

# TECHNICAL MEMORANDUM

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**To:** Nevada Environmental Response Trust

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

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**From:** Dana Grady

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**Date:** May 1, 2020

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**Subject:** Las Vegas Wash Bioremediation Pilot Study Monthly Progress Report

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At the direction of the Nevada Environmental Response Trust (NERT or Trust), Tetra Tech, Inc. (Tetra Tech) has prepared this memorandum which summarizes Tetra Tech's progress during March 2020 toward successfully implementing the Las Vegas Wash Bioremediation Pilot Study.

## Task Progress Update: March 2020

### Task M19 – Las Vegas Wash Pilot Study

- Task Leader – Dana Grady
- Current Status
  - Access negotiations with the City of Henderson for the use of a portion of their landfill as a staging area are on-going.
  - Drilling began on February 10, 2020 and is on-going.
    - During February 2020, the Zone 1 and 3 pilot boring wells were installed and developed. Table 1 provides well construction details for the pilot borings. For reference, Figure 1 provides a location map of the pilot boring wells.
    - The Zone 1 and 3 pilot boring wells were sampled and aquifer tested (both slug testing and nuclear magnetic resonance [NMR] logging) from February 29 through March 10, 2020. A brief summary of results is provided below:
      - Groundwater sample results indicated that concentrations of perchlorate, chlorate, and nitrate were generally consistent with those observed in these areas during the Phase 1 pre-design field activities. Specifically, perchlorate and chlorate in groundwater samples collected from Zone 1 were detected at concentrations of up to 9,300 µg/L and 14,000 µg/L, respectively. Perchlorate and chlorate in groundwater samples collected from Zone 3 were detected at concentrations of up to 7,200 µg/L and 11,000 µg/L, respectively. Complete analytical results are provided in Table 2.

- Preliminary slug tests in Zones 1 and 3 pilot boring monitoring wells indicated an average hydraulic conductivity of 1.3 ft/day for the unconsolidated Upper Muddy Creek formation (UMCf) in both areas, which is generally consistent with Phase 1 pre-design results.
- NMR logs for Zone 1 pilot borings indicated an average total porosity of 58% and mobile porosity of 11% in the UMCf, which is generally consistent with Phase 1 pre-design results.
- NMR logs for Zone 3 pilot borings indicated an average total porosity of 35% and mobile porosity of 5% in the UMCf-coarse grain, which is generally consistent with Phase 1 pre-design results.
- Based on these results, the Zone 1 and 3 injection and monitoring well layouts were finalized and are consistent with the layouts provided in the approved Work Plan Addendum. The Notice of Intent (NOIs) for wells located within Zones 1 and 3 were approved on March 27, 2020. As a result, drilling activities will begin in Zones 1 and 3 in April 2020.
- Drilling in Zone 2 began on February 25, 2020 and is on-going. On March 5, 2020, the Trust notified NDEP that based on information obtained from the newly installed wells in Zone 2, the paleochannel appears to be farther west than anticipated. As a result, it was recommended that two soil borings be installed farther west to evaluate the depth of the alluvium/UMCf contact to further define the extent of the paleochannel to ensure that the planned injection well transect is appropriately located across the paleochannel. NDEP approved this approach on March 5, 2020 and one soil boring was advanced that same day, which indicated that the paleochannel is approximately 150 feet wide and about 150' feet farther west than expected based on previously available data. Although a second boring was proposed, it was not deemed necessary based on the data collected at the first borehole. As a result, the Trust recommended shifting the Zone 2 injection and monitoring well layout approximately 100 feet to the west. While the general layout remains unchanged, this shift allowed Tetra Tech to optimize the injection well transect to fulfill the Zone 2 pilot study objective of "Determine if ISB can effectively create a biologically active zone for remediation of perchlorate- and chlorate-contaminated groundwater within a main, deep paleochannel located upgradient of the Wash". NDEP approved this shift on March 12, 2020.
- A final layout map of all injection and monitoring wells will be provided in future monthly progress reports upon completion of the drilling effort.
- Schedule and Progress Updates
  - Tetra Tech continues to monitor the COVID-19 situation. At this time, this task remains on schedule.
  - Well installation activities are anticipated to be completed in June 2020.
  - Baseline groundwater sampling and aquifer testing will be performed following completion of well installation and development activities.
- Health and Safety
  - There were no safety incidents related to Task M19 during March 2020.
  - Safety measures have been implemented to minimize potential exposure to COVID-19, including the addition of face coverings, gloves, and hand sanitizer, as well as implementing protocols for monitoring temperatures, minimizing the number of people on site at one time, and evaluating tasks to increase physical distance between personnel.

