.09	mg/L	0.07	mg/L
Selenium, Total	1/31/2020	Avg Mo	0.09	mg/L	0.07	mg/L

Parameter	Date	SBC	DMR Value	Units	Limit Value	Units
Total Suspended Solids	1/31/2020	Avg Mo	33	mg/L	30	mg/L
Selenium, Total	2/29/2020	Avg Mo	0.09	mg/L	0.07	mg/L
Selenium, Total	3/31/2020	Avg Mo	0.09	mg/L	0.07	mg/L
Selenium, Total	4/30/2020	Avg Mo	0.08	mg/L	0.07	mg/L
Selenium, Total	1/31/2021	Avg Mo	0.08	mg/L	0.07	mg/L
Selenium, Total	3/31/2021	Avg Mo	0.09	mg/L	0.07	mg/L
Total Suspended Solids	4/30/2021	Avg Mo	45	mg/L	30	mg/L
Total Suspended Solids	7/31/2021	Avg Mo	33	mg/L	30	mg/L
Total Suspended Solids	11/30/2021	Avg Mo	46	mg/L	30	mg/L
Selenium, Total	1/31/2022	Avg Mo	0.09	mg/L	0.07	mg/L
Total Residual Chlorine (TRC)	3/31/2022	Avg Mo	1.1	mg/L	0.5	mg/L
Total Residual Chlorine (TRC)	3/31/2022	Daily Max	2.2	mg/L	1.0	mg/L
Selenium, Total	4/30/2022	Avg Mo	0.08	mg/L	0.07	mg/L
Total Suspended Solids	5/31/2022	Avg Mo	31	mg/L	30	mg/L
Selenium, Total	12/31/2022	Avg Mo	0.081	mg/L	0.07	mg/L
Selenium, Total	1/31/2023	Avg Mo	0.084	mg/L	0.07	mg/L
Selenium, Total	2/28/2023	Avg Mo	0.078	mg/L	0.07	mg/L
Selenium, Total	3/31/2023	Avg Mo	0.083	mg/L	0.07	mg/L
Selenium, Total	4/30/2023	Avg Mo	0.082	mg/L	0.07	mg/L
Total Suspended Solids	4/30/2023	Avg Mo	31	mg/L	30	mg/L
Selenium, Total	12/31/2023	Avg Mo	0.076	mg/L	0.07	mg/L
Selenium, Total	01/31/2024	Avg Mo	0.082	mg/L	0.07	mg/L

Parameter	Date	SBC	DMR Value	Units	Limit Value	Units
Selenium, Total	02/29/2024	Avg Mo	0.088	mg/L	0.07	mg/L
Selenium, Total	03/31/2024	Avg Mo	0.081	mg/L	0.07	mg/L

Summary of Inspections:

Other Comments:

Development of Effluent Limitations

Outfall No.	006	**Design Flow (MGD)**	0.216
Latitude	40° 39' 10.00"	**Longitude**	80° 20' 38.00"

Wastewater Description: Residual waste (fly ash/slag) landfill leachate and storm water runoff

Current Effluent Limits and Monitoring Requirements / Anti-backsliding

Discharges monitored at Outfall 006 are currently subject to the following effluent limits and monitoring requirements.

Table 1. Current Effluent Limits and Monitoring Requirements for Outfall 006

Parameter	Mass (lbs/day)		Concentration (mg/L)			Measurement Frequency	Sample Type	Basis
	Avg. Mo.	Daily Max	Minimum	Avg. Mo.	Daily Max			
Flow (MGD)	Report	Report	—	—	—	2/discharge	Measured	25 Pa. Code § 92a.61(b)
pH (S.U.)	—	—	6.0	—	9.0 (IMAX)	2/discharge	Grab	25 Pa. Code § 95.2(1)
Total Residual Chlorine (TRC)	—	—	—	0.5	1.0	2/discharge	Grab	25 Pa. Code § 92a.48(b)(2)
Total Suspended Solids	—	—	—	30.0	100.0	2/discharge	Grab	25 Pa. Code § 92a.48(a)(3)
Total Dissolved Solids	—	—	—	Report	Report	2/discharge	Grab	25 Pa. Code § 92a.61(b)
Total Aluminum	—	—	—	3.8	7.0	2/discharge	Grab	25 Pa. Code § 92a.48(a)(3)
Total Antimony	—	—	—	Report	Report	2/discharge	Grab	25 Pa. Code § 92a.61(b)
Total Arsenic	—	—	—	Report	Report	2/discharge	Grab	25 Pa. Code § 92a.61(b)
Total Iron	—	—	—	5.0	12.0	2/discharge	Grab	25 Pa. Code § 92a.48(a)(3)
Total Lead	—	—	—	Report	Report	2/discharge	Grab	25 Pa. Code § 92a.61(b)
Total Manganese	—	—	—	0.14	0.22	2/discharge	Grab	25 Pa. Code § 92a.48(a)(3)
Total Selenium	—	—	—	0.07	0.14	2/discharge	Grab	25 Pa. Code § 92a.48(a)(3)
Dissolved Selenium	—	—	—	Report	Report	2/discharge	Grab	25 Pa. Code § 92a.61(b)
Sulfate	—	—	—	Report	Report	2/discharge	Grab	25 Pa. Code § 92a.61(b)
Total Thallium	—	—	—	0.006	0.010	2/discharge	Grab	25 Pa. Code § 92a.61(b)
Total Zinc	—	—	—	0.6	1.0	2/discharge	Grab	25 Pa. Code § 92a.48(a)(3)
Chloride	—	—	—	Report	Report	2/discharge	Grab	25 Pa. Code § 92a.61(b)
Bromide	—	—	—	Report	Report	2/discharge	Grab	25 Pa. Code § 92a.61(b)

The effluent limits and monitoring requirements in Table 1 will remain in effect at Outfall 006 in the renewed permit pursuant to anti-backsliding requirements under Section 402(o) of the Clean Water Act and/or 40 CFR § 122.44(l) (incorporated by reference at 25 Pa. Code § 92a.44) [1], unless the limits are superseded by more stringent limits developed for this renewal or are relaxed pursuant to the anti-backsliding exceptions listed in Section 402(o) of the Clean Water Act or 40 CFR § 122.44(l).

006.A. Technology-Based Effluent Limitations (TBELs)

[1] *Reissued permits.* (1) Except as provided in paragraph (l)(2) of this section when a permit is renewed or reissued, interim effluent limitations, standards or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit (unless the circumstances on which the previous permit was based have materially and substantially changed since the time the permit was issued and would constitute cause for permit modification or revocation and reissuance under § 122.62.)

This facility is not subject to any Federal Effluent Limitations Guidelines (ELGs). There is an ELG for the Landfills Point Source Category, 40 CFR Part 445, but Part 445 does not apply to this facility. As 40 CFR § 445.1(e) states, "[Part 445] does not apply to discharges of landfill wastewater from landfills operated in conjunction with other industrial or commercial operations when the landfill only receives wastes generated by the industrial or commercial operation directly associated with the landfill." The Monaca Landfill was only operated in conjunction with the former Horsehead Corporation zinc smelting facility (formerly of NPDES Permit No. PA0002208), so Part 445 does not apply to the Monaca Landfill.

In the absence of applicable ELGs, site-specific TBELs were developed for Outfall 006's discharges in accordance with 40 CFR § 125.3 based on DEP's Best Professional Judgment (BPJ) and applicable regulatory effluent standards and monitoring requirements.

Table 2. BPJ TBELs and Regulatory Effluent Standards and Monitoring Requirements for Outfall 006

Parameter	Mass (lb/day)		Concentration (mg/L)		
	Average Monthly	Daily Maximum	Average Monthly	Daily Maximum	Instant Maximum
Flow (MGD)	Report	Report	—	—	—
TSS	—	—	30	100	—
Aluminum	—	—	3.8	7.0	—
Iron	—	—	5.0	12.0	—
Manganese	—	—	0.14	0.22	—
Selenium	—	—	0.07	0.14	—
Zinc	—	—	0.6	1.0	—
TRC	—	—	0.5	1.0	—
pH (S.U.)	—	—	6.0 (Minimum)	—	9.0 (Maximum)

Flow monitoring and pH limits are imposed based on 25 Pa. Code §§ 92a.61(b) and 95.2(1), respectively. Effluent limits for Total Residual Chlorine (TRC) are imposed pursuant to 25 Pa. Code § 92a.48(b)(2). The NPDES permit renewal application does not list chlorine as a chemical used onsite, but the previous permittee used chlorine to control algae in the sedimentation pond. Therefore, TRC limits for facilities using chlorination were imposed. Befesa attributed exceedances of the TRC limits in 2022 to analyses being conducted outside the hold time and not to the use of chlorine. To qualify the applicability of TRC limits, the following footnote will be added to Part A of the permit:

> Samples for analysis of TRC shall be collected during the first discharge that occurs after each chlorine dosing.

The TBELs for aluminum, iron, manganese, selenium, and zinc listed in Table 2 were developed and imposed at Outfall 006 as part of the 1995 renewal of NPDES Permit No. PA0002208. Discharges from the landfill were previously authorized by NPDES PA0097586, but that permit was cancelled once the authorization for Outfall 006 was moved to PA0002208 with the 1995 renewal at the permittee's request.

The aluminum, iron, manganese, selenium, and zinc TBELs were calculated using a 95% and 99% confidence interval analysis of a lognormal distribution of Outfall 006 effluent data from December 1989 to April 1992. The statistical approach used was consistent with that used by EPA to develop ELGs. EPA describes this procedure in the 2010 NPDES Permit Writer's Manual, Chapter 5, p. 5-47 as follows:

> [T]he maximum daily limitation could be calculated by multiplying the long-term average achievable by implementation of the model technology or process change by a daily variability factor determined from the statistical properties of a lognormal distribution. The average monthly limitation can be calculated similarly except that the variability factor corresponds to the distribution of monthly averages instead of daily concentration measurements. The daily variability factor is a statistical factor defined as the ratio of the estimated 99th percentile of a distribution of daily values divided by the mean of the distribution. Similarly, the monthly variability factor is typically defined as the estimated 95th percentile of the distribution of monthly averages divided by the mean of the distribution of monthly averages.

With the exception of selenium and, to a lesser extent, TSS, the permittee generally complies with the current case-by-case TBELs, which were maintained at Outfall 006 from their initial imposition in the 1995 permit based on anti-backsliding requirements that require final effluent limits to be at least as stringent as those in the previous permit.

In the February 2014 Fact Sheet for the 2015 NPDES permit, DEP performed an extensive review of treatment technologies for selenium consistent with the requirements of 40 CFR § 125.3(d) (regarding factors that must be considered when setting case-by-case TBELs) and selected passive biochemical reactors as the model treatment technology for selenium at the Monaca Landfill. In its comments on the 2014 draft permit, Horsehead rejected passive biochemical reactors as the model treatment technology and proposed Modified Enhanced Chemical Precipitation (MECP) as the model treatment technology in its December 2014 "Treatability Study Report" (see **Attachment A**). DEP re-drafted the permit and modified the selenium TBELs to match the expected performance of MECP. Horsehead did not object to the revised selenium TBELs.

Notwithstanding the identification of MECP as the Best Available Technology (BAT) for the Monaca Landfill, Horsehead and its successors intended to address selenium by closing the landfill and not by installing wastewater treatment technologies. No treatment technologies have been installed since the previous NPDES permit was issued in 2015.

Befesa is free to use any combination of technologies to achieve the BPJ TBELs—bearing in mind that the model technology is considered an available technology to meet the TBELs and could be used irrespective of the availability of other technologies. DEP notes that while closing and capping a landfill is a reasonable and appropriate technology to decrease leachate volumes, DEP expects that any leachate generated after closure will be more concentrated, which would increase selenium effluent concentrations. Thus, the use of MECP or some other wastewater treatment technologies may be needed to comply with the selenium TBELs in addition to closing and capping the landfill.

Since there have been no substantial changes to the Monaca Landfill since the permit was last issued in 2015 and neither closing and capping nor MECP have been implemented (and thus remain available) to comply with the selenium TBELs, the existing selenium TBELs will be maintained in the renewed permit.

Per- and Polyfluoroalkyl Substances (PFAS)

In February 2024, DEP implemented a new monitoring initiative for PFAS. PFAS are a family of thousands of synthetic organic chemicals that contain a chain of strong carbon-fluorine bonds. Many PFAS are highly stable, water- and oil-resistant, and exhibit other properties that make them useful in a variety of consumer products and industrial processes. PFAS are resistant to biodegradation, photooxidation, direct photolysis, and hydrolysis and do not readily degrade naturally; thus, many PFAS accumulate over time. According to the United States Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR), the environmental persistence and mobility of some PFAS, combined with decades of widespread use, have resulted in their presence in surface water, groundwater, drinking water, rainwater, soil, sediment, ice caps, outdoor and indoor air, plants, animal tissue, and human blood serum across the globe. ATSDR also reported that exposure to certain PFAS can lead to adverse human health impacts.[2] Due to their durability, toxicity, persistence, and pervasiveness, PFAS have emerged as significant pollutants of concern.

In accordance with Section II.I of DEP's "Standard Operating Procedure (SOP) for Clean Water Program – Establishing Effluent Limitations for Individual Industrial Permits" [SOP No. BCW-PMT-032] and under the authority of 25 Pa. Code § 92a.61(b), DEP has determined that monitoring for a subset of common/well-studied PFAS including Perfluorooctanoic acid (PFOA), Perfluorooctanesulfonic acid (PFOS), Perfluorobutanesulfonic acid (PFBS), and Hexafluoropropylene oxide dimer acid (HFPO-DA) is necessary to help understand the extent of environmental contamination by PFAS in the Commonwealth and the extent to which point source dischargers are contributors. SOP BCW-PMT-032 directs permit writers to consider special monitoring requirements for PFOA, PFOS, PFBS, and HFPO-DA in the following instances:

a. If sampling that is completed as part of the permit renewal application reveals a detection of PFOA, PFOS, HFPO-DA or PFBS (any of these compounds), the application manager will establish a quarterly monitoring requirement for PFOA, PFOS, HFPO-DA and PFBS (all of these compounds) in the permit.

b. If sampling that is completed as part of the permit renewal application demonstrates non-detect values at or below the Target QLs for PFOA, PFOS, HFPO-DA and PFBS (all of these compounds in a minimum of 3 samples), the application manager will establish an annual monitoring requirement for PFOA, PFOS, HFPO-DA and PFBS in the permit.

c. In all cases the application manager will include a condition in the permit that the permittee may cease monitoring for PFOA, PFOS, HFPO-DA and PFBS when the permittee reports non-detect values at or below the Target QL for four consecutive monitoring periods for each PFAS parameter that is analyzed. Use the following language: The permittee may discontinue monitoring for PFOA, PFOS, HFPO-DA, and PFBS if the

[2] ATSDR, "Toxicological Profile for Perfluoroalkyls". Patrick N. Breysse, Ph.D., CIH Director, National Center for Environmental Health and Agency for Toxic Substances and Disease Registry Centers for Disease Control and Prevention, May 2021.

results in 4 consecutive monitoring periods indicate non-detects at or below Quantitation Limits of 4.0 ng/L for PFOA, 3.7 ng/L for PFOS, 3.5 ng/L for PFBS and 6.4 ng/L for HFPO-DA. When monitoring is discontinued, permittees should enter a No Discharge Indicator (NODI) Code of "GG" on DMRs.

Befesa's application was submitted before the NPDES permit application forms were updated to require sampling for PFOA, PFOS, PFBS, and HFPO-DA, so there are no PFAS data to evaluate. However, the potential for PFAS to be present can be estimated based on studies of various industries by EPA.

The Monaca Landfill is a facility that ostensibly operates in one of the industries EPA expects to be a source for PFAS: landfilling. However, as explained at the beginning of Section 006.A of this Fact Sheet, landfills operated in conjunction with other industrial or commercial operations that only receive wastes generated by the industrial or commercial operation directly associated with the landfill are not regulated by the Landfills Point Source Category ELGs. The Monaca Landfill was only ever operated in conjunction with Horsehead's former zinc smelting plant, so the landfill is more of an orphan captive landfill and not necessarily one of the standalone landfills (*e.g.*, municipal solid waste) targeted by EPA as part of the planned rulemaking to revise Part 445 to regulate PFAS. Therefore, DEP does not classify the Monaca Landfill as an expected source of PFAS and annual reporting of PFOA, PFOS, PFBS, and HFPO-DA will be required consistent with Section II.I.b of SOP BCW-PMT-032.

As stated in Section II.I.c of the SOP, if non-detect values at or below DEP's Target QLs are reported for four consecutive monitoring periods (*i.e.*, four consecutive annual results in Befesa's case), then the monitoring may be discontinued.

006.B. <u>Water Quality-Based Effluent Limitations (WQBELs)</u>

<u>Toxics Management Spreadsheet Water Quality Modeling Program and Procedures for Evaluating Reasonable Potential</u>

WQBELs are developed pursuant to Section 301(b)(1)(C) of the Clean Water Act and, per 40 CFR § 122.44(d)(1)(i), are imposed to "control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) that are or may be discharged at a level that will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality." The Department of Environmental Protection developed the DEP Toxics Management Spreadsheet (TMS) to facilitate calculations necessary to complete a reasonable potential (RP) analysis and determine WQBELs for discharges of toxic and some nonconventional pollutants.

The TMS is a single discharge, mass-balance water quality modeling program for Microsoft Excel® that considers mixing, first-order decay, and other factors to determine WQBELs for toxic and nonconventional pollutants. Required input data including stream code, river mile index, elevation, drainage area, discharge flow rate, low-flow yield, and the hardness and pH of both the discharge and the receiving stream are entered into the TMS to establish site-specific discharge conditions. Other data such as reach dimensions, partial mix factors, and the background concentrations of pollutants in the stream also may be entered to further characterize the discharge and receiving stream. The pollutants to be analyzed by the model are identified by inputting the maximum concentration reported in the permit application or Discharge Monitoring Reports, or by inputting an Average Monthly Effluent Concentration (AMEC) calculated using DEP's TOXCONC.xls spreadsheet for datasets of 10 or more effluent samples. Pollutants with no entered concentration data and pollutants for which numeric water quality criteria in 25 Pa. Code Chapter 93 have not been promulgated are excluded from the modeling. If necessary, ammonia-nitrogen, CBOD-5, and dissolved oxygen are analyzed separately using DEP's WQM 7.0 model.

