

TECHNICAL MEMORANDUM

To: Nevada Environmental Response Trust

Cc: Nevada Division of Environmental Protection
United States Environmental Protection Agency

From: Katie Hendrickson

Date: November 3, 2020

Subject: Hydrogen-Based Gas Permeable Membrane Pilot Study Monthly Progress Report

At the direction of the Nevada Environmental Response Trust (NERT or Trust), Tetra Tech, Inc. (Tetra Tech) has prepared this memorandum that summarizes Tetra Tech's progress made during September 2020 toward successfully implementing the Hydrogen-Based Gas Permeable Membrane Pilot Study.

Task Progress Update: September 2020

Task M26 – Hydrogen-Based Gas Permeable Membrane Pilot Study

- Current Status
 - Test Scenario #1, which involves treatment of the existing FBR influent obtained from the FBR equalization tank, began on August 31, 2020. Weekly steady state performance sample collection, as outlined in the Hydrogen-Based Gas Permeable Membrane Pilot Study System Operation Manual, started on September 15, 2020.
 - Based on unvalidated laboratory data from operational samples, the perchlorate concentrations in the pilot unit influent water averaged 45,725 µg/L and perchlorate concentrations in the pilot unit effluent have been below laboratory detection levels (initially 25 µg/L and 12.5 µg/L, then 5 µg/L beginning on September 10, 2020) since August 31, 2020.
 - The available performance assesment sample results, including analytical data and field parameters from the influent, effluent from each reactor, and final effluent after the clarifier and cartridge filter are shown in Table 1. The results from the first three weeks of performance sampling demonstrating the pilot unit is significantly reducing contaminant concentrations including:
 - Perchlorate concentrations in the pilot unit influent ranged from 45,000 to 60,000 µg/L, while perchlorate concentrations in the effluent water from the lag biological reactor were 4.2, 6.1, and 54 µg/L and in the pilot unit effluent (cartridge filter effluent) were 2.2, 2.2, and 130 µg/L for the first three weeks of performance assessment.
 - Chlorate and nitrate concentrations in the pilot unit influent ranged from 97,000 to 100,000 µg/L and 8.4 to 9.2 µg/L, respectively, and concentrations for both parameters were below laboratory detection limits in the pilot unit effluent in weeks 2 and 3.

- Schedule and Progress Updates
 - Steady state operations and performance sampling for Test Scenario #1 will continue in October 2020. Analytical results for the ongoing performance sampling events will be presented in future monthly progress reports when data are available.
- Health and Safety
 - There were no health and safety incidents related to Task M26 during September 2020. Safety measures continue to be implemented to minimize potential exposure to COVID-19, including the use of face coverings, gloves, and hand sanitizer, as well as protocols for monitoring temperatures, minimizing the number of people on site at one time, and evaluating tasks to increase physical distance between personnel.

CERTIFICATION

Hydrogen-Based Gas Permeable Membrane Pilot Study Monthly Progress Report

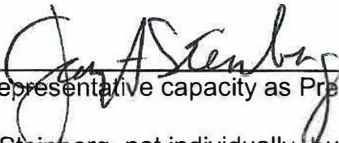
**Nevada Environmental Response Trust Site
(Former Tronox LLC Site)
Henderson, Nevada**

Nevada Environmental Response Trust (NERT) Representative Certification

I certify that this document and all attachments submitted to the Division were prepared at the request of, or under the direction or supervision of NERT. Based on my own involvement and/or my inquiry of the person or persons who manage the systems(s) or those directly responsible for gathering the information or preparing the document, or the immediate supervisor of such person(s), the information submitted and provided herein is, to the best of my knowledge and belief, true, accurate, and complete in all material respects.

Office of the Nevada Environmental Response Trust

Le Petomane XXVII, not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

Signature:  **Not Individually, but Solely as President of the Trustee**, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

Name: Jay A. Steinberg, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

Title: Solely as President and not individually

Company: Le Petomane XXVII, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

Date: 11/3/2020

CERTIFICATION

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

Description of Services Provided: Prepared Hydrogen-Based Gas Permeable Pilot Study Monthly Progress Report.



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

November 3, 2020

Date

Nevada CEM Certificate Number: 2167
Nevada CEM Expiration Date: September 18, 2022

Tables

Table 1
Scenario 1 Performance Monitoring Data
Hydrogen-Gas Based Permeable Membrane Pilot Study

Week and Date	Influent Water										Biological Reactors																						
	Flow	T	pH	Perchlorate	Chlorate	Nitrate -N	Total Cr ¹	Cr VI ¹	TDS	TSS	Perchlorate (ppb)			Chlorate (ppb)			Nitrate (ppm)			Total Cr (ppb) ¹	Cr VI (ppb) ¹	TSS (ppm)			pH			T (°C)			ORP		
	gpm	°C	s.u.	ppb	ppb	ppm	ppb	ppb	ppm	ppm	Lead	Middle	Lag	Lead	Middle	Lag	Lead	Middle	Lag	Lag	Lag	Lead	Middle	Lag	Lead	Middle	Lag	Lead	Middle	Lag	Lead	Middle	Lag
1 (9/15/20)	2.0	28.1	7.67	58,000	97,000	8.4	NA	NA	5,800	13	34,000	340	4.2	31,000	<100	90	0.29	<0.014	0.13	NA	NA	11	35	15	7.79	7.78	7.65	29.5	30.6	30.4	-102	-397	-406
2 (9/21/20)	2.0	30.6	7.69	45,000	100,000	8.8	NA	NA	4,800	17	34,000	240	6.1	33,000	<100	<100	0.33	<0.014	<0.014	NA	NA	12	22	17	7.85	7.86	7.89	31.2	31.8	31.5	-80	-383	-373
3 (9/30/2020)	2.0	30.2	7.69	60,000	99,000	9.2	NA	NA	5,500	14	40,000	10,000	54	49,000	7,000	<10	1.8	0.093	<0.014	NA	NA	14	5.5	<5	7.83	7.83	7.49	29.8	30.5	30.4	-162	-116	-327

Week and Date	Post Reactor Tank Effluent							Treated Water Holding Tank							Cartridge Filter Effluent								
	Perchlorate	Chlorate	Nitrate - N	Total Cr ¹	Cr VI ¹	TSS	T	pH	Total Cr ¹	Cr VI ¹	TSS	T	pH	Turbidity	Perchlorate	Chlorate	Nitrate -N	Total Cr ¹	Cr VI ¹	TDS	TSS	T	pH
	ppb	ppb	ppm	ppb	ppb	ppm	°C	s.u.	ppb	ppb	ppm	°C	s.u.	NTU	ppb	ppb	ppm	ppb	ppb	ppm	ppm	°C	s.u.
1 (9/15/20)	4.7	70	<0.014	NA	NA	8.5	29.5	7.65	NA	NA	13	30.2	8.38	251	2.2	<100	<0.014	NA	NA	5,500	8	30.0	8.4
2 (9/21/20)	6.4	<100	<0.014	NA	NA	6.5	30.9	7.72	NA	NA	10	31.1	8.32	286	2.2	<40	<0.014	NA	NA	4,800	6	31.2	8.28
3 (9/30/2020)	20	<10	<0.014	NA	NA	12	28.5	7.76	NA	NA	9.5	30.0	7.92	37.4	130	180	<0.014	NA	NA	5,200	5	30.2	7.83

1 The chromium analysis will only be performed during Scenario #3.
NA = Not analyzed