## CERTIFICATION

### Las Vegas Wash Bioremediation 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:** Jay A. Steinberg **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:** 5/1/2020

## CERTIFICATION

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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:** Las Vegas Wash Bioremediation Pilot Study Monthly Progress Report, Nevada Environmental Response Trust Site, Henderson, Nevada.



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

May 1, 2020

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Date

Nevada CEM Certificate Number: 2167  
Nevada CEM Expiration Date: September 18, 2020

# Figures

# DRAFT



Legend	
	Pilot Boring
	Existing Monitoring Well


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**NEVADA ENVIRONMENTAL RESPONSE TRUST**  
 LAS VEGAS WASH BIOREMEDIATION PILOT STUDY  
 HENDERSON, NEVADA  
**PILOT BORING LOCATIONS**

PROJECT NO.:	117-7502019
DATE:	APRIL 14, 2020
DESIGNED BY:	ES
Figure No.	<b>1</b>

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# Tables

Table 1  
 Pilot Boring Well Construction Details  
 Las Vegas Wash Bioremediation Pilot Study

Well	Screened Lithology	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Nominal Screen Length	Slot Size	Filter Pack Gradation	Well Diameter	Borehole Diameter	Borehole Total Depth	Bottom of Filter Pack	Well Total Depth	Bottom of Screen	Top of Screen	Top of Filter Pack	Top of Bentonite Seal
				feet amsl	feet amsl	feet bTOC	feet amsl	feet	inches	inches	inches	inches	feet bgs	feet bgs	feet bgs	feet bgs	feet bgs	feet bgs	feet bgs
<b>Zone 1 Pilot Boring Wells</b>																			
LVWPS-U1-MW01B	UMCf	26735052.48	838200.84	1525.78	1525.85	30.96	1494.89	20	0.010	#2/16	4	8	157.5	155	153.5	153	133.5	131	126
LVWPS-U1-MW02B	UMCf	26734976.53	838276.51	1529.75	1529.63	34.97	1494.66	25	0.010	#2/16	4	8	165	164	162	161.5	136.9	135	130
LVWPS-U1-MW03B	UMCf	26735108.31	838199.29	1527.13	1527.06	32.42	1494.64	20	0.010	#2/16	4	8	165	155	154.5	154	134.5	131	126
LVWPS-U1-MW04B	UMCf	26735026.82	838262.94	1529.47	1529.33	34.62	1494.71	25	0.010	#2/16	4	8	175	165.5	165	164.5	139.9	138	133
LVWPS-U1-MW05B	UMCf	26734951.22	838315.42	1530.45	1530.30	35.51	1494.79	25	0.010	#2/16	4	8	172.5	165	162	161.5	136.9	135	130
<b>Zone 3 Pilot Boring Wells</b>																			
LVWPS-U3-MW01B	UMCf-cg	26734942.69	839376.18	1522.54	1522.41	31.03	1491.38	20	0.010	#2/16	4	8	107.5	105	103.8	103.3	83.8	79.8	75.4
LVWPS-U3-MW02B	UMCf-cg	26734943.89	839475.12	NS	NS	30.93	NA	20	0.010	#2/16	4	8	130	125	123	122.5	103	100	95.5
LVWPS-U3-MW03B	UMCf-cg	26734944.11	839576.72	1522.86	1522.49	30.88	1491.61	25	0.010	#2/16	4	8	179	176.5	176.2	175.7	151.1	147.8	142.7
LVWPS-U3-MW04B	UMCf-cg	26734968.11	839326.96	1522.25	1521.92	30.47	1491.45	20	0.010	#2/16	4	8	102.5	98.4	98.2	97.7	78.2	74.3	70
LVWPS-U3-MW05B	UMCf-cg	26734968.70	839425.48	1522.17	1521.98	30.59	1491.39	20	0.010	#2/16	4	8	112.5	107	105.2	104.7	85.2	83	79.3
LVWPS-U3-MW06B	UMCf-cg	26734965.59	839528.63	1522.18	1521.92	30.36	1491.56	25	0.010	#2/16	4	8	152.5	152.5	150.4	149.9	125.3	123.1	118