The TMS evaluates each pollutant by computing a wasteload allocation for each applicable criterion, determining the most stringent governing WQBEL, and comparing that governing WQBEL to the input discharge concentration to determine whether permit requirements apply in accordance with the following RP thresholds:

- Establish limits in the permit where the maximum reported effluent concentration or calculated AMEC equals or exceeds 50% of the WQBEL. Use the average monthly, maximum daily, and instantaneous maximum (IMAX) limits for the permit as recommended by the TMS (or, if appropriate, use a multiplier of 2 times the average monthly limit for the maximum daily limit and 2.5 times the average monthly limit for IMAX).
- For non-conservative pollutants, establish monitoring requirements where the maximum reported effluent concentration or calculated AMEC is between 25% - 50% of the WQBEL.
- For conservative pollutants, establish monitoring requirements where the maximum reported effluent concentration or calculated AMEC is between 10% - 50% of the WQBEL.

In most cases, pollutants with effluent concentrations that are not detectable at the level of DEP's Target Quantitation Limits are eliminated as candidates for WQBELs and water quality-based monitoring.

<u>Ambient Background Stream Data</u>

In the 2015 NPDES permit, DEP imposed a condition requiring the permittee to collect and report background information on Racoon Creek to assist with future water quality modeling efforts. The required information included in-stream concentration data for Total Aluminum, Total Antimony, Total Arsenic, Total Barium, Total Cadmium, Total Chromium, Total Copper, Total Iron, Total Lead, Total Manganese, Total Mercury, Total Nickel, Total Selenium, Dissolved Selenium, Total Thallium, Total Zinc, and Total Hardness. The condition also required Horsehead to report the flow rate of Raccoon Creek at the time of sampling using data from USGS Gage 03108000 Raccoon Creek at Moffatts Mill, PA. Horsehead/AZR collected and analyzed concentration data pursuant to DEP's "Implementation Guidance for the Determination and Use of Background/Ambient Water Quality in the Determination of Wasteload Allocations and NPDES Effluent Limitations for Toxic Substances" and submitted those data and stream flow information to DEP in a report dated September 11, 2018. The raw data are summarized in the table below.

Table 3. Raccoon Creek Analytical Data

Parameter	Sampling Date and Results (in µg/L unless otherwise indicated)									
	8/9 2016	10/11 2016	11/7 2016	11/16 2016	11/22 2016	8/22 2017	9/25 2017	10/2 2017	10/23 2017	11/15 2017
Flow (cfs)	27.0	27.0	51.0	48.0	46.0	62.1	33.3	30.8	29.0	60.2
Flow (gpm)	12,118	12,118	22,890	21,544	20,646	27,917	14,946	13,824	13,016	27,020
Temp. (°C)	23.9	15.7	9.7	6.5	3.1	21.0	21.9	13.7	14.1	5.8
pH (s.u.)	8.13	8.48	8.52	8.57	8.78	8.55	8.18	8.56	8.11	8.40
Hardness (mg/L)	448	466	414	392	407	425	494	567	562	367
Aluminum	184	<50.0	50.7	<50.0	<50.0	181.0	118.0	68.2	52.6	54.3
Antimony	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6
Arsenic	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Iron	268.0	149.0	192.0	157.0	148.0	213.0	170.0	75.9	104.0	164.0
Lead	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Manganese	60.8	29.9	28.9	24.3	22.2	45.6	34.1	21.6	23.6	5.1
Selenium T.	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Selenium D.	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Thallium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Zinc	10.7	10.1	<10.0	12.0	11.2	<10.0	46.8	<10.0	41.0	12.9

NOTE: Stream data were not collected at Q_{7-10} low-flow conditions (estimated as 9.6 cfs or 4,310 gpm for Racoon Creek), but long-term average concentrations calculated from the above data are assumed to represent stream quality at all flow conditions.

Based on the results of AZR's sampling, background stream concentrations and coefficients of variation (CVs) will be used for water quality modeling for aluminum, iron, manganese, and zinc. Other parameters were not detected, so background concentrations for those parameters are assumed to be zero for modeling purposes. The background stream concentrations and CVs calculated from the above data and the distributions used to calculate those values are summarized in the table below.

Table 4. Background Stream Concentrations and CVs

Parameter	Background Stream Conc. (µg/L)	Coefficient of Variation	Distribution Applied
Aluminum, Total	87.33	0.685	Delta-Lognormal †
Iron, Total	165.75	0.366	Lognormal
Manganese, Total	31.56	0.732	Lognormal
Zinc, Total	17.57	0.791	Delta-Lognormal †

† A Delta-Lognormal distribution is used for a mixed dataset of non-detect and detected results.

<u>Reasonable Potential Analysis and WQBEL Development for Outfall 006</u>

Discharges from Outfall 006 are evaluated based on concentrations reported on the application and Discharge Monitoring Reports. In accordance with the instructions for DEP's Toxics Management Spreadsheet, the discharge concentrations of aluminum, antimony, arsenic, chloride, iron, lead, manganese, selenium, sulfate, thallium, TDS and zinc used in the spreadsheet are calculated using DEP's TOXCONC spreadsheet and two years of effluent data (see **Attachment B**). This is done because more than ten data points are available for copper and zinc.[3]

[3] Average monthly and maximum daily WQBELs of 1.5 mg/L (for both statistical bases) are imposed for zinc in the current NPDES permit. Monitoring also is required for copper. Results for both parameters are reported monthly based on two samples per month.

Table 5. TMS Inputs for 006

Parameter	Value
River Mile Index	1.28
Discharge Flow (MGD)	0.216
Basin/Stream Characteristics	
Parameter	**Value**
Area in Square Miles	183.59
Q_{7-10} (cfs)	9.6
Low-flow yield (cfs/mi^2)	0.052
Width (ft)	130
Depth (ft)	4.0
Elevation (ft)	685
Slope	0.0017

The TMS model is run for Outfall 006 with the modeled discharge and receiving stream characteristics shown in Table 5. Pollutants for which water quality criteria have not been promulgated (e.g., TSS, Oil and Grease, etc.) are excluded from the modeling.

The Q_{7-10} flow of Raccoon Creek was calculated as 9.6 cfs using USGS's Hydrologic Toolbox v.1.1.0 software and data from USGS Gage 03108000 for the period of record lasting from 1999 through 2024. The width of Raccoon Creek was determined by measuring the width of the creek on a topographic map and the depth is estimated as 4.0 feet based on DEP's professional judgement. The width and depth are estimated for Q_{7-10} low-flow conditions.

Output from the TMS model is included in **Attachment C** to this Fact Sheet. The modeling results indicate that the following WQBELs and water quality-based reporting requirements are necessary for discharges from Outfall 006.

Table 6. Water Quality-Based Effluent Limits for Outfall 006

Parameter	Permit Limits					Discharge Conc. (µg/L) †	Target QL (µg/L)	Governing WQBEL Basis‡
	Mass (lb/day)		Concentration (µg/L)					
	Avg Mo.	Max Daily	Avg Mo.	Max Daily	IMAX			
Aluminum, Total	11.9	20.5	6,586	11,376	16,465	3978	10	AFC
Antimony, Total	0.3	0.33	166	183	414	139	2.0	THH
Arsenic, Total	Report	Report	Report	Report	Report	95.3	3.0	THH
Selenium, Total	0.27	0.35	148	194	369	89.5	5.0	CFC
Acrylamide	0.02	0.032	11.3	17.6	28.1	<10	0.1	CRL
Hexachlorobutadiene	Report	Report	Report	Report	Report	<0.52	0.5	CRL

† Calculated as the average monthly effluent concentration using either a lognormal or delta lognormal distribution of maximum daily DMR results (Feb. 2022 – Feb. 2024)

‡ AFC = Acute Fish Criterion; CFC = Chronic Fish Criterion; THH = Threshold Human Health; CRL = Cancer Risk Level

Befesa reported results for Acrylamide using an analytical reporting limit of 10 µg/L. For modeling purposes, the TMS uses a Target QL of 0.1 µg/L for Acrylamide. The permit application instructions do not identify a Target QL for Acrylamide, so applicants are not held to the TMS's Target QL for Acrylamide. Also, according to the application, chemical additives containing Acrylamide are not used at the site. Therefore, the WQBELs for Acrylamide are not imposed at Outfall 006.

The reporting requirement for hexachlorobutadiene is the result of Befesa's attainment of an analytical reporting limit (0.52 µg/L) that is less stringent (i.e., higher) than DEP's Target QL (0.5 µg/L). Even though the result was reported as less than the laboratory reporting limit, the reporting limit used does not allow DEP rule out the possibility that discharges will result in excursions above Pennsylvania's water quality criteria. In those situations, DEP allows dischargers to collect additional samples and analyze them using methods with reporting limits equivalent to the Target QLs specified in the Instructions for DEP's NPDES Application for Individual Permit to Discharge Industrial Wastewater. With new results, DEP will reevaluate whether reasonable potential exists. Befesa will have an opportunity to resample during the draft permit comment period. If new analyses show that hexachlorobutadiene is not detectable at the level of DEP's Target QLs or is present below thresholds that would constitute reasonable potential, then the reporting requirement will be removed before the permit is renewed.

The WQBELs and reporting requirements for the remaining parameters (aluminum, antimony, arsenic, and selenium) are based on detected results. Those WQBELs and reporting requirements will control in the permit to the extent that they are not superseded by more stringent TBELs.

Based on the modeling conducted for this permit and pursuant to the exceptions to anti-backsliding given in sections 402(o) and 303(d)(4)(B) of the Clean Water Act, the existing WQBELs for Total Thallium will be removed from the permit. Outfall 006's current thallium WQBELs (0.006 µg/L average monthly and 0.010 µg/L maximum daily) were established pursuant to section 301(b)(1)(C) of the Clean Water Act and were based on state water quality standards. For state WQBELs, relaxation of limits is allowed in either case of a section 402(o)(2) exception being satisfied or if water quality provisions of section 303(d)(4) are satisfied. Satisfying either provision allows for backsliding.
Section 303(d)(4) is divided between: (A) waters where the applicable water quality standard has not been attained, and (B) waters where the "quality of such waters equals or exceeds levels necessary to protect the designated use for such

waters or otherwise required by applicable water quality standards." Section 303(d)(4)(B) is the relevant requirement because the receiving water, Raccoon Creek, is attaining its designated uses in the segment near Outfall 006. Section 303(d)(4)(B) states:

> For waters identified under paragraph (1)(A) where the quality of such waters equals or exceeds levels necessary to protect the designated use for such waters or otherwise required by applicable water quality standards, any effluent limitation based on a total maximum daily load or other waste load allocation established under this section, or any water quality standard established under this section, or any other permitting standard may be revised only if such revision is subject to and consistent with the antidegradation policy established under this section.

Backsliding from the Total Thallium WQBELs will not contribute to the degradation of Raccoon Creek consistent with the lack of reasonable potential. Therefore, backsliding is permissible.

Total Residual Chlorine

To determine if WQBELs are required for discharges containing total residual chlorine (TRC), a discharge evaluation is performed using a DEP program called TRC_CALC created with Microsoft Excel for Windows. TRC_CALC calculates TRC Waste Load Allocations (WLAs) through the application of a mass balance model which considers TRC losses due to stream and discharge chlorine demands and first-order chlorine decay. Input values for the program include flow rates and chlorine demands for the receiving stream and the discharge, the number of samples taken per month, coefficients of TRC variability, partial mix factors, and an optional factor of safety. The mass balance model calculates WLAs for acute and chronic criteria that are then converted to long term averages using calculated multipliers. The multipliers are functions of the number of samples taken per month and the TRC variability coefficients (normally kept at default values unless site specific information is available). The most stringent limitation between the acute and chronic long-term averages is converted to an average monthly limit for comparison to the BAT average monthly limit of 0.5 mg/l from 25 Pa. Code § 92a.48(b)(2). The more stringent of those average monthly TRC limitations is imposed in the permit.

The stream flow and discharge flow entered in the TRC_CALC spreadsheet are 9.6 cfs and 0.216 MGD, respectively. Acute and chronic partial mix factors of 0.478 and 1.0 are input into the spreadsheet based on values calculated by the TMS model. The results of the TRC_CALC analysis included in **Attachment D** indicate that no WQBELs are needed for TRC.

Total Dissolved Solids (TDS), Chloride, Bromide, and Sulfate

DEP ended its monitoring initiative for TDS, chloride, bromide, and sulfate in early 2021 after approximately seven years. DEP determined that enough data were collected to evaluate the effects of point source discharges of those pollutants on waters of the Commonwealth.

Consistent with DEP's ceased monitoring initiative, the TMS no longer recommends reporting for TDS, chloride, bromide, and sulfate unless reasonable potential exists. As the modeling results in **Attachment C** show, there is no reasonable potential for discharges of TDS, chloride, bromide, and sulfate from Outfall 006 to cause or contribute to an in-stream excursion above water quality criteria, and the discharge concentrations do not rise to the thresholds at which reporting is necessary. Therefore, reporting requirements for TDS, chloride, bromide, and sulfate will be removed from Outfall 001. The removal of those reporting requirements is consistent with 40 CFR §§ 122.44(l)(1) and 122.62(a)(2) regarding the allowance for backsliding based on new information.

006.C. Effluent Limitations and Monitoring Requirements for Outfall 006

Effluent limits imposed at Outfall 006 are the more stringent of TBELs, WQBELs, regulatory effluent standards, and monitoring requirements as described in Sections 006.A and 006.B, above. Effluent limits that are not modified as part of this NPDES permit renewal are maintained in the renewed permit based on anti-backsliding. Applicable effluent limits and reporting requirements are summarized in the table below.

Table 9. Effluent Limits and Monitoring Requirements for Outfall 006

Parameter	Mass (pounds/day)		Concentration (µg/L)			Basis
	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Instant Maximum	
Flow (MGD)	Report	Report	—	—	—	25 Pa. Code § 92a.61(b) & 40 CFR & 122.44(l)

Table 9 (continued). Effluent Limits and Monitoring Requirements for Outfall 006

Parameter	Mass (pounds/day)		Concentration (mg/L)			Basis
	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Instant Maximum	
pH (S.U.)	—	—	6.0 Inst. Min.	—	9.0	25 Pa. Code § 92a.48(a)(2) & 95.2(1)
Total Residual Chlorine (TRC)	—	—	0.5	1.0	—	25 Pa. Code § 92a.48(b)(2)
Total Suspended Solids	—	—	30.0	100.0	—	BPJ TBELs; 25 Pa. Code § 92a.48(a)(3) & 40 CFR & 122.44(l)
Aluminum, Total	—	—	3.8	7.0	—	BPJ TBELs; 25 Pa. Code § 92a.48(a)(3) & 40 CFR & 122.44(l)
Antimony, Total	0.3	0.33	0.166	0.183	0.414	WQBELs; 25 Pa. Code §§ 92a.12(a)(1) & 96.4(b)
Arsenic, Total	—	—	Report	Report	—	25 Pa. Code § 92a.61(b) & 40 CFR & 122.44(l)
Iron, Total	—	—	5.0	12.0	—	BPJ TBELs; 25 Pa. Code § 92a.48(a)(3) & 40 CFR & 122.44(l)
Lead, Total	—	—	Report	Report	—	25 Pa. Code § 92a.61(b) & 40 CFR & 122.44(l)
Manganese, Total	—	—	0.14	0.22	—	BPJ TBELs; 25 Pa. Code § 92a.48(a)(3) & 40 CFR & 122.44(l)
Selenium, Total	—	—	0.07	0.14	—	BPJ TBELs; 25 Pa. Code § 92a.48(a)(3) & 40 CFR & 122.44(l)
Selenium, Dissolved	—	—	Report	Report	—	25 Pa. Code § 92a.61(b) & 40 CFR & 122.44(l)
Zinc, Total	—	—	0.6	1.0	—	BPJ TBELs; 25 Pa. Code § 92a.48(a)(3) & 40 CFR & 122.44(l)
Hexachlorobutadiene (µg/L)	—	—	Report	Report	—	25 Pa. Code § 92a.61(b) & 40 CFR & 122.44(l)
Perfluorooctanoic acid (PFOA) (ng/L)	—	—	—	Report	—	25 Pa. Code § 92a.61(b)
Perfluorooctanesulfonic acid (PFOS) (ng/L)	—	—	—	Report	—	25 Pa. Code § 92a.61(b)
Perfluorobutanesulfonic acid (PFBS) (ng/L)	—	—	—	Report	—	25 Pa. Code § 92a.61(b)
Hexafluoropropylene oxide dimer acid (HFPO-DA) (ng/L)	—	—	—	Report	—	25 Pa. Code § 92a.61(b)

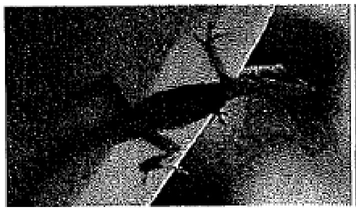
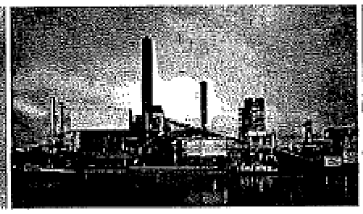
Monitoring frequencies and sample types are based on those in the existing permit and the recommendations from Chapter 6, Table 6-4 in DEP's "Technical Guidance for the Development and Specification of Effluent Limitations and Other Permit Conditions in NPDES Permits". All parameters are currently subject to grab sampling with a frequency 2/discharge except for flow, which must be measured 2/discharge. For this permit renewal DEP considers it appropriate to require routine monitoring at set intervals rather than discharge-event-based monitoring. Routine monitoring better correlates with the semi-continuous nature of the discharge and will facilitate improved process control. Therefore, the monitoring frequencies for all parameters other than flow and the newly added PFAS parameters will be changed to 1/week consistent with the self-monitoring requirements for process wastewaters in Table 6-4 of the aforementioned technical guidance. Discharge flow must be recorded 1/day using a flow meter. The PFAS parameters will be subject to grab sampling 1/year.

Befesa is expected to comply with the new WQBELs for Total Antimony. The most recent DMRs results that would have exceeded the proposed antimony WQBELs were reported in July 2016. Therefore, no schedule of compliance is included for the new limits.

Tools and References Used to Develop Permit	
☐	WQM for Windows Model (see Attachment)
☒	Toxics Management Spreadsheet (see Attachment C)
☒	TRC Model Spreadsheet (see Attachment D)
☐	Temperature Model Spreadsheet (see)
☒	Water Quality Toxics Management Strategy, 361-0100-003, 4/06.
☒	Technical Guidance for the Development and Specification of Effluent Limitations, 386-0400-001, 10/97.
☐	Policy for Permitting Surface Water Diversions, 386-2000-019, 3/98.
☐	Policy for Conducting Technical Reviews of Minor NPDES Renewal Applications, 386-2000-018, 11/96.
☐	Technology-Based Control Requirements for Water Treatment Plant Wastes, 386-2183-001, 10/97.
☐	Technical Guidance for Development of NPDES Permit Requirements Steam Electric Industry, 386-2183-002, 12/97.
☐	Pennsylvania CSO Policy, 386-2000-002, 9/08.
☐	Water Quality Antidegradation Implementation Guidance, 391-0300-002, 11/03.
☐	Implementation Guidance Evaluation & Process Thermal Discharge (316(a)) Federal Water Pollution Act, 386-2000-008, 4/97.
☐	Determining Water Quality-Based Effluent Limits, 386-2000-004, 12/97.
☐	Implementation Guidance Design Conditions, 386-2000-007, 9/97.
☐	Technical Reference Guide (TRG) WQM 7.0 for Windows, Wasteload Allocation Program for Dissolved Oxygen and Ammonia Nitrogen, Version 1.0, 386-2000-016, 6/2004.
☐	Interim Method for the Sampling and Analysis of Osmotic Pressure on Streams, Brines, and Industrial Discharges, 386-2000-012, 10/1997.
☐	Implementation Guidance for Section 95.6 Management of Point Source Phosphorus Discharges to Lakes, Ponds, and Impoundments, 386-2000-009, 3/99.
☐	Technical Reference Guide (TRG) PENTOXSD for Windows, PA Single Discharge Wasteload Allocation Program for Toxics, Version 2.0, 386-2000-015, 5/2004.
☐	Implementation Guidance for Section 93.7 Ammonia Criteria, 386-2000-022, 11/97.
☐	Policy and Procedure for Evaluating Wastewater Discharges to Intermittent and Ephemeral Streams, Drainage Channels and Swales, and Storm Sewers, 386-2000-013, 4/2008.
☐	Implementation Guidance Total Residual Chlorine (TRC) Regulation, 386-2000-011, 11/1994.
☐	Implementation Guidance for Temperature Criteria, 386-2000-001, 4/09.
☐	Implementation Guidance for Section 95.9 Phosphorus Discharges to Free Flowing Streams, 386-2000-021, 10/97.
☐	Implementation Guidance for Application of Section 93.5(e) for Potable Water Supply Protection Total Dissolved Solids, Nitrite-Nitrate, Non-Priority Pollutant Phenolics and Fluorides, 386-2000-020, 10/97.
☐	Field Data Collection and Evaluation Protocol for Determining Stream and Point Source Discharge Design Hardness, 386-2000-005, 3/99.
☐	Implementation Guidance for the Determination and Use of Background/Ambient Water Quality in the Determination of Wasteload Allocations and NPDES Effluent Limitations for Toxic Substances, 386-2000-010, 3/1999.
☐	Design Stream Flows, 386-2000-003, 9/98.
☐	Field Data Collection and Evaluation Protocol for Deriving Daily and Hourly Discharge Coefficients of Variation (CV) and Other Discharge Characteristics, 386-2000-006, 10/98.
☐	Evaluations of Phosphorus Discharges to Lakes, Ponds and Impoundments, 386-3200-001, 6/97.
☐	Pennsylvania's Chesapeake Bay Tributary Strategy Implementation Plan for NPDES Permitting, 4/07.
☒	SOP: Standard Operating Procedure for Clean Water Program Establishing Effluent Limitations for Individual Sewage Permits
☒	SOP: Standard Operating Procedure (SOP) for Clean Water Program – Establishing Effluent Limitations for Individual Industrial Permits
☐	Other:

ATTACHMENT A

Treatability Study Report


Treatability Study Report
Horsehead Corporation
Residual Waste Landfill NPDES Permit

Prepared for:
Horsehead Corporation
Pittsburgh, Pennsylvania

Prepared by:
ENVIRON International Corporation
Nashville, Tennessee

Date:
December 2014

Project Number:
20-34975A

ENVIRON

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Attachment 1: ENVIRON's Assessment of the PBR Technology

1 Introduction

ENVIRON International Corporation (ENVIRON) was retained by Horsehead Corporation (Horsehead) to assess potentially viable selenium treatment technologies and to perform treatability studies of water collected for discharge at Horsehead's Monaca, Pennsylvania residual waste landfill in connection with the issuance of an NPDES Permit for the discharge from the landfill. This report describes the results of ENVIRON's technology evaluation and treatability testing.

The draft NPDES Permit prepared by the Pennsylvania Department of Environmental Protection (PADEP) has lower limits for selenium, new limits for antimony and thallium, and the same limits for aluminum, iron, manganese, and zinc. PADEP developed the new limits for selenium based on a Best Professional Judgment (BPJ) evaluation of Best Available Technology (BAT) because there is no federal Effluent Limitation Guideline for the discharges from the landfill.

2 Evaluation of Potentially Viable Treatment Technologies

ENVIRON reviewed PADEP's BPJ evaluation for selenium, which is presented in the Draft NPDES Permit Fact Sheet issued by PADEP in March, 2014. The BPJ analysis included an evaluation of technologies that were described in a June 2010 CH2M Hill Report entitled, "Review of Available Technologies for the Removal of Selenium from Water" prepared by Tom Sandy and Cindy DiSante (Sandy and DiSante, 2010). The technologies evaluated are summarized as follows:

Biological Treatment	Physical/Chemical Treatment	Membrane Treatment
• Advanced Biological Metals Removal (ABMet®) • Algal-Bacterial Selenium Removal (ABSR) • Constructed Wetlands • Fluidized Bed Reactor • Passive Biochemical Reactor (PBR)	• Catalyzed Cementation • Ferrihydrite Adsorption • Ion Exchange • Zero Valent Iron (ZVI)	• Nanofiltration • Reverse Osmosis

Based on the BPJ evaluation, PADEP determined that effluent limitations achieved by the implementation of a Passive Biochemical Reactor (PBR) technology would be representative of BAT. The PBR technology is a biological reduction process that utilizes organic substrates for the reduction of selenium. According to PADEP, the technology was chosen based on the assumption that it would only require modifications to the existing pond, would not require power, and that it was well demonstrated. Based on PADEP's evaluation, application of BAT to the influent generated at the landfill would achieve a monthly average selenium limit of 0.011 milligrams per liter (mg/L). While ENVIRON concurs with the array of potential technologies identified by PADEP for the treatment of selenium, ENVIRON disagrees that PBR constitutes BAT for the discharge from the landfill. (See Horsehead's May 5, 2014 comments on the draft NPDES Permit that include ENVIRON's assessment of PBR that are attached to this Report (see Attachment 1).)

Using the criteria for a BPJ analysis of BAT for the discharge from the landfill, the only technology that ENVIRON believes could be potentially amenable to the treatment of selenium in addition to antimony, thallium, aluminum, iron, manganese, and zinc is ferrihydrite adsorption (or enhanced chemical precipitation). The enhanced chemical precipitation technology is an Environmental Protection Agency (EPA) Best Demonstrated Available Technology (BDAT) for the treatment of selenium in wastewaters including leachate because the technology is commercially available and can achieve selenium reductions in many cases (EPA, 1990).

The enhanced chemical precipitation technology consists of the introduction of a ferric salt that results in the adsorption of the selenite to ferrihydrite monohydrate amorphous solids, as well as potentially and to a lesser degree, ferric hydroxide solids (EPA, June 2001).

3 Treatability Test Overview

On August 20, 2014, ENVIRON and Horsehead personnel collected samples of the landfill influent water from a central collection point at the landfill, herein identified as Manhole 2[1] (MH2) water, to conduct jar treatability testing to simulate the effect of enhanced chemical precipitation. Jar treatability testing is an appropriate first-stage screening process to evaluate physical/chemical treatment technologies like enhanced chemical precipitation (EPA, September 2000). Jar testing is utilized to optimize chemical dosage rates, to evaluate reproducibility and implementability, and to estimate conceptual-level capital and operation and maintenance (O&M) costs for an installed full-scale system. For physical/chemical processes, jar treatability testing is a relatively low cost and quick way to preliminarily evaluate treatment effectiveness and full-scale costs before more extensive field-scale pilot testing is performed.

The treatability tests were performed by adding varying iron doses, polymer, and caustic to samples of MH2 water in order to precipitate selenium. Iron was first added, which lowered the pH to below 1 s.u., followed by caustic soda in order to raise the pH to 3.5 - 4.0 s.u, which is the optimal pH range for adsorption of the selenite to the iron (EPA, June 2001). Polymer is then added to coagulate the solids, which are then allowed to settle, before the final step of additional caustic that raises the pH to about 7.0 s.u. before a second settling step. The supernatant is then considered to be representative of the treated effluent.

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1 MH2 waters include comingled water from the Phase I and Phase II leachate collection system and Phase I spring drain system.

4 Treatability Tests for the External Enhanced Chemical Precipitation Treatment System

The treatability tests were performed in multi-step fashion by adding varying iron doses, polymer, and caustic to 1-liter samples of MH2 water in order to precipitate selenium. ENVIRON utilized a mechanical jar test apparatus equipped with mixing paddles to simulate full-scale mixing. Table 1 provides a summary of the treatability tests.

One-liter aliquots of MH2 water samples were added to glass beakers for each jar test. An initial pH was recorded for each aliquot. The influent water was initially tested to determine an effective iron dosage for selenium removal. ENVIRON's initial six iron dosages (as Fe) were: 100, 200, 300, 400, 1,000, and 2,000 mg/L (or ppm). Iron dosages were calculated as a ratio of Fe:Se. After reviewing the results, ENVIRON decided to use a 400 mg/L iron dose (as Fe) for future confirmatory tests since dosages less than 400 mg/L did not achieve optimal selenium reduction. Since there is an asymptotic relationship between the projected removal rates and the higher dosage rates, iron dosages above 400 mg/L are projected to result in excessive chemical costs, chemical storage requirements, and sludge generation rates as compared to the incremental improvement in selenium removal efficiency.

After the addition of each iron dose, 10N sodium hydroxide (caustic soda) was added to each sample in order to raise the pH to 3.5 - 4.0 s.u. Each sample was then rapidly mixed at 100 revolutions per minute (rpm) for 2 minutes before a 6 ppm polymer dose was added to each sample. Once polymer was added, each sample was flocculated at 60 rpm for 5 minutes and then allowed to settle for 10 to 30 minutes.

After adequate settling time, the aliquot supernatant was decanted and a second caustic was added to adjust the supernatant pH to 7.0 s.u.. A sample of the pH adjusted supernatant was then preserved for analysis. If filtered selenium analysis was required, a second sample of supernatant was filtered through Whatman 934-AH filter paper (1.5 micron (µm) pore size) before being preserved for analysis.

ENVIRON also performed several follow-up sampling jar tests to evaluate the observed manganese increases (via controlled tests with distilled water) and to evaluate if more efficient reduction could be achieved by first adding a mild reducing agent (sodium bisulfite) to reduce the oxidation reduction potential (ORP) of the sample from 412 millivolts to 108 millivolts, that was intended to result in the reduction of the selenate to selenite, before the iron addition step.

Table 2 provides a summary of the treatability test data (identified as "External Enhanced Chemical Precipitation Treatment"). Based on the results of the treatability testing discussed above and assuming an initial selenium concentration in the MH2 water (without storm water) of about 0.090 mg/L, ENVIRON was able to consistently achieve a 35 percent selenium reduction during the laboratory testing using an iron dose of 400 mg/L (as Fe) (or 4,000:1 (Fe:Se)). ENVIRON was not successful in improving selenium reduction with the use of sodium bisulfite, and was not able to ascertain the cause of the increase in manganese.

Based on a comparison of the external enhanced chemical precipitation treatability test results with the Draft NPDES Permit proposed monthly average effluent limitations, the external enhanced chemical precipitation technology is not able to achieve the proposed limitations for selenium or manganese.[2] However, compliance with the proposed water quality-based effluent limits (WQBELs) for selenium is possible (see Table 2).

Table 2 also includes a conceptual-level capital and O&M cost estimate for the external enhanced chemical precipitation treatment technology. A conceptual design of the external treatment system would include a collection sump, three mix tanks, two clarifiers, and pumps and piping systems. All equipment, except the collection sump, would be located in a new engineered building. Conceptual-level capital costs are estimated to be $1,000,000 with an annual O&M costs ranging from $150,000 to $200,000 per year assuming an influent flow of 20 gallons per minute (gpm), which includes Phase II spring drain system waters.[3] Utilizing the cost estimating procedure established by EPA in development of the Landfill Effluent Limit Guidelines (ELGs), ENVIRON estimated the annualized cost for the removal of selenium via the external chemical precipitation technology to be about $100,000 per pound selenium removed (see Table 3).

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2 Additional testing is required to evaluate if effluent limits for manganese could be met using the described Enhanced Chemical Precipitation Treatment Technology.

3 Water from the Phase II spring drain system will be routed to MH2 where it will be combined with water from the Phase I and Phase II leachate drain systems and the Phase I spring drains system, before the combined flow is treated.

5 Treatability Tests for the Modified Enhanced Chemical Precipitation Treatment System

Based on the treatability testing described above, Horsehead requested ENVIRON to assess an alternate treatment scenario that might achieve selenium removal in a manner that would satisfy the requirements for a BAT system. ENVIRON proposed the use of a modified enhanced chemical precipitation treatment system that could be integrated with the pond treatment system currently in place. ENVIRON developed a modified treatability test protocol to preliminarily evaluate the potential effectiveness of this treatment system.

The modified jar test procedure was performed using a 1-liter aliquot of MH2 water. After an initial pH of the sample was noted, a 400 mg/L iron dose (as Fe), 1.25 mL caustic dose, and 6 mL of polymer were quickly added at once. The sample was then mixed at 60 rpm for 10 seconds before being allowed to settle. After 20 minutes of settling time (versus 10 minutes for the standard test), the supernatant was decanted and a second caustic addition was utilized to adjust the supernatant pH to 7.0 s.u.. A sample of this supernatant was then preserved for analysis, while a second sample of the supernatant was filtered through Whatman 934-AH filter paper (1.5 µm pore size) before being preserved for analysis for filtered selenium. A duplicate sample of the MH2 water was analyzed for total selenium to verify that the influent selenium concentration had not changed while stored in ENVIRON's treatability sample storage cooler. Table 1 provides a summary of the treatability tests.

Table 2 provides a summary of the treatability test data (identified as "Modified Enhanced Chemical Precipitation Treatment"). Based on the results of the modified treatability testing discussed above and assuming an initial selenium concentration of the MH2 water (without storm water) of about 0.090 mg/L, ENVIRON was able to preliminarily achieve a 20% selenium reduction during the initial laboratory testing, though further testing might yield slightly better results.

Based on a comparison of the modified enhanced chemical precipitation treatability test results with the Draft NPDES Permit proposed monthly average effluent limitations, the modified enhanced chemical precipitation technology is not able to achieve the proposed limitations for selenium or manganese.[4] However, compliance with the proposed WQBELs for selenium is possible, with an added cushion if the WQBELs are calculated assuming a 1.0 Partial Mix Factor in PADEP's PENTOXSD Version 2.0d model (see Table 2).

Table 2 also includes a conceptual-level capital and O&M cost estimate for the modified enhanced chemical precipitation treatment technology. For the modified treatment design, ENVIRON would need to further assess the potential of modifying the existing inlet structure to allow for the addition of iron, polymer, and caustic before MH2 water enters the existing pond. ENVIRON would also need to evaluate installing a static mixer in the inlet structure to aid in chemical mixing, and building berms in the existing pond in order to section off the pond into

4 Additional tests are required to evaluate if effluent limits for manganese could be met using the described Enhanced Chemical Precipitation Treatment Technology.

four separate basins (see Figure 2). Chemically treated MH2 water would enter the first basin for mixing/settling, the second basin for a second caustic addition and settling, and the third and fourth basin for additional settling before being discharged. Conceptual-level capital costs are estimated to be $550,000 with annual O&M costs of about $150,000 per year assuming an influent flow of 20 gpm (including Phase II spring drain system waters).

6 Conclusions

The goal of the treatability testing was to determine the efficacy of enhanced chemical precipitation for the treatment of selenium and other regulated metals. Two systems were evaluated - an external standalone treatment system and a system based on modifying the existing pond treatment system. The results from this testing show that enhanced chemical precipitation can likely achieve a 35 percent removal of selenium under laboratory testing for the external system with costs estimated to be in excess of $1,000,000 and O&M costs that are equally excessive given the projected removal rate; and about 20 percent removal for the modified system with costs that are projected to be less. Additional testing to verify the projected removal rate and an engineering evaluation is required before any conclusions can be reached on the viability of such a system given the preliminary nature of the test results.

7 References

Sandy, Tom and Cindy Disante, P.E. Review of Available Technologies for the Removal of Selenium from Water, Final Report, CH2M Hill, June 2010.

Final Best Demonstrated Available (BDAT) Background Document for K031, K084, K101, K102, Characteristic Arsenic Wastes (D004), Characteristic Selenium Wastes (D010), and P and U Wastes Containing Arsenic and Selenium Listing Constituents, U.S Environmental Protection Agency, Office of Solid Waste, May 1990.

Wastewater Technology Fact Sheet, Chemical Precipitation, United States Environmental Protection Agency, Office of Water (EPA 832-F-00-018, September 2000).

Selenium Treatment/Removal Alternatives Demonstration Project, Mine Waste Technology Program Activity III, Project 20, National Risk Management Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268 (EPA/600/R-01/077, June 2001).