Notes:  
 amsl - above mean sea level  
 bTOC - below top of casing  
 bgs - below ground surface  
 UMCf - Upper Muddy Creek formation  
 UMCf-cg - Upper Muddy Creek formation-coarse grain  
 1. Depth to water measurements were collected on March 4, 2020.  
 NS - Survey Pending



**DRAFT**

**Table 2**  
**Groundwater Analytical Results**  
Las Vegas Wash Bioremediation Pilot Study

Well	Sample Date	QCType	Screened Lithology	Screened Interval	EPA 314.0	EPA 300.1	Field Readings					
					Perchlorate	Chlorate	Conductivity	Dissolved Oxygen	Oxidation Reduction Potential	pH	Temperature	Turbidity
					µg/L	µg/L	mS/cm	mg/L	mV	SU	degrees Celsius	NTU
LVWPS-U1-MW01B	3/2/2020	N	UMCf	133.5 - 153	9,300	14,000	5.000	6.03	226.20	7.49	17.5	2.0
	3/2/2020	FD			9,100	14,000	-	-	-	-	-	-
LVWPS-U1-MW02B	3/2/2020	N	UMCf	136.9 - 161.5	2,500	4,500	4.528	5.08	202.00	7.36	21.5	1.5
LVWPS-U1-MW03B	3/2/2020	N	UMCf	134.5 - 154	5,800	9,900	4.343	3.20	172.00	7.52	21.7	5.0
LVWPS-U1-MW04B	3/2/2020	N	UMCf	139.9 - 164.5	6,300	9,900	4.871	3.85	181.60	7.48	20.8	2.9
LVWPS-U1-MW05B	3/3/2020	N	UMCf	136.9 - 161.5	7,800	12,000	5.129	3.90	169.90	7.88	17.4	4.9
LVWPS-U3-MW01B	3/4/2020	N	UMCf-cg	83.8 - 103.3	1,400	2,800	4.071	2.26	112.30	7.49	25.8	6.5
LVWPS-U3-MW02B	3/4/2020	N	UMCf-cg	103 - 122.5	6,600	11,000	5.253	2.30	134.40	7.51	24.3	5.4
LVWPS-U3-MW03B	3/3/2020	N	UMCf-cg	151.1 - 175.7	7,200	11,000	5.434	3.40	80.50	7.86	23.7	2.7
LVWPS-U3-MW04B	3/4/2020	N	UMCf-cg	78.2 - 97.7	1,200	2,300	3.987	2.14	-59.80	8.34	26.2	5.8
LVWPS-U3-MW05B	3/3/2020	N	UMCf-cg	85.2 - 104.7	280	430	4.127	3.34	-75.18	8.30	24.0	5.5
LVWPS-U3-MW06B	3/4/2020	N	UMCf-cg	125.3 - 149.9	1,900	3,000	4.018	4.20	109.90	7.81	18.3	12.6

Notes:  
FD - Field duplicate  
mg/L - milligrams per liter  
µg/L - micrograms per liter  
N - Normal field sample  
UMCf - Upper Muddy Creek Formation  
UMCf-cg - Upper Muddy Creek Formation-coarse grained  
< - The analyte was analyzed for, but was not detected above the level of the reported sample quantitation  
---- Not tested.