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Tables

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TABLE 1
Treatability Test Setup at 400 MG/L Iron Dosage Rate
Horsehead Monaca Landfill

PARAMETER	UNITS	EXTERNAL TREATED MH2 WATERS	DI pH 7	DI pH 8	DI pH 8	BISULFITE ADDITION	MODIFIED TREATED MH2 WATERS	COMMENTS
Test Date	—	8/28	9/11	9/11	9/11	9/17	11/5	
Test Volume	L	1.0	1.0	1.0	1.0	1.0	1.0	
Initial pH	s.u.	9.4	6.4	6.4	9.24	9.53	9.29	
Initial Selenium	ug/L	92.4	—	—	92.4	92.4	97.3	~0.1 mg/L
Iron Dose (as Fe)	mg/L	400	400	400	400	400	400	
Adjusted pH	s.u.	3.88	4.05	4.02	4.04	4.06	3.28	3.5-4.0 s.u.
Caustic / Acid Added	mL	1.25	1.75	1.75	1.25	1.25	1.25	
Rapid Mix Time	min	2	2	2	2	2	10 sec	1-2 minutes
Rapid Mix Speed	rpm	100	100	100	100	100	60	100-120
Anionic Polymer Dose	ppm	6	6	6	6	6	6	
Flocculation Time	min	5	5	5	5	5	5	2-5 min
Flocculation Speed	rpm	60	60	60	60	60	60	
Settling Time	min	10	10	10	10	10	20	5-10 min
Sludge Volume	mL	190	50	50	190	200	100	
Supernatant pH	s.u.	6.94	6.95	7.98	8.03	8.03	6.97	Adjust to 7.0 s.u.
Caustic / Acid Added	mL	<1	<0.1	<0.1	0.1	<0.1	0.15	

TABLE 2
Treatability Data Summary Results with Comparison to the Proposed Limits
Horsehead Monaca Landfill

	SELENIUM (ppm)	ALUMINUM (ppm)	ANTIMONY (ppm)	IRON (ppm)	MANGANESE[3] (ppm)	THALLIUM (ppm)	ZINC (ppm)	CONCEPTUAL CAPITAL ($)	CONCEPTUAL O&M ($)
PERMIT LIMITS									
CURRENT MONTHLY AVG LIMITS[1]	0.030	3.8	–	5.0	0.14	–	0.6		
CURRENT MONTHLY AVG WQBELS[1]	0.38	38.5	0.77	115.4	76.9	–	5.7		
PROPOSED MONTHLY AVG LIMITS	0.01	3.8	0.08	5.0	0.14	0.003	0.6		
PROPOSED MONTHLY AVG WQBELS (50% mixing factor)[2]	0.07	6.4	0.08	12.0	–	0.003	1.0		
TREATMENT TECHNOLOGY ACHIEVABILITY									
INFLUENT MH2 WATERS (NO STORMWATER)	0.090	5.8	0.15	0.47	0.01	<0.002	0.7	–	–
EXTERNAL ENHANCED CHEMICAL PRECIPITATION TREATMENT	0.060	2.5	0.003	0.78	0.52	<0.002	0.4	1,000,000[4]	150,000-200,000
MODIFIED ENHANCED CHEMICAL PRECIPITATION TREATMENT	0.070	0.090[3]	0.004	3.58[3]	0.66	<0.002	0.03[3]	550,000[4]	150,000[5]

Notes:
1. Stormwater included.
2. WQBELS based on 100% mixing factor estimated to be twice the proposed WQBELS.
3. Results require further review.
4. Enhanced chemical precipitation conceptual capital costs estimated with a 50% contingency.
5. Conceptual O&M cost estimates for enhanced chemical precipitation are highly dependent upon chemical usage. Power, labor, sludge disposal, and maintenance are also included in the estimates.

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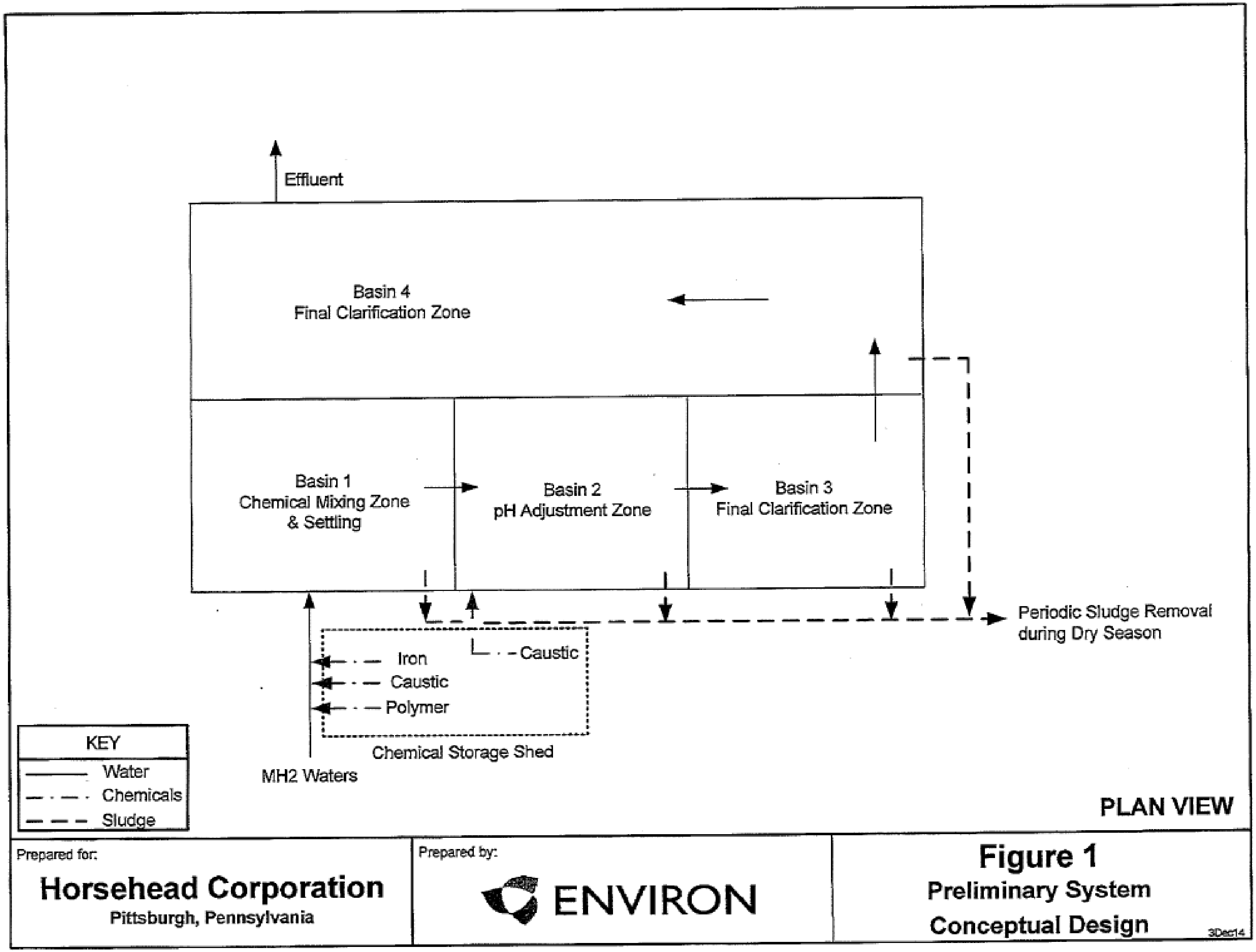
TABLE 3
Estimated Cost of Selenium Treatment by External Enhanced Chemical Precipitation
Horsehead Monaca Landfill

Parameter	Units	Without Stormwater	Comments/Source
Design Flow Rate	gpm	20	MH2 waters and Phase II Spring Underdrain System
Influent Se Concentration	mg/L	0.090	Recent sampling events
Effluent Se Concentration	mg/L	0.060	35% removal efficiency
Selenium Removal Rate	lb/d	0.0072	Mass removal based on 35% removal efficiency
	lb/yr	3	
Capital Cost Estimate	$	1,000,000	Conceptual estimation from treatability study
Annualization Rate	%	7%	Landfill ELG Guidance
Facility Life	yrs	15	Landfill ELG Guidance
Annualized Factor		9	
Annualized Capital Cost	$/yr	109,795	
O&M Cost Estimate	$/yr	150,000	Conceptual estimation from treatability study
Total Annualized Cost	$/yr	259,795	Sum of annualized capital + O&M
Equivalent Cost of Treatment	*$/lb Se*	*100,000*	

Figures


Effluent
Basin 4
Final Clarification Zone
Basin 1
Chemical Mixing Zone
& Settling
Basin 2
pH Adjustment Zone
Basin 3
Final Clarification Zone
Periodic Sludge Removal
during Dry Season
Caustic
Iron
Caustic
Polymer
Chemical Storage Shed
MH2 Waters
KEY
Water
Chemicals
Sludge
PLAN VIEW
Prepared for:
Horsehead Corporation
Pittsburgh, Pennsylvania
Prepared by:
ENVIRON
Figure 1
Preliminary System
Conceptual Design
3Dec14

Attachment 1

ENVIRON's Assessment of the PBR Technology

ENVIRON

ENVIRON

May 2, 2014

Via Electronic Mail

Mr. Marc Gold, Esq.
Manko, Gold, Katcher, Fox, LLP
401 City Avenue, Suite 901
Bala Cynwyd, Pennsylvania 19004

Re: ENVIRON Comments on Application of Best Professional Judgment by the Pennsylvania Department of Environmental Protection for Horsehead Corporation's Landfill in Monaca, Pennsylvania

Dear Mr. Gold:

This letter provides ENVIRON's comments on the application of Best Professional Judgment (BPJ) by the Pennsylvania Department of Environmental Protection (PADEP) and the methodology used in selecting a control technology for removal of selenium from landfill leachate and storm water as described in the Fact Sheet that accompanied draft NPDES Permit No. PA0254584 for Horsehead Corporation's Landfill. ENVIRON's comments are divided into the following sections:

- Review of relevant site-specific conditions;
- Overall technology evaluation for selenium removal;
- Review of the PADEP BPJ evaluation; and,
- Specific comments on the selection of the passive biochemical reactor (PBR) as the Best Available Technology Economically Achievable (BAT).

1. Review of Relevant Site-Specific Conditions

Several critical site specific factors were not fully considered in PADEP's evaluation of PBR as the technology selected as a result of the BPJ analysis.

Comment #1-1: ***Horsehead expects to close the landfill in the near term, which would impact the future characteristics of the leachate water and storm water to be treated.*** Once the landfill is closed in accordance with an approved Closure Plan, the storm water that contributes to overland flow would no longer contact the material in the landfill containing selenium; thus, the selenium concentration in the storm water is anticipated to decrease. This may also reduce the amount of storm water that infiltrates the landfill leading to lower volumes of landfill leachate. Given the changes in landfill operation and resulting changes expected in the influent characteristics, selecting a BAT technology for the discharge is premature.

Comment #1-2: ***The sedimentation pond receives water from multiple sources that have not been characterized for potential source reduction opportunities.*** Under current operating conditions, the landfill leachate comes from two different areas of the landfill based on its construction over time. Additionally, a spring located under Phase One of the landfill, and a second adjacent spring, provide flow to the sedimentation pond. The fifth source to the pond is storm water runoff via overland flow. The five individual sources, including the storm water, were not considered in any detail in the PADEP BPJ evaluation. Considering the different individual potential sources of selenium, and the fact that they are likely to change over time, selecting a BAT technology is premature.

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<u>Comment #1-3:</u> ***The current site does not have available power for treatment equipment.*** The cost analysis did not include an allowance for developing the necessary infrastructure to supply power to the site, where power would be required for the proposed treatment steps. This factor would be expected to add significantly to the projected costs.

2. Technology Evaluation

PADEP evaluated eleven technologies that have demonstrated pilot-scale or full-scale applications. The technologies included in the Fact Sheet are summarized as follows:

Biological Treatment	Physical/Chemical Treatment	Membrane Treatment
• Advanced Biological Metals Removal (ABMet®) • Algal-Bacterial Selenium Removal (ABSR) • Constructed Wetlands • Fluidized Bed Reactor • Passive Biochemical Reactor (PBR)	• Catalyzed Cementation • Ferrihydrite Adsorption • Ion Exchange • Zero Valent Iron (ZVI)	• Nanofiltration • Reverse Osmosis

The primary reference cited in the Fact Sheet is a selenium control technology evaluation prepared by Sandy and DiSante of CH2M HILL[1].

<u>Comment #2-1:</u> ***PADEP's technology review did not include an evaluation of modifications to the existing treatment processes.*** PADEP stated that "Sedimentation, the technology employed by Horsehead at Outfall 006, is not an effective technology for the removal of dissolved selenium."[2] However, PADEP did not consider any modifications to the existing treatment system that would enhance the precipitation of dissolved selenium species. For example, PADEP did not address the potential for precipitation/adsorption by introduction of a ferrous salt. A chemical addition process upstream of the existing sedimentation pond could provide treatment of the dissolved selenium that would be collected in the existing sedimentation pond. This treatment process would provide "reduction of selenate to selenite, followed by adsorption of the selenite to the ferrihydrite monohydrate amorphous solids…as well to a lesser degree the ferric hydroxide solids."[3] This process would also address treatment of selenate, which PADEP states "must first be reduced to selenite" in its review of the ferrihydrite precipitation technology.[4] Depending on the speciation of selenium in the landfill, chemical addition with either ferrous or ferric iron to the existing treatment system would be expected to reduce selenium concentrations and could be implemented for less capital cost than the technologies included in PADEP's BPJ evaluation.

3. PADEP's Best Professional Judgment Evaluation

According to the Fact Sheet and as required pursuant to 40 CFR Part 125.3(d)(3), PADEP considered the following factors in its BPJ evaluation for selenium treatment at the Horsehead Landfill[5]:

- Age of equipment and facilities involved;
- Process employed;

[1] Sandy, T. and DiSante, C. *Review of Available Technologies for the Removal of Selenium from Water.* Report prepared for the North American Metals Council, June 2010.
[2] *NPDES Fact Sheet, p. 6.*
[3] Sandy & DiSante, p. 4-53.
[4] *NPDES Fact Sheet*, p. 11
[5] *NPDES Fact Sheet, p. 7.*

- Engineering aspects of the application of various types of control techniques;
- Process changes;
- Cost of achieving such effluent reduction; and,
- Non-water quality environmental impacts (including energy requirements).

As further described in the comments below, PADEP did not appropriately apply these factors pursuant to 40 CFR 125.3(d)(3). As such, the treatment approach chosen as the Best Available Technology Economically Achievable (BAT) under the BPJ evaluation is not appropriate.

Comment #3-1: ***In performing the BPJ evaluation under 40 CFR 125(d)(3), PADEP should have considered additional factors required pursuant to 40 CFR 125(c)(2).*** Pursuant to 40 CFR 125(c)(2)(i) and (ii), PADEP should have also considered appropriate technologies for the category or class of point sources of which Horsehead is a member, based on available information, as well as any unique factors relating to the applicant. Furthermore, the PADEP *Technical Guidance for the Development and Specification of Effluent Limitations and Other Permit Conditions in NPDES Permits*[6,7] specifically requires the permit writer to first review any existing EPA reports/documents regarding pending or former potentially applicable ELGs, and proactively reach out to others at PADEP and EPA to evaluate if there are similar technologies employed for other similar industries (i.e. other captive landfills) across the state or nation with similar wastewater characteristics, before performing any additional site-specific analyses. PADEP does not present information about sources identified by PADEP that have any similar characteristics to the Landfill where the technologies identified are successfully in use.

Comment #3-2: ***The associated developed costs of treatment for selenium were not evaluated effectively to determine how they would impact Horsehead's operations.*** PADEP evaluated a variety of published information on treatment technologies for selenium. When undertaking the same exercise, EPA typically utilizes the "wholly disproportionate cost test" in making BAT determinations. A technology may not be considered BAT if the cost of a technology is wholly disproportionate to the environmental benefit to be gained. It would have been appropriate for PADEP to have performed this or another more rigorous cost evaluation in its consideration of the PBR technology. This is particularly relevant, given the fact that the Landfill is expected to close in the near term.

As an illustrative example, in establishing the ELGs for landfills[8], EPA considered a "reasonable cost of treatment" (i.e., not wholly disproportionate) that resulted in $14 per pound of constituent removed[9] that it found to be reasonable in determining BAT for development of Effluent Limit Guidelines (ELGs) for the conventional pollutants (BOD_5, TSS, pH) and toxic pollutants (ammonia, arsenic (total), chromium (total), zinc (total), alpha-terpineol, aniline, benzoic acid, naphthalene, p-cresol, phenol, pyridine). The $14 per pound of constituent removed are based on the scaling of an annualized cost of $7.6 Million (1998 dollars) for the treatment of the ELG-specific parameters, estimated at 900,000 pounds per year total.[9] Based on the cost estimates provided in the Fact Sheet by PADEP, the cost of treatment for selenium at the Horsehead Landfill is projected to be significantly higher than this value. Per the calculations shown in Table 1 below, the cost of treatment for selenium is estimated at approximately $6,000 per pound of selenium removal for PBR, the lowest-cost technology considered by PADEP.

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[6] *Document No. 362-0400-001 10/97.*
[7] Pages 7 and 8 of Chapter 2 - Developing Technology-Based Effluent Limitations.
[8] *Federal Register: January 19, 2000 (Volume 65, Number 12, Page 3307-3061).*
[9] Though the ELGs are not applicable to captive landfills, there is a large discrepancy between the "reasonable cost of treatment" developed by EPA versus the pound removal cost developed by PADEP.

Table 1. Estimated Cost of Selenium Treatment by Passive Biochemical Reactor

Parameter	Units	Design Value	Comments/Source
Design Flow Rate	mgd	0.127	NPDES Fact Sheet, p.4
Influent Se Concentration	mg/L	0.071	NPDES Fact Sheet, p. 16
Effluent Se Concentration	mg/L	0.011	BPJ from NPDES Fact Sheet, p. 16
Selenium Removal Rate	lb/d	0.064	Mass removal required per BPJ
	lb/yr	23.2	
Capital Cost Estimate	$	$1,000,000	NPDES Fact Sheet, Table 3, p. 16
Annualization Rate	%	7%	Landfill ELG Guidance[10]
Facility Life	yrs	15	Landfill ELG Guidance[10]
Annualized Capital Cost	$/yr	$109,795	
O&M Cost Estimate	$/yr	$30,000	NPDES Fact Sheet, Table 3, p. 16
Total Annualized Cost	$/yr	$139,795	Sum of annualized capital + O&M
Equivalent Cost of Treatment	*$/lb Se*	***$6,023***	

Comment #3-3: ***The PBR technology will require site-specific testing.*** The Sandy & DiSante report specifically states that PBR "technology requires bench-scale and pilot-scale testing to estimate site and effluent specific design parameters and removal effectiveness." Furthermore, PADEP acknowledges that "consistently attaining 5 μg/L of selenium in treated effluent by any particular technology is strongly dependent on site specific factors." The primary objective for pilot testing of any selenium technology at this site would be to establish full-scale design criteria for such parameters as hydraulic retention time, optimum operating conditions, chemical addition rates, and expected range of removal efficiency. Projections of influent quality under future operating conditions (i.e., changes in leachate and stormwater quality from the closure of the landfill) would need to be considered to establish representative influent conditions for any such study or design of a treatment system. As such, there is no technical basis and insufficient data to now conclude that PBR is the proper option.

4. PADEP's Calculation of BAT

In order to determine effluent limitations representative of BAT for the installation of a PBR at the Horsehead Landfill site, PADEP employed the following approach:

- The treatment system influent concentration was the average of four data points (average 0.071 mg/L, range of 0.064 to 0.082 mg/L);
- The expected removal efficiency was calculated as the average removal efficiency of five case studies (four pilot, one full scale) from the Sandy & DiSante report (average 84 percent, range 66 to 97 percent); and,
- The monthly average concentration for BAT was calculated as the average influent concentration multiplied by the expected removal efficiency (0.071 mg/L x 84 percent removal = 0.011 mg/L).

[10] *Economic Analysis of Final Effluent Limitations Guidelines and Standards for the Landfills Point Source Category. EPA Document No. EPA-821-B-99-005, November 1999, p. 11-2.*

Comment #4-1: ***The calculated removal efficiency does not take into consideration the influent/effluent selenium concentrations for the case studies included in the calculation.*** The highest percent removal among the five case study results listed in Table 2 of the Fact Sheet (96.7 percent) was reported for a system treating an influent selenium concentration of 1.5 mg/L, or approximately 20 times the expected influent concentration for the Horsehead site. In addition, this case study reported an effluent concentration of 0.050 mg/L, which would not meet the proposed calculated limit of 0.011 mg/L. Excluding this case study from the data set would result in a revised expected removal efficiency of 81 percent in place of the 84 percent.

Comment #4-2: ***The case studies used to project removal efficiency were conducted on mining wastewater rather than landfill leachate.*** PADEP states that the "removal rates reported for the mining discharge scenarios should be comparable to those achievable for Horsehead's landfill discharges because metals are the primary pollutants of concern for both types of wastewaters."[11] However, it is unclear whether the presence of coal fly ash in the Horsehead landfill will influence the wastewater matrix for this application. For example, Blumenstein *et al.*[12] report that the PBR process will add hardness, alkalinity, and organic material to the water. These impacts are generally considered beneficial for mining wastewater, which is fairly acidic. The case studies reported by Sandy and DiSiante, all conducted on mining water, also begin with low-pH wastewater. However, the Horsehead landfill leachate is basic and already contains high levels of hardness. It is unclear if this difference in influent pH, or other differences between the mining waste and Horsehead leachate, will impact PBR performance and effluent quality. Additionally, once the landfill is closed (see Comment #1-1), the influent characteristics are likely to change, potentially impacting PBR applicability.

Comment #4-3: ***The calculated expected removal efficiency for PBR in this application relies largely on pilot data.*** These data are not as reliable as full-scale, long-term operating data to establish expected removal efficiencies. In particular, full-scale operational data can address such factors as seasonal variability, projected operating life of the carbon source media, nutrient requirements, or changes in influent quality. One of the disadvantages of PBR noted by PADEP in Table 2 of the Fact Sheet is that "long-term performance unknown".[13] An additional disadvantage of PBR technology sited in Table 2 of the Fact Sheet is the "potential for re-mobilization of selenium," which would impact the removal efficiency.

Comment #4-4: ***The basis for the cost estimates given for the PBR technology is not explicitly stated.*** The Fact Sheet states that "Costs are estimated based on…cost curves provided in CH2M HILL's 'Review of Available Technologies for the Removal of Selenium from Water' from June 2010 (adjusted for inflation)."[14] However, the pertinent section of the referenced report (§4.4.3.2) does not provide any cost curves for PBR systems.

Comment #4-5: ***It is unclear whether the reported capital and operation/maintenance costs given in Table 3 of the Fact Sheet account for the potential requirement of post-aeration and settling treatment processes.*** A pilot study conducted by Blumenstein and Gusek[15] noted the observed effluent BOD concentration from the PBR ranged between 100-200 mg/L after six months of operation, although they state that other passive treatment sites typically achieve PBR effluent

[11] *Fact Sheet., p. 16.*
[12] Blumenstein *et al*, 2006. *Use of Enzyme Bioassays in a Simple Decision Tree for Assessing Aquatic Toxicity Potential of Mining Wastes.* USEPA Hard Rock Mining 2006 Conference, Tucson, AZ.
[13] *Fact Sheet, p. 15.*
[14] *Ibid.*, p.9.
[15] Blumenstein, E.P. and Gusek, J. *Overcoming the Obstacles of Operating a Biochemical Reactor and Aerobic Polishing Cell Year Round in Central Montana.* Proceedings of the 2009 National Meeting of the American Society of Mining and Reclamation, Billings, MT, May 30-June 5, 2009, p. 123.

BOD below 50 mg/L after the initial six months of operation. This BOD concentration would constitute a value greater than the expected WQBEL thus requiring investment in post-aeration and settling. Site specific treatment requirements and costs for any post-treatment were not developed by PADEP.

Comment #4-6: ***Nutrients may need to be supplemented throughout the life of the PBR treatment including Total Organic Carbon (TOC), phosphorus, and nitrogen.*** A pilot study conducted by Schipper and Rutkowski[16] indicated the need for monitoring nutrient loading to a PBR system, and that limited nutrient availability correlated with lower selenium removal rates. In addition to the required TOC source, it may also be necessary to add supplemental phosphorus or nitrogen to the PBR system (at additional cost). These operations and associated costs were not specifically addressed by PADEP.

We appreciate the opportunity to provide our input to Horsehead on these permitting issues.

Sincerely,

Ryan A. Kirkland, PE
Project Manager

Erik D. White
Senior Project Manager

Patrick J. Campbell
Principal

[16] Schipper R. and Rutkowski T. *Three-Year Pilot Case Study of Biochemical Reactor Treatment of Selenium.* Proceedings of the 2012 National Meeting of the American Society of Mining and Reclamation. Tupelo, MS. June 8 -15, 2012. p. 464

ATTACHMENT B

TOXCONC Evaluation

Facility: Befesa Zinc US Inc. - Monaca Landfill
NPDES #: PA0254584
Outfall No: 006
n (Samples/Month): 4
Reviewer/Permit Engineer:

Parameter Name	Aluminum	Antimony	Arsenic	Chloride	Iron	Lead	Manganese	Selenium, T	Sulfate	Thallium	TDS	Zinc	
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Detection Limit					0.05	0.005				0.0002			
Sample Date	*When entering values below the detection limit, enter "ND" or use the < notation (eg. <0.02)*												
02/01/22	3.5	0.12	0.075	28.2	0.5	0.017	0.02	0.08	1310	<0.001	2100	0.2	
03/01/22	2.2	0.12	0.067	36.4	0.2	0.012	0.02	0.08	1530	<0.001	2800	0.3	
04/01/22	1.3	0.12	0.057	48.6	0.1	0.0079	0.01	0.09	1700	<0.001	2880	0.2	
05/01/22	1.1	0.13	0.068	33.9	<0.05	0.0035	<0.0032	0.07	1370	<0.001	2400	0.1	
06/01/22	0.8	0.12	0.044	52	<0.05	0.0048	0.037	0.06	1950	<0.001	3200	0.2	
07/01/22	0.46	0.12	0.039	50.5	<0.05	0.0026	0.041	0.059	2050	<0.001	3400	0.28	
08/01/22	0.59	0.13	0.042	47	<0.05	0.0044	0.034	0.059	1950	<0.001	3000	0.34	
09/01/22	1.6	0.15	0.086	36.7	<0.1	0.0063	<0.01	0.068	1540	<0.00038	2500	0.12	
10/01/22	0.6	0.13	0.056	48.2	<0.1	0.0045	0.02	0.07	2050	<0.0002	3200	0.2	
11/01/22	3.2	0.12	0.069	51.4	0.24	0.019	0.037	0.061	2010	<0.00038	3000	0.34	
12/01/22	2.6	0.13	0.067	34.8	0.1	0.017	0.018	0.086	1590	<0.00038	2600	0.26	
01/01/23	2.6	0.13	0.067	32.7	0.12	0.017	0.017	0.088	1390	<0.00038	2400	0.26	
02/01/23	1.2	0.13	0.045	37	0.13	0.0074	0.025	0.083	1630	<0.00038	2600	0.22	
03/01/23	2.3	0.12	0.076	34.4	0.19	0.013	0.015	0.084	1560	<0.0002	2600	0.22	
04/01/23	1.1	0.13	0.077	35.5	0.1	0.0048	0.025	0.086	1620	<0.0002	2600	0.14	
06/01/23	0.83	0.11	0.065	45.5	0.21	0.0039	0.049	0.058	1980	<0.001	3200	0.26	
07/01/23	2.9	0.14	0.13	31.3	<0.048	0.0094	0.0037	0.066	1260	0.00047	2300	0.097	
08/01/23	3.1	0.15	0.11	30.3	<0.05	0.013	0.0031	0.073	1340	<0.00013	2300	0.17	
09/01/23	0.7	0.11	0.065	46.2	<0.047	0.0032	0.005	0.059	1940	<0.0002	3100	0.075	
10/01/23	0.87	0.11	0.038	53.4	0.11	0.0047	0.033	0.068	2350	<0.00013	3600	0.2	
11/01/23	3.7	0.11	0.054	51.5	<0.41	0.021	0.085	0.057	2290	<0.00038	3400	0.62	
12/01/23	1	0.12	0.042	42.5	<0.02	0.0072	0.012	0.077	1690	<0.00013	2800	0.093	
01/01/24	2.4	0.14	0.071	25.3	0.31	0.014	0.016	0.094	1270	<0.00038	2100	0.21	
02/01/24	2.9	0.13	0.085	26.6	<0.041	0.016	<0.005	0.093	1390	<0.00038	2400	0.17	

Facility: Befesa Zinc US Inc. - Monaca Landfill
NPDES #: PA0254584
Outfall No: 006
n (Samples/Month): 4

Parameter Name	Aluminum	Antimony	Arsenic	Chloride	Iron	Lead	Manganese	Selenium, T	Sulfate	Thallium	TDS	Zinc
Number of Samples	24	24	24	24	24	24	24	24	24	24	24	24
Samples Nondetected	0	0	0	0	12	0	3	0	0	23	0	0
LOGNORMAL												
Log MEAN	0.4074100	-2.0766433	-2.7593839	3.6634849	NA	-4.8226880	NA	-2.6212263	7.4201012	NA	7.9151731	-1.6258854
Log VAR.	0.4269664	0.0079558	0.0988242	0.0539200		0.4221245		0.0284801	0.0359064		0.0239086	0.2319467
(LTA) [E(x)]	1.8605892	0.1258499	0.0665387	40.0626661		0.0099357		0.0737565	1699.4405474		2771.4541949	0.2209294
Variance [V(x)]	1.8437544	0.0001265	0.0004599	88.9181369		0.0000518		0.0001572	105585.5148897		185853.9174770	0.0127419
CV (raw)	0.7297953	0.0893732	0.3222922	0.2353723		0.7247057		0.1699692	0.1912037		0.1555529	0.5109330
CV (n)	0.3648976	0.0446866	0.1611461	0.1176861		0.3623529		0.0849846	0.0956018		0.0777765	0.2554665
Monthly Avg. (99%, n-day)	3.9779353	0.1394884	0.0953345	52.2669678		0.0211454		0.0895225	2111.9554334		3310.1451232	0.3841683
DELTA-LOGNORMAL												
Delta-Log MEAN	NA	NA	NA	NA	-1.7831482	NA	-3.9668703	NA	NA	-7.6627779	NA	NA
Delta-Log VAR.					0.2684628		0.6946912			#DIV/0!		
(LTA) [E(x)]					0.1211290		0.0234460			#DIV/0!		
Variance [V(x)]					0.0107508		0.0007087			#DIV/0!		
CV (raw)					0.8559962		1.1354498			#DIV/0!		
Delta-Log VAR. (n)					0.1469030		0.2791372			#DIV/0!		
A, Table E-2, TSD					0.1930130		0.3223115			#DIV/0!		
B, Table E-2, TSD					-0.0105196		0.0000000			#DIV/0!		
C, Table E-2, TSD					0.0529643		0.0000000			#DIV/0!		
Delta-Log MEAN (n)					-2.1459495		-3.8923805			#DIV/0!		
phi (Φ)					0.9800000		0.9885714			0.7600000		
Z*					2.0500000		2.2700000			0.7000000		
Monthly Avg. (99%, n-day)					0.2566025		0.0676734			#DIV/0!		
NORMAL												
MEAN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VAR.												
(LTA) [E(x)]												
Variance [V(x)]												
CV (raw)												
CV (n)												
Monthly Avg. (99%, n-day)												

		Reviewer/Permit Engineer:	
Facility:	Befesa Zinc US Inc. - Monaca Landfill		
NPDES #:	PA0254584		
Outfall No:	006		
n (Samples/Month):	4		

Parameter	Distribution Applied	Coefficient of Variation (daily)	Avg. Monthly
Aluminum (mg/L)	Lognormal	0.7297953	3.9779353
Antimony (mg/L)	Lognormal	0.0893732	0.1394884
Arsenic (mg/L)	Lognormal	0.3222922	0.0953345
Chloride (mg/L)	Lognormal	0.2353723	52.2669678
Iron (mg/L)	Delta-Lognormal	0.8559962	0.2566025
Lead (mg/L)	Lognormal	0.7247057	0.0211454
Manganese (mg/L)	Delta-Lognormal	#NAME?	0.0676734
Selenium, T (mg/L)	Lognormal	0.1699692	0.0895225
Sulfate (mg/L)	Lognormal	0.1912037	2111.9554334
Thallium (mg/L)	Delta-Lognormal	#DIV/0!	#DIV/0!
TDS (mg/L)	Lognormal	0.1555529	3310.1451232
Zinc (mg/L)	Lognormal	0.5109330	0.3841683

TOXCON Output 5/22/2024

ATTACHMENT C

Toxics Management Spreadsheet Results for Outfall 001

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Toxics Management Spreadsheet
Version 1.4, May 2023

Discharge Information

Instructions | Discharge | Stream

Facility: **Befesa Zinc US Inc. - Monaca Landfill** NPDES Permit No.: **PA02564584** Outfall No.: **006**

Evaluation Type: **Major Sewage / Industrial Waste** Wastewater Description: **Landfill leachate and storm water**

Discharge Characteristics								
Design Flow (MGD)*	Hardness (mg/l)*	pH (SU)*	Partial Mix Factors (PMFs)				Complete Mix Times (min)	
			AFC	CFC	THH	CRL	Q_{7-10}	Q_h
0.216	190	8.7						

	Discharge Pollutant	Units		Max Discharge Conc	Trib Conc (0 if left blank)	Stream Conc (0 if left blank)	Daily CV (0.5 if left blank)	Hourly CV (0.5 if left blank)	Stream CV (0 if left blank)	Fate Coeff (0 if left blank)	FOS (0 if left blank)	Criteria Mod (1 if left blank)	Chem Transl (1 if left blank)
Group 1	Total Dissolved Solids (PWS)	mg/L		3310			0.1556						
	Chloride (PWS)	mg/L		52.27			0.2354						
	Bromide	mg/L		5									
	Sulfate (PWS)	mg/L		2112			0.1912						
	Fluoride (PWS)	mg/L		1.9									
Group 2	Total Aluminum	µg/L		3978		87.338	0.7298		0.6855				
	Total Antimony	µg/L		139			0.0894						
	Total Arsenic	µg/L		95.3			0.3223						
	Total Barium	µg/L		20									
	Total Beryllium	µg/L	<	0.5									
	Total Boron	µg/L		4000									
	Total Cadmium	µg/L		1.2									
	Total Chromium (III)	µg/L		5.7									
	Hexavalent Chromium	µg/L		5.8									
	Total Cobalt	µg/L		2.5									
	Total Copper	µg/L		12									
	Free Cyanide	µg/L											
	Total Cyanide	µg/L		21									
	Dissolved Iron	µg/L	<	60									
	Total Iron	µg/L		256.6		165.75	0.856		0.366				
	Total Lead	µg/L		21.15			0.7247						
	Total Manganese	µg/L		67.7		31.56			0.732				
	Total Mercury	µg/L		0.01									
	Total Nickel	µg/L		9.5									
	Total Phenols (Phenolics) (PWS)	µg/L	<	2									
	Total Selenium	µg/L		89.5			0.17						
	Total Silver	µg/L		0.52									
	Total Thallium	µg/L	<	1			0.2314						
	Total Zinc	µg/L		384		17.57	0.5109		0.791				
	Total Molybdenum	µg/L											
	Acrolein	µg/L	<	1.3									
	Acrylamide	µg/L	<	10									
	Acrylonitrile	µg/L	<	2									
	Benzene	µg/L	<	0.12									
	Bromoform	µg/L	<	0.37									

Group 3	Carbon Tetrachloride	µg/L	<	0.23									
	Chlorobenzene	µg/L		0.25									
	Chlorodibromomethane	µg/L	<	0.25									
	Chloroethane	µg/L	<	0.47									
	2-Chloroethyl Vinyl Ether	µg/L	<	3.1									
	Chloroform	µg/L		0.35									
	Dichlorobromomethane	µg/L	<	0.25									
	1,1-Dichloroethane	µg/L	<	0.05									
	1,2-Dichloroethane	µg/L	<	0.12									
	1,1-Dichloroethylene	µg/L	<	0.13									
	1,2-Dichloropropane	µg/L	<	0.26									
	1,3-Dichloropropylene	µg/L	<	0.47									
	1,4-Dioxane	µg/L	<	0.37									
	Ethylbenzene	µg/L	<	0.2									
	Methyl Bromide	µg/L	<	0.42									
	Methyl Chloride	µg/L	<	0.33									
	Methylene Chloride	µg/L		0.36									
	1,1,2,2-Tetrachloroethane	µg/L	<	0.38									
	Tetrachloroethylene	µg/L	<	0.27									
	Toluene	µg/L	<	0.24									
	1,2-trans-Dichloroethylene	µg/L	<	0.08									
	1,1,1-Trichloroethane	µg/L	<	0.12									
	1,1,2-Trichloroethane	µg/L	<	0.13									
	Trichloroethylene	µg/L	<	0.29									
	Vinyl Chloride	µg/L	<	0.33									
Group 4	2-Chlorophenol	µg/L	<	0.41									
	2,4-Dichlorophenol	µg/L	<	0.46									
	2,4-Dimethylphenol	µg/L	<	0.49									
	4,6-Dinitro-o-Cresol	µg/L	<	1.3									
	2,4-Dinitrophenol	µg/L	<	3									
	2-Nitrophenol	µg/L	<	0.41									
	4-Nitrophenol	µg/L	<	1.4									
	p-Chloro-m-Cresol	µg/L	<	0.41									
	Pentachlorophenol	µg/L	<	1.9									
	Phenol	µg/L	<	0.27									
	2,4,6-Trichlorophenol	µg/L	<	0.49									
Group 5	Acenaphthene	µg/L	<	0.42									
	Acenaphthylene	µg/L	<	0.41									
	Anthracene	µg/L	<	0.42									
	Benzidine	µg/L	<	2.6									
	Benzo(a)Anthracene	µg/L	<	0.43									
	Benzo(a)Pyrene	µg/L	<	0.38									
	3,4-Benzofluoranthene	µg/L	<	0.42									
	Benzo(ghi)Perylene	µg/L	<	0.44									
	Benzo(k)Fluoranthene	µg/L	<	0.41									
	Bis(2-Chloroethoxy)Methane	µg/L	<	0.46									
	Bis(2-Chloroethyl)Ether	µg/L	<	0.4									
	Bis(2-Chloroisopropyl)Ether	µg/L	<	0.46									
	Bis(2-Ethylhexyl)Phthalate	µg/L	<	0.85									
	4-Bromophenyl Phenyl Ether	µg/L	<	0.47									
	Butyl Benzyl Phthalate	µg/L	<	0.61									
	2-Chloronaphthalene	µg/L	<	0.42									
	4-Chlorophenyl Phenyl Ether	µg/L	<	0.42									
	Chrysene	µg/L	<	0.44									
	Dibenzo(a,h)Anthrancene	µg/L	<	0.45									
	1,2-Dichlorobenzene	µg/L	<	0.37									
	1,3-Dichlorobenzene	µg/L	<	0.43									
	1,4-Dichlorobenzene	µg/L	<	0.43									
	3,3-Dichlorobenzidine	µg/L	<	1.1									
	Diethyl Phthalate	µg/L	<	0.59									
	Dimethyl Phthalate	µg/L	<	0.44									
	Di-n-Butyl Phthalate	µg/L	<	0.6									
	2,4-Dinitrotoluene	µg/L	<	0.47									

	2,6-Dinitrotoluene	µg/L	<	0.43									
	Di-n-Octyl Phthalate	µg/L	<	0.92									
	1,2-Diphenylhydrazine	µg/L	<	0.4									
	Fluoranthene	µg/L	<	0.45									
	Fluorene	µg/L	<	0.4									
	Hexachlorobenzene	µg/L	<	0.45									
	Hexachlorobutadiene	µg/L	<	0.52									
	Hexachlorocyclopentadiene	µg/L	<	0.77									
	Hexachloroethane	µg/L	<	0.39									
	Indeno(1,2,3-cd)Pyrene	µg/L	<	0.42									
	Isophorone	µg/L	<	0.45									
	Naphthalene	µg/L	<	0.42									
	Nitrobenzene	µg/L	<	0.55									
	n-Nitrosodimethylamine	µg/L	<	1.2									
	n-Nitrosodi-n-Propylamine	µg/L	<	0.44									
	n-Nitrosodiphenylamine	µg/L	<	0.52									
	Phenanthrene	µg/L	<	0.41									
	Pyrene	µg/L	<	0.44									
	1,2,4-Trichlorobenzene	µg/L	<	0.44									
Group 6	Aldrin	µg/L	<	0.0068									
	alpha-BHC	µg/L	<	0.011									
	beta-BHC	µg/L	<	0.012									
	gamma-BHC	µg/L	<	0.012									
	delta BHC	µg/L	<	0.014									
	Chlordane	µg/L	<	0.068									
	4,4-DDT	µg/L	<	0.0068									
	4,4-DDE	µg/L	<	0.018									
	4,4-DDD	µg/L	<	0.018									
	Dieldrin	µg/L	<	0.011									
	alpha-Endosulfan	µg/L	<	0.0097									
	beta-Endosulfan	µg/L	<	0.011									
	Endosulfan Sulfate	µg/L	<	0.014									
	Endrin	µg/L	<	0.013									
	Endrin Aldehyde	µg/L	<	0.014									
	Heptachlor	µg/L	<	0.011									
	Heptachlor Epoxide	µg/L	<	0.0097									
	PCB-1016	µg/L	<	0.061									
	PCB-1221	µg/L	<	0.062									
	PCB-1232	µg/L	<	0.044									
	PCB-1242	µg/L	<	0.047									
	PCB-1248	µg/L	<	0.044									
	PCB-1254	µg/L	<	0.026									
	PCB-1260	µg/L	<	0.05									
	PCBs, Total	µg/L	<	0.334									
	Toxaphene	µg/L	<	0.19									
	2,3,7,8-TCDD	ng/L	<										
Group 7	Gross Alpha	pCi/L											
	Total Beta	pCi/L	<										
	Radium 226/228	pCi/L	<										
	Total Strontium	µg/L	<										
	Total Uranium	µg/L	<										
	Osmotic Pressure	mOs/kg											

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Toxics Management Spreadsheet
Version 1.4, May 2023

Stream / Surface Water Information

Befesa Zinc US Inc. - Monaca Landfill, NPDES Permit No. PA02564584, Outfall 006

Instructions | Discharge | Stream

Receiving Surface Water Name: **Raccoon Creek**

No. Reaches to Model: 1

- (●) Statewide Criteria
- ( ) Great Lakes Criteria
- ( ) ORSANCO Criteria

Location	Stream Code*	RMI*	Elevation (ft)*	DA (mi²)*	Slope (ft/ft)	PWS Withdrawal (MGD)	Apply Fish Criteria*
Point of Discharge	033564	1.28	685	183.59	0.0017		Yes
End of Reach 1	033564	1	684	183.82	0.0017		Yes

Q_{7-10}

Location	RMI	LFY (cfs/mi²)*	Flow (cfs)		W/D Ratio	Width (ft)	Depth (ft)	Velocity (fps)	Travel Time (days)	Tributary		Stream		Analysis	
			Stream	Tributary						Hardness	pH	Hardness*	pH*	Hardness	pH
Point of Discharge	1.28	0.052				130	4					382.7	8		
End of Reach 1	1	0.052													

Q_h

Location	RMI	LFY (cfs/mi²)	Flow (cfs)		W/D Ratio	Width (ft)	Depth (ft)	Velocity (fps)	Travel Time (days)	Tributary		Stream		Analysis	
			Stream	Tributary						Hardness	pH	Hardness	pH	Hardness	pH
Point of Discharge	1.28														
End of Reach 1	1														

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Toxics Management Spreadsheet
Version 1.4, May 2023

Model Results

Befesa Zinc US Inc. - Monaca Landfill, NPDES Permit No. PA02564584, Outfall 006

Instructions | Results | RETURN TO INPUTS | SAVE AS PDF | PRINT | ◉ All ○ Inputs ○ Results ○ Limits

☐ ***Hydrodynamics***

☑ ***Wasteload Allocations***

☑ ***AFC*** CCT (min): 15 PMF: 0.478 Analysis Hardness (mg/l): 369.56 Analysis pH: 8.02

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Dissolved Solids (PWS)	0	0		0	N/A	N/A	N/A	
Chloride (PWS)	0	0		0	N/A	N/A	N/A	
Sulfate (PWS)	0	0		0	N/A	N/A	N/A	
Fluoride (PWS)	0	0		0	N/A	N/A	N/A	
Total Aluminum	87.338017	0.6855		0	750	750	8,267	
Total Antimony	0	0		0	1,100	1,100	16,133	
Total Arsenic	0	0		0	340	340	4,986	Chem Translator of 1 applied
Total Barium	0	0		0	21,000	21,000	307,988	
Total Boron	0	0		0	8,100	8,100	118,796	
Total Cadmium	0	0		0	7.165	8.06	118	Chem Translator of 0.889 applied
Total Chromium (III)	0	0		0	1661.994	5,259	77,136	Chem Translator of 0.316 applied
Hexavalent Chromium	0	0		0	16	16.3	239	Chem Translator of 0.982 applied
Total Cobalt	0	0		0	95	95.0	1,393	
Total Copper	0	0		0	46.052	48.0	704	Chem Translator of 0.96 applied
Dissolved Iron	0	0		0	N/A	N/A	N/A	
Total Iron	165.75	0.366		0	N/A	N/A	N/A	
Total Lead	0	0		0	258.900	431	6,323	Chem Translator of 0.601 applied
Total Manganese	31.56	0.732		0	N/A	N/A	N/A	
Total Mercury	0	0		0	1.400	1.65	24.2	Chem Translator of 0.85 applied
Total Nickel	0	0		0	1414.904	1,418	20,793	Chem Translator of 0.998 applied
Total Phenols (Phenolics) (PWS)	0	0		0	N/A	N/A	N/A	
Total Selenium	0	0		0	N/A	N/A	N/A	Chem Translator of 0.922 applied
Total Silver	0	0		0	30.468	35.8	526	Chem Translator of 0.85 applied
Total Thallium	0	0		0	65	65.0	953	
Total Zinc	17.57	0.791		0	354.695	363	4,726	Chem Translator of 0.978 applied
Acrolein	0	0		0	3	3.0	44.0	

Acrylamide	0	0		0	N/A	N/A	N/A	
Acrylonitrile	0	0		0	650	650	9,533	
Benzene	0	0		0	640	640	9,386	
Bromoform	0	0		0	1,800	1,800	26,399	
Carbon Tetrachloride	0	0		0	2,800	2,800	41,065	
Chlorobenzene	0	0		0	1,200	1,200	17,599	
Chlorodibromomethane	0	0		0	N/A	N/A	N/A	
2-Chloroethyl Vinyl Ether	0	0		0	18,000	18,000	263,990	
Chloroform	0	0		0	1,900	1,900	27,866	
Dichlorobromomethane	0	0		0	N/A	N/A	N/A	
1,2-Dichloroethane	0	0		0	15,000	15,000	219,992	
1,1-Dichloroethylene	0	0		0	7,500	7,500	109,996	
1,2-Dichloropropane	0	0		0	11,000	11,000	161,327	
1,3-Dichloropropylene	0	0		0	310	310	4,546	
Ethylbenzene	0	0		0	2,900	2,900	42,532	
Methyl Bromide	0	0		0	550	550	8,066	
Methyl Chloride	0	0		0	28,000	28,000	410,651	
Methylene Chloride	0	0		0	12,000	12,000	175,993	
1,1,2,2-Tetrachloroethane	0	0		0	1,000	1,000	14,666	
Tetrachloroethylene	0	0		0	700	700	10,266	
Toluene	0	0		0	1,700	1,700	24,932	
1,2-trans-Dichloroethylene	0	0		0	6,800	6,800	99,730	
1,1,1-Trichloroethane	0	0		0	3,000	3,000	43,998	
1,1,2-Trichloroethane	0	0		0	3,400	3,400	49,865	
Trichloroethylene	0	0		0	2,300	2,300	33,732	
Vinyl Chloride	0	0		0	N/A	N/A	N/A	
2-Chlorophenol	0	0		0	560	560	8,213	
2,4-Dichlorophenol	0	0		0	1,700	1,700	24,932	
2,4-Dimethylphenol	0	0		0	660	660	9,680	
4,6-Dinitro-o-Cresol	0	0		0	80	80.0	1,173	
2,4-Dinitrophenol	0	0		0	660	660	9,680	
2-Nitrophenol	0	0		0	8,000	8,000	117,329	
4-Nitrophenol	0	0		0	2,300	2,300	33,732	
p-Chloro-m-Cresol	0	0		0	160	160	2,347	
Pentachlorophenol	0	0		0	24.422	24.4	358	
Phenol	0	0		0	N/A	N/A	N/A	
2,4,6-Trichlorophenol	0	0		0	460	460	6,746	
Acenaphthene	0	0		0	83	83.0	1,217	
Anthracene	0	0		0	N/A	N/A	N/A	
Benzidine	0	0		0	300	300	4,400	
Benzo(a)Anthracene	0	0		0	0.5	0.5	7.33	
Benzo(a)Pyrene	0	0		0	N/A	N/A	N/A	
3,4-Benzofluoranthene	0	0		0	N/A	N/A	N/A	
Benzo(k)Fluoranthene	0	0		0	N/A	N/A	N/A	
Bis(2-Chloroethyl)Ether	0	0		0	30,000	30,000	439,984	
Bis(2-Chloroisopropyl)Ether	0	0		0	N/A	N/A	N/A	
Bis(2-Ethylhexyl)Phthalate	0	0		0	4,500	4,500	65,998	
4-Bromophenyl Phenyl Ether	0	0		0	270	270	3,960	

Butyl Benzyl Phthalate	0	0		0	140	140	2,053	
2-Chloronaphthalene	0	0		0	N/A	N/A	N/A	
Chrysene	0	0		0	N/A	N/A	N/A	
Dibenzo(a,h)Anthrancene	0	0		0	N/A	N/A	N/A	
1,2-Dichlorobenzene	0	0		0	820	820	12,026	
1,3-Dichlorobenzene	0	0		0	350	350	5,133	
1,4-Dichlorobenzene	0	0		0	730	730	10,706	
3,3-Dichlorobenzidine	0	0		0	N/A	N/A	N/A	
Diethyl Phthalate	0	0		0	4,000	4,000	58,664	
Dimethyl Phthalate	0	0		0	2,500	2,500	36,665	
Di-n-Butyl Phthalate	0	0		0	110	110	1,613	
2,4-Dinitrotoluene	0	0		0	1,600	1,600	23,466	
2,6-Dinitrotoluene	0	0		0	990	990	14,519	
1,2-Diphenylhydrazine	0	0		0	15	15.0	220	
Fluoranthene	0	0		0	200	200	2,933	
Fluorene	0	0		0	N/A	N/A	N/A	
Hexachlorobenzene	0	0		0	N/A	N/A	N/A	
Hexachlorobutadiene	0	0		0	10	10.0	147	
Hexachlorocyclopentadiene	0	0		0	5	5.0	73.3	
Hexachloroethane	0	0		0	60	60.0	880	
Indeno(1,2,3-cd)Pyrene	0	0		0	N/A	N/A	N/A	
Isophorone	0	0		0	10,000	10,000	146,661	
Naphthalene	0	0		0	140	140	2,053	
Nitrobenzene	0	0		0	4,000	4,000	58,664	
n-Nitrosodimethylamine	0	0		0	17,000	17,000	249,324	
n-Nitrosodi-n-Propylamine	0	0		0	N/A	N/A	N/A	
n-Nitrosodiphenylamine	0	0		0	300	300	4,400	
Phenanthrene	0	0		0	5	5.0	73.3	
Pyrene	0	0		0	N/A	N/A	N/A	
1,2,4-Trichlorobenzene	0	0		0	130	130	1,907	
Aldrin	0	0		0	3	3.0	44.0	
alpha-BHC	0	0		0	N/A	N/A	N/A	
beta-BHC	0	0		0	N/A	N/A	N/A	
gamma-BHC	0	0		0	0.95	0.95	13.9	
Chlordane	0	0		0	2.4	2.4	35.2	
4,4-DDT	0	0		0	1.1	1.1	16.1	
4,4-DDE	0	0		0	1.1	1.1	16.1	
4,4-DDD	0	0		0	1.1	1.1	16.1	
Dieldrin	0	0		0	0.24	0.24	3.52	
alpha-Endosulfan	0	0		0	0.22	0.22	3.23	
beta-Endosulfan	0	0		0	0.22	0.22	3.23	
Endosulfan Sulfate	0	0		0	N/A	N/A	N/A	
Endrin	0	0		0	0.086	0.086	1.26	
Endrin Aldehyde	0	0		0	N/A	N/A	N/A	
Heptachlor	0	0		0	0.52	0.52	7.63	
Heptachlor Epoxide	0	0		0	0.5	0.5	7.33	
PCBs, Total	0	0		0	N/A	N/A	N/A	
Toxaphene	0	0		0	0.73	0.73	10.7	

☑ **CFC** CCT (min): 65.557 PMF: 1 Analysis Hardness (mg/l): 376.18 Analysis pH: 8.01

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Dissolved Solids (PWS)	0	0		0	N/A	N/A	N/A	
Chloride (PWS)	0	0		0	N/A	N/A	N/A	
Sulfate (PWS)	0	0		0	N/A	N/A	N/A	
Fluoride (PWS)	0	0		0	N/A	N/A	N/A	
Total Aluminum	87.338017	0.6855		0	N/A	N/A	N/A	
Total Antimony	0	0		0	220	220	6,505	
Total Arsenic	0	0		0	150	150	4,435	Chem Translator of 1 applied
Total Barium	0	0		0	4,100	4,100	121,236	
Total Boron	0	0		0	1,600	1,600	47,312	
Total Cadmium	0	0		0	0.616	0.72	21.4	Chem Translator of 0.854 applied
Total Chromium (III)	0	0		0	219.359	255	7,542	Chem Translator of 0.86 applied
Hexavalent Chromium	0	0		0	10	10.4	307	Chem Translator of 0.962 applied
Total Cobalt	0	0		0	19	19.0	562	
Total Copper	0	0		0	27.783	28.9	856	Chem Translator of 0.96 applied
Dissolved Iron	0	0		0	N/A	N/A	N/A	
Total Iron	165.75	0.366		0	1,500	1,500	38,076	WQC = 30 day average; PMF = 1
Total Lead	0	0		0	10.275	17.2	508	Chem Translator of 0.598 applied
Total Manganese	31.56	0.732		0	N/A	N/A	N/A	
Total Mercury	0	0		0	0.770	0.91	26.8	Chem Translator of 0.85 applied
Total Nickel	0	0		0	159.531	160	4,732	Chem Translator of 0.997 applied
Total Phenols (Phenolics) (PWS)	0	0		0	N/A	N/A	N/A	
Total Selenium	0	0		0	4.600	4.99	148	Chem Translator of 0.922 applied
Total Silver	0	0		0	N/A	N/A	N/A	Chem Translator of 1 applied
Total Thallium	0	0		0	13	13.0	384	
Total Zinc	17.57	0.791		0	363.019	368	10,013	Chem Translator of 0.986 applied
Acrolein	0	0		0	3	3.0	88.7	
Acrylamide	0	0		0	N/A	N/A	N/A	
Acrylonitrile	0	0		0	130	130	3,844	
Benzene	0	0		0	130	130	3,844	
Bromoform	0	0		0	370	370	10,941	
Carbon Tetrachloride	0	0		0	560	560	16,559	
Chlorobenzene	0	0		0	240	240	7,097	
Chlorodibromomethane	0	0		0	N/A	N/A	N/A	
2-Chloroethyl Vinyl Ether	0	0		0	3,500	3,500	103,495	
Chloroform	0	0		0	390	390	11,532	
Dichlorobromomethane	0	0		0	N/A	N/A	N/A	
1,2-Dichloroethane	0	0		0	3,100	3,100	91,667	
1,1-Dichloroethylene	0	0		0	1,500	1,500	44,355	
1,2-Dichloropropane	0	0		0	2,200	2,200	65,054	
1,3-Dichloropropylene	0	0		0	61	61.0	1,804	

Ethylbenzene	0	0		0	580	580	17,151	
Methyl Bromide	0	0		0	110	110	3,253	
Methyl Chloride	0	0		0	5,500	5,500	162,634	
Methylene Chloride	0	0		0	2,400	2,400	70,968	
1,1,2,2-Tetrachloroethane	0	0		0	210	210	6,210	
Tetrachloroethylene	0	0		0	140	140	4,140	
Toluene	0	0		0	330	330	9,758	
1,2-trans-Dichloroethylene	0	0		0	1,400	1,400	41,398	
1,1,1-Trichloroethane	0	0		0	610	610	18,038	
1,1,2-Trichloroethane	0	0		0	680	680	20,108	
Trichloroethylene	0	0		0	450	450	13,306	
Vinyl Chloride	0	0		0	N/A	N/A	N/A	
2-Chlorophenol	0	0		0	110	110	3,253	
2,4-Dichlorophenol	0	0		0	340	340	10,054	
2,4-Dimethylphenol	0	0		0	130	130	3,844	
4,6-Dinitro-o-Cresol	0	0		0	16	16.0	473	
2,4-Dinitrophenol	0	0		0	130	130	3,844	
2-Nitrophenol	0	0		0	1,600	1,600	47,312	
4-Nitrophenol	0	0		0	470	470	13,898	
p-Chloro-m-Cresol	0	0		0	500	500	14,785	
Pentachlorophenol	0	0		0	18.737	18.7	554	
Phenol	0	0		0	N/A	N/A	N/A	
2,4,6-Trichlorophenol	0	0		0	91	91.0	2,691	
Acenaphthene	0	0		0	17	17.0	503	
Anthracene	0	0		0	N/A	N/A	N/A	
Benzidine	0	0		0	59	59.0	1,745	
Benzo(a)Anthracene	0	0		0	0.1	0.1	2.96	
Benzo(a)Pyrene	0	0		0	N/A	N/A	N/A	
3,4-Benzofluoranthene	0	0		0	N/A	N/A	N/A	
Benzo(k)Fluoranthene	0	0		0	N/A	N/A	N/A	
Bis(2-Chloroethyl)Ether	0	0		0	6,000	6,000	177,419	
Bis(2-Chloroisopropyl)Ether	0	0		0	N/A	N/A	N/A	
Bis(2-Ethylhexyl)Phthalate	0	0		0	910	910	26,909	
4-Bromophenyl Phenyl Ether	0	0		0	54	54.0	1,597	
Butyl Benzyl Phthalate	0	0		0	35	35.0	1,035	
2-Chloronaphthalene	0	0		0	N/A	N/A	N/A	
Chrysene	0	0		0	N/A	N/A	N/A	
Dibenzo(a,h)Anthrancene	0	0		0	N/A	N/A	N/A	
1,2-Dichlorobenzene	0	0		0	160	160	4,731	
1,3-Dichlorobenzene	0	0		0	69	69.0	2,040	
1,4-Dichlorobenzene	0	0		0	150	150	4,435	
3,3-Dichlorobenzidine	0	0		0	N/A	N/A	N/A	
Diethyl Phthalate	0	0		0	800	800	23,656	
Dimethyl Phthalate	0	0		0	500	500	14,785	
Di-n-Butyl Phthalate	0	0		0	21	21.0	621	

2,4-Dinitrotoluene	0	0		0	320	320	9,462	
2,6-Dinitrotoluene	0	0		0	200	200	5,914	
1,2-Diphenylhydrazine	0	0		0	3	3.0	88.7	
Fluoranthene	0	0		0	40	40.0	1,183	
Fluorene	0	0		0	N/A	N/A	N/A	
Hexachlorobenzene	0	0		0	N/A	N/A	N/A	
Hexachlorobutadiene	0	0		0	2	2.0	59.1	
Hexachlorocyclopentadiene	0	0		0	1	1.0	29.6	
Hexachloroethane	0	0		0	12	12.0	355	
Indeno(1,2,3-cd)Pyrene	0	0		0	N/A	N/A	N/A	
Isophorone	0	0		0	2,100	2,100	62,097	
Naphthalene	0	0		0	43	43.0	1,272	
Nitrobenzene	0	0		0	810	810	23,952	
n-Nitrosodimethylamine	0	0		0	3,400	3,400	100,538	
n-Nitrosodi-n-Propylamine	0	0		0	N/A	N/A	N/A	
n-Nitrosodiphenylamine	0	0		0	59	59.0	1,745	
Phenanthrene	0	0		0	1	1.0	29.6	
Pyrene	0	0		0	N/A	N/A	N/A	
1,2,4-Trichlorobenzene	0	0		0	26	26.0	769	
Aldrin	0	0		0	0.1	0.1	2.96	
alpha-BHC	0	0		0	N/A	N/A	N/A	
beta-BHC	0	0		0	N/A	N/A	N/A	
gamma-BHC	0	0		0	N/A	N/A	N/A	
Chlordane	0	0		0	0.0043	0.004	0.13	
4,4-DDT	0	0		0	0.001	0.001	0.03	
4,4-DDE	0	0		0	0.001	0.001	0.03	
4,4-DDD	0	0		0	0.001	0.001	0.03	
Dieldrin	0	0		0	0.056	0.056	1.66	
alpha-Endosulfan	0	0		0	0.056	0.056	1.66	
beta-Endosulfan	0	0		0	0.056	0.056	1.66	
Endosulfan Sulfate	0	0		0	N/A	N/A	N/A	
Endrin	0	0		0	0.036	0.036	1.06	
Endrin Aldehyde	0	0		0	N/A	N/A	N/A	
Heptachlor	0	0		0	0.0038	0.004	0.11	
Heptachlor Epoxide	0	0		0	0.0038	0.004	0.11	
PCBs, Total	0	0		0	0.014	0.014	0.41	
Toxaphene	0	0		0	0.0002	0.0002	0.006	

☑ ***THH*** CCT (min): 65.557 PMF: 1 Analysis Hardness (mg/l): N/A Analysis pH: N/A

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Dissolved Solids (PWS)	0	0		0	500,000	500,000	N/A	
Chloride (PWS)	0	0		0	250,000	250,000	N/A	
Sulfate (PWS)	0	0		0	250,000	250,000	N/A	

Fluoride (PWS)	0	0		0	2,000	2,000	N/A	
Total Aluminum	87.338017	0.6855		0	N/A	N/A	N/A	
Total Antimony	0	0		0	5.6	5.6	166	
Total Arsenic	0	0		0	10	10.0	296	
Total Barium	0	0		0	2,400	2,400	70,968	
Total Boron	0	0		0	3,100	3,100	91,667	
Total Cadmium	0	0		0	N/A	N/A	N/A	
Total Chromium (III)	0	0		0	N/A	N/A	N/A	
Hexavalent Chromium	0	0		0	N/A	N/A	N/A	
Total Cobalt	0	0		0	N/A	N/A	N/A	
Total Copper	0	0		0	N/A	N/A	N/A	
Dissolved Iron	0	0		0	300	300	8,871	
Total Iron	165.75	0.366		0	N/A	N/A	N/A	
Total Lead	0	0		0	N/A	N/A	N/A	
Total Manganese	31.56	0.732		0	1,000	1,000	28,668	
Total Mercury	0	0		0	0.050	0.05	1.48	
Total Nickel	0	0		0	610	610	18,038	
Total Phenols (Phenolics) (PWS)	0	0		0	5	5.0	N/A	
Total Selenium	0	0		0	N/A	N/A	N/A	
Total Silver	0	0		0	N/A	N/A	N/A	
Total Thallium	0	0		0	0.24	0.24	7.1	
Total Zinc	17.57	0.791		0	N/A	N/A	N/A	
Acrolein	0	0		0	3	3.0	88.7	
Acrylamide	0	0		0	N/A	N/A	N/A	
Acrylonitrile	0	0		0	N/A	N/A	N/A	
Benzene	0	0		0	N/A	N/A	N/A	
Bromoform	0	0		0	N/A	N/A	N/A	
Carbon Tetrachloride	0	0		0	N/A	N/A	N/A	
Chlorobenzene	0	0		0	100	100.0	2,957	
Chlorodibromomethane	0	0		0	N/A	N/A	N/A	
2-Chloroethyl Vinyl Ether	0	0		0	N/A	N/A	N/A	
Chloroform	0	0		0	5.7	5.7	169	
Dichlorobromomethane	0	0		0	N/A	N/A	N/A	
1,2-Dichloroethane	0	0		0	N/A	N/A	N/A	
1,1-Dichloroethylene	0	0		0	33	33.0	976	
1,2-Dichloropropane	0	0		0	N/A	N/A	N/A	
1,3-Dichloropropylene	0	0		0	N/A	N/A	N/A	
Ethylbenzene	0	0		0	68	68.0	2,011	
Methyl Bromide	0	0		0	100	100.0	2,957	
Methyl Chloride	0	0		0	N/A	N/A	N/A	
Methylene Chloride	0	0		0	N/A	N/A	N/A	
1,1,2,2-Tetrachloroethane	0	0		0	N/A	N/A	N/A	
Tetrachloroethylene	0	0		0	N/A	N/A	N/A	
Toluene	0	0		0	57	57.0	1,685	
1,2-trans-Dichloroethylene	0	0		0	100	100.0	2,957	

1,1,1-Trichloroethane	0	0		0	10,000	10,000	295,699	
1,1,2-Trichloroethane	0	0		0	N/A	N/A	N/A	
Trichloroethylene	0	0		0	N/A	N/A	N/A	
Vinyl Chloride	0	0		0	N/A	N/A	N/A	
2-Chlorophenol	0	0		0	30	30.0	887	
2,4-Dichlorophenol	0	0		0	10	10.0	296	
2,4-Dimethylphenol	0	0		0	100	100.0	2,957	
4,6-Dinitro-o-Cresol	0	0		0	2	2.0	59.1	
2,4-Dinitrophenol	0	0		0	10	10.0	296	
2-Nitrophenol	0	0		0	N/A	N/A	N/A	
4-Nitrophenol	0	0		0	N/A	N/A	N/A	
p-Chloro-m-Cresol	0	0		0	N/A	N/A	N/A	
Pentachlorophenol	0	0		0	N/A	N/A	N/A	
Phenol	0	0		0	4,000	4,000	118,279	
2,4,6-Trichlorophenol	0	0		0	N/A	N/A	N/A	
Acenaphthene	0	0		0	70	70.0	2,070	
Anthracene	0	0		0	300	300	8,871	
Benzidine	0	0		0	N/A	N/A	N/A	
Benzo(a)Anthracene	0	0		0	N/A	N/A	N/A	
Benzo(a)Pyrene	0	0		0	N/A	N/A	N/A	
3,4-Benzofluoranthene	0	0		0	N/A	N/A	N/A	
Benzo(k)Fluoranthene	0	0		0	N/A	N/A	N/A	
Bis(2-Chloroethyl)Ether	0	0		0	N/A	N/A	N/A	
Bis(2-Chloroisopropyl)Ether	0	0		0	200	200	5,914	
Bis(2-Ethylhexyl)Phthalate	0	0		0	N/A	N/A	N/A	
4-Bromophenyl Phenyl Ether	0	0		0	N/A	N/A	N/A	
Butyl Benzyl Phthalate	0	0		0	0.1	0.1	2.96	
2-Chloronaphthalene	0	0		0	800	800	23,656	
Chrysene	0	0		0	N/A	N/A	N/A	
Dibenzo(a,h)Anthrancene	0	0		0	N/A	N/A	N/A	
1,2-Dichlorobenzene	0	0		0	1,000	1,000	29,570	
1,3-Dichlorobenzene	0	0		0	7	7.0	207	
1,4-Dichlorobenzene	0	0		0	300	300	8,871	
3,3-Dichlorobenzidine	0	0		0	N/A	N/A	N/A	
Diethyl Phthalate	0	0		0	600	600	17,742	
Dimethyl Phthalate	0	0		0	2,000	2,000	59,140	
Di-n-Butyl Phthalate	0	0		0	20	20.0	591	
2,4-Dinitrotoluene	0	0		0	N/A	N/A	N/A	
2,6-Dinitrotoluene	0	0		0	N/A	N/A	N/A	
1,2-Diphenylhydrazine	0	0		0	N/A	N/A	N/A	
Fluoranthene	0	0		0	20	20.0	591	
Fluorene	0	0		0	50	50.0	1,478	
Hexachlorobenzene	0	0		0	N/A	N/A	N/A	
Hexachlorobutadiene	0	0		0	N/A	N/A	N/A	
Hexachlorocyclopentadiene	0	0		0	4	4.0	118	

Hexachloroethane	0	0		0	N/A	N/A	N/A	
Indeno(1,2,3-cd)Pyrene	0	0		0	N/A	N/A	N/A	
Isophorone	0	0		0	34	34.0	1,005	
Naphthalene	0	0		0	N/A	N/A	N/A	
Nitrobenzene	0	0		0	10	10.0	296	
n-Nitrosodimethylamine	0	0		0	N/A	N/A	N/A	
n-Nitrosodi-n-Propylamine	0	0		0	N/A	N/A	N/A	
n-Nitrosodiphenylamine	0	0		0	N/A	N/A	N/A	
Phenanthrene	0	0		0	N/A	N/A	N/A	
Pyrene	0	0		0	20	20.0	591	
1,2,4-Trichlorobenzene	0	0		0	0.07	0.07	2.07	
Aldrin	0	0		0	N/A	N/A	N/A	
alpha-BHC	0	0		0	N/A	N/A	N/A	
beta-BHC	0	0		0	N/A	N/A	N/A	
gamma-BHC	0	0		0	4.2	4.2	124	
Chlordane	0	0		0	N/A	N/A	N/A	
4,4-DDT	0	0		0	N/A	N/A	N/A	
4,4-DDE	0	0		0	N/A	N/A	N/A	
4,4-DDD	0	0		0	N/A	N/A	N/A	
Dieldrin	0	0		0	N/A	N/A	N/A	
alpha-Endosulfan	0	0		0	20	20.0	591	
beta-Endosulfan	0	0		0	20	20.0	591	
Endosulfan Sulfate	0	0		0	20	20.0	591	
Endrin	0	0		0	0.03	0.03	0.89	
Endrin Aldehyde	0	0		0	1	1.0	29.6	
Heptachlor	0	0		0	N/A	N/A	N/A	
Heptachlor Epoxide	0	0		0	N/A	N/A	N/A	
PCBs, Total	0	0		0	N/A	N/A	N/A	
Toxaphene	0	0		0	N/A	N/A	N/A	

☑ ***CRL*** CCT (min): 22.687 PMF: 1 Analysis Hardness (mg/l): N/A Analysis pH: N/A

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Dissolved Solids (PWS)	0	0		0	N/A	N/A	N/A	
Chloride (PWS)	0	0		0	N/A	N/A	N/A	
Sulfate (PWS)	0	0		0	N/A	N/A	N/A	
Fluoride (PWS)	0	0		0	N/A	N/A	N/A	
Total Aluminum	87.338017	0.6855		0	N/A	N/A	N/A	
Total Antimony	0	0		0	N/A	N/A	N/A	
Total Arsenic	0	0		0	N/A	N/A	N/A	
Total Barium	0	0		0	N/A	N/A	N/A	
Total Boron	0	0		0	N/A	N/A	N/A	
Total Cadmium	0	0		0	N/A	N/A	N/A	
Total Chromium (III)	0	0		0	N/A	N/A	N/A	

Hexavalent Chromium	0	0		0	N/A	N/A	N/A	
Total Cobalt	0	0		0	N/A	N/A	N/A	
Total Copper	0	0		0	N/A	N/A	N/A	
Dissolved Iron	0	0		0	N/A	N/A	N/A	
Total Iron	165.75	0.366		0	N/A	N/A	N/A	
Total Lead	0	0		0	N/A	N/A	N/A	
Total Manganese	31.56	0.732		0	N/A	N/A	N/A	
Total Mercury	0	0		0	N/A	N/A	N/A	
Total Nickel	0	0		0	N/A	N/A	N/A	
Total Phenols (Phenolics) (PWS)	0	0		0	N/A	N/A	N/A	
Total Selenium	0	0		0	N/A	N/A	N/A	
Total Silver	0	0		0	N/A	N/A	N/A	
Total Thallium	0	0		0	N/A	N/A	N/A	
Total Zinc	17.57	0.791		0	N/A	N/A	N/A	
Acrolein	0	0		0	N/A	N/A	N/A	
Acrylamide	0	0		0	0.07	0.07	11.3	
Acrylonitrile	0	0		0	0.06	0.06	9.64	
Benzene	0	0		0	0.58	0.58	93.2	
Bromoform	0	0		0	7	7.0	1,125	
Carbon Tetrachloride	0	0		0	0.4	0.4	64.3	
Chlorobenzene	0	0		0	N/A	N/A	N/A	
Chlorodibromomethane	0	0		0	0.8	0.8	129	
2-Chloroethyl Vinyl Ether	0	0		0	N/A	N/A	N/A	
Chloroform	0	0		0	N/A	N/A	N/A	
Dichlorobromomethane	0	0		0	0.95	0.95	153	
1,2-Dichloroethane	0	0		0	9.9	9.9	1,591	
1,1-Dichloroethylene	0	0		0	N/A	N/A	N/A	
1,2-Dichloropropane	0	0		0	0.9	0.9	145	
1,3-Dichloropropylene	0	0		0	0.27	0.27	43.4	
Ethylbenzene	0	0		0	N/A	N/A	N/A	
Methyl Bromide	0	0		0	N/A	N/A	N/A	
Methyl Chloride	0	0		0	N/A	N/A	N/A	
Methylene Chloride	0	0		0	20	20.0	3,215	
1,1,2,2-Tetrachloroethane	0	0		0	0.2	0.2	32.1	
Tetrachloroethylene	0	0		0	10	10.0	1,607	
Toluene	0	0		0	N/A	N/A	N/A	
1,2-trans-Dichloroethylene	0	0		0	N/A	N/A	N/A	
1,1,1-Trichloroethane	0	0		0	N/A	N/A	N/A	
1,1,2-Trichloroethane	0	0		0	0.55	0.55	88.4	
Trichloroethylene	0	0		0	0.6	0.6	96.4	
Vinyl Chloride	0	0		0	0.02	0.02	3.21	
2-Chlorophenol	0	0		0	N/A	N/A	N/A	
2,4-Dichlorophenol	0	0		0	N/A	N/A	N/A	
2,4-Dimethylphenol	0	0		0	N/A	N/A	N/A	
4,6-Dinitro-o-Cresol	0	0		0	N/A	N/A	N/A	

2,4-Dinitrophenol	0	0		0	N/A	N/A	N/A	
2-Nitrophenol	0	0		0	N/A	N/A	N/A	
4-Nitrophenol	0	0		0	N/A	N/A	N/A	
p-Chloro-m-Cresol	0	0		0	N/A	N/A	N/A	
Pentachlorophenol	0	0		0	0.030	0.03	4.82	
Phenol	0	0		0	N/A	N/A	N/A	
2,4,6-Trichlorophenol	0	0		0	1.5	1.5	241	
Acenaphthene	0	0		0	N/A	N/A	N/A	
Anthracene	0	0		0	N/A	N/A	N/A	
Benzidine	0	0		0	0.0001	0.0001	0.016	
Benzo(a)Anthracene	0	0		0	0.001	0.001	0.16	
Benzo(a)Pyrene	0	0		0	0.0001	0.0001	0.016	
3,4-Benzofluoranthene	0	0		0	0.001	0.001	0.16	
Benzo(k)Fluoranthene	0	0		0	0.01	0.01	1.61	
Bis(2-Chloroethyl)Ether	0	0		0	0.03	0.03	4.82	
Bis(2-Chloroisopropyl)Ether	0	0		0	N/A	N/A	N/A	
Bis(2-Ethylhexyl)Phthalate	0	0		0	0.32	0.32	51.4	
4-Bromophenyl Phenyl Ether	0	0		0	N/A	N/A	N/A	
Butyl Benzyl Phthalate	0	0		0	N/A	N/A	N/A	
2-Chloronaphthalene	0	0		0	N/A	N/A	N/A	
Chrysene	0	0		0	0.12	0.12	19.3	
Dibenzo(a,h)Anthrancene	0	0		0	0.0001	0.0001	0.016	
1,2-Dichlorobenzene	0	0		0	N/A	N/A	N/A	
1,3-Dichlorobenzene	0	0		0	N/A	N/A	N/A	
1,4-Dichlorobenzene	0	0		0	N/A	N/A	N/A	
3,3-Dichlorobenzidine	0	0		0	0.05	0.05	8.04	
Diethyl Phthalate	0	0		0	N/A	N/A	N/A	
Dimethyl Phthalate	0	0		0	N/A	N/A	N/A	
Di-n-Butyl Phthalate	0	0		0	N/A	N/A	N/A	
2,4-Dinitrotoluene	0	0		0	0.05	0.05	8.04	
2,6-Dinitrotoluene	0	0		0	0.05	0.05	8.04	
1,2-Diphenylhydrazine	0	0		0	0.03	0.03	4.82	
Fluoranthene	0	0		0	N/A	N/A	N/A	
Fluorene	0	0		0	N/A	N/A	N/A	
Hexachlorobenzene	0	0		0	0.00008	0.00008	0.013	
Hexachlorobutadiene	0	0		0	0.01	0.01	1.61	
Hexachlorocyclopentadiene	0	0		0	N/A	N/A	N/A	
Hexachloroethane	0	0		0	0.1	0.1	16.1	
Indeno(1,2,3-cd)Pyrene	0	0		0	0.001	0.001	0.16	
Isophorone	0	0		0	N/A	N/A	N/A	
Naphthalene	0	0		0	N/A	N/A	N/A	
Nitrobenzene	0	0		0	N/A	N/A	N/A	
n-Nitrosodimethylamine	0	0		0	0.0007	0.0007	0.11	
n-Nitrosodi-n-Propylamine	0	0		0	0.005	0.005	0.8	
n-Nitrosodiphenylamine	0	0		0	3.3	3.3	530	

Phenanthrene	0	0		0	N/A	N/A	N/A	
Pyrene	0	0		0	N/A	N/A	N/A	
1,2,4-Trichlorobenzene	0	0		0	N/A	N/A	N/A	
Aldrin	0	0		0	0.0000008	8.00E-07	0.0001	
alpha-BHC	0	0		0	0.0004	0.0004	0.064	
beta-BHC	0	0		0	0.008	0.008	1.29	
gamma-BHC	0	0		0	N/A	N/A	N/A	
Chlordane	0	0		0	0.0003	0.0003	0.048	
4,4-DDT	0	0		0	0.00003	0.00003	0.005	
4,4-DDE	0	0		0	0.00002	0.00002	0.003	
4,4-DDD	0	0		0	0.0001	0.0001	0.016	
Dieldrin	0	0		0	0.000001	0.000001	0.0002	
alpha-Endosulfan	0	0		0	N/A	N/A	N/A	
beta-Endosulfan	0	0		0	N/A	N/A	N/A	
Endosulfan Sulfate	0	0		0	N/A	N/A	N/A	
Endrin	0	0		0	N/A	N/A	N/A	
Endrin Aldehyde	0	0		0	N/A	N/A	N/A	
Heptachlor	0	0		0	0.000006	0.000006	0.001	
Heptachlor Epoxide	0	0		0	0.00003	0.00003	0.005	
PCBs, Total	0	0		0	0.000064	0.00006	0.01	
Toxaphene	0	0		0	0.0007	0.0007	0.11	

☑ ***Recommended WQBELs & Monitoring Requirements***

No. Samples/Month: 4

	Mass Limits		*Concentration Limits*						
Pollutants	AML (lbs/day)	MDL (lbs/day)	AML	MDL	IMAX	Units	Governing WQBEL	WQBEL Basis	Comments
Total Aluminum	11.9	20.5	6,586	11,376	16,465	µg/L	6,586	AFC	Discharge Conc ≥ 50% WQBEL (RP)
Total Antimony	0.3	0.33	166	183	414	µg/L	166	THH	Discharge Conc ≥ 50% WQBEL (RP)
Total Arsenic	Report	Report	Report	Report	Report	µg/L	296	THH	Discharge Conc > 10% WQBEL (no RP)
Total Selenium	0.27	0.32	148	177	369	µg/L	148	CFC	Discharge Conc ≥ 50% WQBEL (RP)
Total Zinc	Report	Report	Report	Report	Report	µg/L	3,062	AFC	Discharge Conc > 10% WQBEL (no RP)
Acrylamide	0.02	0.032	11.3	17.6	28.1	µg/L	11.3	CRL	Discharge Conc ≥ 50% WQBEL (RP)
Hexachlorobutadiene	Report	Report	Report	Report	Report	µg/L	1.61	CRL	Discharge Conc > 25% WQBEL (no RP)

☑ ***Other Pollutants without Limits or Monitoring***

The following pollutants do not require effluent limits or monitoring based on water quality because reasonable potential to exceed water quality criteria was not determined and the discharge concentration was less than thresholds for monitoring, or the pollutant was not detected and a sufficiently sensitive analytical method was used (e.g., <= Target QL).

Pollutants	Governing WQBEL	Units	Comments

Total Dissolved Solids (PWS)	N/A	N/A	PWS Not Applicable
Chloride (PWS)	N/A	N/A	PWS Not Applicable
Bromide	N/A	N/A	No WQS
Sulfate (PWS)	N/A	N/A	PWS Not Applicable
Fluoride (PWS)	N/A	N/A	PWS Not Applicable
Total Barium	70,968	µg/L	Discharge Conc ≤ 10% WQBEL
Total Beryllium	N/A	N/A	No WQS
Total Boron	47,312	µg/L	Discharge Conc ≤ 10% WQBEL
Total Cadmium	21.4	µg/L	Discharge Conc ≤ 10% WQBEL
Total Chromium (III)	7,542	µg/L	Discharge Conc ≤ 10% WQBEL
Hexavalent Chromium	153	µg/L	Discharge Conc ≤ 10% WQBEL
Total Cobalt	562	µg/L	Discharge Conc ≤ 10% WQBEL
Total Copper	451	µg/L	Discharge Conc ≤ 10% WQBEL
Total Cyanide	N/A	N/A	No WQS
Dissolved Iron	8,871	µg/L	Discharge Conc ≤ 10% WQBEL
Total Iron	38,076	µg/L	Discharge Conc ≤ 10% WQBEL
Total Lead	508	µg/L	Discharge Conc ≤ 10% WQBEL
Total Manganese	28,668	µg/L	Discharge Conc ≤ 10% WQBEL
Total Mercury	1.48	µg/L	Discharge Conc ≤ 10% WQBEL
Total Nickel	4,732	µg/L	Discharge Conc ≤ 10% WQBEL
Total Phenols (Phenolics) (PWS)		µg/L	Discharge Conc < TQL
Total Silver	337	µg/L	Discharge Conc ≤ 10% WQBEL
Total Thallium	7.1	µg/L	Discharge Conc < TQL
Acrolein	28.2	µg/L	Discharge Conc < TQL
Acrylonitrile	9.64	µg/L	Discharge Conc < TQL
Benzene	93.2	µg/L	Discharge Conc < TQL
Bromoform	1,125	µg/L	Discharge Conc < TQL
Carbon Tetrachloride	64.3	µg/L	Discharge Conc < TQL
Chlorobenzene	2,957	µg/L	Discharge Conc ≤ 25% WQBEL
Chlorodibromomethane	129	µg/L	Discharge Conc < TQL
Chloroethane	N/A	N/A	No WQS
2-Chloroethyl Vinyl Ether	103,495	µg/L	Discharge Conc < TQL
Chloroform	169	µg/L	Discharge Conc ≤ 25% WQBEL
Dichlorobromomethane	153	µg/L	Discharge Conc < TQL
1,1-Dichloroethane	N/A	N/A	No WQS
1,2-Dichloroethane	1,591	µg/L	Discharge Conc < TQL
1,1-Dichloroethylene	976	µg/L	Discharge Conc < TQL
1,2-Dichloropropane	145	µg/L	Discharge Conc < TQL
1,3-Dichloropropylene	43.4	µg/L	Discharge Conc < TQL
1,4-Dioxane	N/A	N/A	No WQS
Ethylbenzene	2,011	µg/L	Discharge Conc < TQL
Methyl Bromide	2,957	µg/L	Discharge Conc < TQL
Methyl Chloride	162,634	µg/L	Discharge Conc < TQL
Methylene Chloride	3,215	µg/L	Discharge Conc ≤ 25% WQBEL
1,1,2,2-Tetrachloroethane	32.1	µg/L	Discharge Conc < TQL

Tetrachloroethylene	1,607	µg/L	Discharge Conc < TQL
Toluene	1,685	µg/L	Discharge Conc < TQL
1,2-trans-Dichloroethylene	2,957	µg/L	Discharge Conc < TQL
1,1,1-Trichloroethane	18,038	µg/L	Discharge Conc < TQL
1,1,2-Trichloroethane	88.4	µg/L	Discharge Conc < TQL
Trichloroethylene	96.4	µg/L	Discharge Conc < TQL
Vinyl Chloride	3.21	µg/L	Discharge Conc < TQL
2-Chlorophenol	887	µg/L	Discharge Conc < TQL
2,4-Dichlorophenol	296	µg/L	Discharge Conc < TQL
2,4-Dimethylphenol	2,957	µg/L	Discharge Conc < TQL
4,6-Dinitro-o-Cresol	59.1	µg/L	Discharge Conc < TQL
2,4-Dinitrophenol	296	µg/L	Discharge Conc < TQL
2-Nitrophenol	47,312	µg/L	Discharge Conc < TQL
4-Nitrophenol	13,898	µg/L	Discharge Conc < TQL
p-Chloro-m-Cresol	1,504	µg/L	Discharge Conc < TQL
Pentachlorophenol	4.82	µg/L	Discharge Conc < TQL
Phenol	118,279	µg/L	Discharge Conc < TQL
2,4,6-Trichlorophenol	241	µg/L	Discharge Conc < TQL
Acenaphthene	503	µg/L	Discharge Conc < TQL
Acenaphthylene	N/A	N/A	No WQS
Anthracene	8,871	µg/L	Discharge Conc < TQL
Benzidine	0.016	µg/L	Discharge Conc < TQL
Benzo(a)Anthracene	0.16	µg/L	Discharge Conc < TQL
Benzo(a)Pyrene	0.016	µg/L	Discharge Conc < TQL
3,4-Benzofluoranthene	0.16	µg/L	Discharge Conc < TQL
Benzo(ghi)Perylene	N/A	N/A	No WQS
Benzo(k)Fluoranthene	1.61	µg/L	Discharge Conc < TQL
Bis(2-Chloroethoxy)Methane	N/A	N/A	No WQS
Bis(2-Chloroethyl)Ether	4.82	µg/L	Discharge Conc < TQL
Bis(2-Chloroisopropyl)Ether	5,914	µg/L	Discharge Conc < TQL
Bis(2-Ethylhexyl)Phthalate	51.4	µg/L	Discharge Conc < TQL
4-Bromophenyl Phenyl Ether	1,597	µg/L	Discharge Conc < TQL
Butyl Benzyl Phthalate	2.96	µg/L	Discharge Conc < TQL
2-Chloronaphthalene	23,656	µg/L	Discharge Conc < TQL
4-Chlorophenyl Phenyl Ether	N/A	N/A	No WQS
Chrysene	19.3	µg/L	Discharge Conc < TQL
Dibenzo(a,h)Anthrancene	0.016	µg/L	Discharge Conc < TQL
1,2-Dichlorobenzene	4,731	µg/L	Discharge Conc < TQL
1,3-Dichlorobenzene	207	µg/L	Discharge Conc < TQL
1,4-Dichlorobenzene	4,435	µg/L	Discharge Conc < TQL
3,3-Dichlorobenzidine	8.04	µg/L	Discharge Conc < TQL
Diethyl Phthalate	17,742	µg/L	Discharge Conc < TQL
Dimethyl Phthalate	14,785	µg/L	Discharge Conc < TQL
Di-n-Butyl Phthalate	591	µg/L	Discharge Conc < TQL
2,4-Dinitrotoluene	8.04	µg/L	Discharge Conc < TQL

2,6-Dinitrotoluene	8.04	µg/L	Discharge Conc < TQL
Di-n-Octyl Phthalate	N/A	N/A	No WQS
1,2-Diphenylhydrazine	4.82	µg/L	Discharge Conc < TQL
Fluoranthene	591	µg/L	Discharge Conc < TQL
Fluorene	1,478	µg/L	Discharge Conc < TQL
Hexachlorobenzene	0.013	µg/L	Discharge Conc < TQL
Hexachlorocyclopentadiene	29.6	µg/L	Discharge Conc < TQL
Hexachloroethane	16.1	µg/L	Discharge Conc < TQL
Indeno(1,2,3-cd)Pyrene	0.16	µg/L	Discharge Conc < TQL
Isophorone	1,005	µg/L	Discharge Conc < TQL
Naphthalene	1,272	µg/L	Discharge Conc < TQL
Nitrobenzene	296	µg/L	Discharge Conc < TQL
n-Nitrosodimethylamine	0.11	µg/L	Discharge Conc < TQL
n-Nitrosodi-n-Propylamine	0.8	µg/L	Discharge Conc < TQL
n-Nitrosodiphenylamine	530	µg/L	Discharge Conc < TQL
Phenanthrene	29.6	µg/L	Discharge Conc < TQL
Pyrene	591	µg/L	Discharge Conc < TQL
1,2,4-Trichlorobenzene	2.07	µg/L	Discharge Conc < TQL
Aldrin	0.0001	µg/L	Discharge Conc < TQL
alpha-BHC	0.064	µg/L	Discharge Conc < TQL
beta-BHC	1.29	µg/L	Discharge Conc < TQL
gamma-BHC	8.93	µg/L	Discharge Conc < TQL
delta BHC	N/A	N/A	No WQS
Chlordane	0.048	µg/L	Discharge Conc < TQL
4,4-DDT	0.005	µg/L	Discharge Conc < TQL
4,4-DDE	0.003	µg/L	Discharge Conc < TQL
4,4-DDD	0.016	µg/L	Discharge Conc < TQL
Dieldrin	0.0002	µg/L	Discharge Conc < TQL
alpha-Endosulfan	1.66	µg/L	Discharge Conc < TQL
beta-Endosulfan	1.66	µg/L	Discharge Conc < TQL
Endosulfan Sulfate	591	µg/L	Discharge Conc < TQL
Endrin	0.81	µg/L	Discharge Conc < TQL
Endrin Aldehyde	29.6	µg/L	Discharge Conc < TQL
Heptachlor	0.001	µg/L	Discharge Conc < TQL
Heptachlor Epoxide	0.005	µg/L	Discharge Conc < TQL
PCB-1016	N/A	N/A	No WQS
PCB-1221	N/A	N/A	No WQS
PCB-1232	N/A	N/A	No WQS
PCB-1242	N/A	N/A	No WQS
PCB-1248	N/A	N/A	No WQS
PCB-1254	N/A	N/A	No WQS
PCB-1260	N/A	N/A	No WQS
PCBs, Total	0.01	µg/L	Discharge Conc < TQL
Toxaphene	0.006	µg/L	Discharge Conc < TQL

ATTACHMENT D

TRC Modeling Results

TRC EVALUATION – Outfall 006

9.6	= Q stream (cfs)	0.5	= CV Daily
0.216	= Q discharge (MGD)	0.5	= CV Hourly
4	= no. samples	0.478	= AFC_Partial Mix Factor
0.3	= Chlorine Demand of Stream	1	= CFC_Partial Mix Factor
0	= Chlorine Demand of Discharge	15	= AFC_Criteria Compliance Time (min)
0.5	= BAT/BPJ Value	720	= CFC_Criteria Compliance Time (min)
	= % Factor of Safety (FOS)		=Decay Coefficient (K)

Source	Reference	AFC Calculations		Reference	CFC Calculations	
TRC	1.3.2.iii	WLA afc =	4.400	1.3.2.iii	WLA cfc =	8.946
PENTOXSD TRG	5.1a	LTAMULT afc =	0.373	5.1c	LTAMULT cfc =	0.581
PENTOXSD TRG	5.1b	LTA_afc=	1.639	5.1d	LTA_cfc =	5.201

Source	Reference	Effluent Limit Calculations		
PENTOXSD TRG	5.1f	AML MULT =	1.720	
PENTOXSD TRG	5.1g	AVG MON LIMIT (mg/l) =	0.500	BAT/BPJ
		INST MAX LIMIT (mg/l) =	1.170	

WLA afc	**(.019/e(-k*AFC_tc)) + [(AFC_Yc*Qs*.019/Qd*e(-k*AFC_tc)) + Xd + (AFC_Yc*Qs*Xs/Qd)]*(1-FOS/100)**
LTAMULT afc	EXP((0.5*LN(cvh^2+1))-2.326*LN(cvh^2+1)^0.5)
LTA_afc	wla_afc*LTAMULT_afc
WLA_cfc	**(.011/e(-k*CFC_tc) + [(CFC_Yc*Qs*.011/Qd*e(-k*CFC_tc)) + Xd + (CFC_Yc*Qs*Xs/Qd)]*(1-FOS/100)**
LTAMULT_cfc	EXP((0.5*LN(cvd^2/no_samples+1))-2.326*LN(cvd^2/no_samples+1)^0.5)
LTA_cfc	wla_cfc*LTAMULT_cfc
AML MULT	EXP(2.326*LN((cvd^2/no_samples+1)^0.5)-0.5*LN(cvd^2/no_samples+1))
AVG MON LIMIT	MIN(BAT_BPJ,MIN(LTA_afc,LTA_cfc)*AML_MULT)
INST MAX LIMIT	**1.5*((av_mon_limit/AML_MULT)/LTAMULT_afc)**