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May 31, 2016

Arthur Burbank
USDA Forest Service
4350 South Cliffs Dr.
Pocatello, ID 83204

Subject: Biological Selenium Removal Treatment Technology Fluidized Bed Bioreactor Pilot Study April 2016 Progress Report

Dear Art,

This progress report summarizes key activities in April 2016 associated with the fluidized bed bioreactor (FBR) pilot study located near Hoopes Spring. This pilot study is being conducted as part of the Smoky Canyon Mine Remedial Investigation/Feasibility Study (RI/FS) to provide information on the effectiveness of the active biological treatment system in removing selenium and other COPCs from South Fork Sage Creek Springs and Hoopes Spring. Operation and monitoring of the pilot study follows the *Pilot Study Work Plan and Sampling and Analysis Plan (Work Plan/SAP), Biological Selenium Removal Treatment Technology Fluidized Bed Bioreactor* (prepared by Formation Environmental, dated September 2014, with revised text and tables dated March 5, 2015), along with Work Plan/SAP Addenda 01, 02, and 03 which Simplot submitted to the Agencies (and were subsequently approved) in the summer of 2015, and Addendum 04 submitted to and approved by the Agencies in January 2016.

The system was restarted in March 2016 and ran continuously through April. Week 1 sampling was conducted on April 6 (full analyte list), Week 2 sampling was conducted on April 13 (focused analyte list), week 3 sampling was conducted on April 20 (full analyte list), and week 4 sampling was conducted on April 28 (focused analyte list).

Identification of Deliverables and Data Transmittals

At the time of this report laboratory data for Weeks 0 – 4 have been received (samples collected from March 30 – April 28, 2016). Preliminary laboratory data for the weeks with the full analyte list are presented in Table 1.1, the weeks with the focused analyte list are presented in Table 1.2, and the field data are presented in Table 2.

There were no outstanding deliverables or transmittals for the month of April.

Upcoming Activities

The following activities associated with the FBR pilot study are planned through May 2016, or have occurred as of the date of this progress report:

- The system was taken off line for seven days between May 13 and May 20 to drain and repair the aeration tank. The stand pipe in the aeration tank had fallen over, and broken pieces of plastic were entrained in the flow leaving the tank.
- Sampling for Weeks 5 and 6 occurred in May without any deviations. Sampling for Week 7 was postponed by one week to the week of May 23 due to the aeration tank repairs.

Please contact me if there are questions regarding this monthly progress report.

Sincerely,

Monty Johnson
Environmental Engineering Manager
J. R. Simplot Company

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Table 1.1
Laboratory Results Full Analyte List

		Week 0			Week 1		Week 3	
	Station >>	Influent	Bioreactor	Effluent	Influent	Effluent	Influent	Effluent
	Sample ID >>	SC0316-LSSHS-IN001	SC0316-LSSHS-BE001	SC0316-LSSHS-EF001	SC0416-LSSHS-IN001	SC0416-LSSHS-EF001	SC0416-LSSHS-IN003	SC0416-LSSHS-EF003
	Date >>	3/30/2016	3/30/2016	3/30/2016	4/6/2016	4/6/2016	4/20/2016	4/20/2016
Analyte	Units							
General Chemistry								
Ammonia as N	mg/L	0.026 U	1.57	1.33	0.026 U	1.65	0.026 U	1.24
Bicarbonate	mg/L	160	180	170	200	160	200	180
Biochemical Oxygen Demand	mg/L	2 U	33	5	2 U	26	2 U	2
Carbonate	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chemical Oxygen Demand	mg/L	5 U	7	5	5 U	5	5 U	5 U
Calcium, Dissolved	mg/L	61	60.6	61.3	62.7	62.9	57.8	57.1
Magnesium, Dissolved	mg/L	22.3	22.2	22.1	23	22.9	21.7	21.7
Potassium, Dissolved	mg/L	0.687	0.601	0.649	0.615	0.665	0.549	0.528
Sodium, Dissolved	mg/L	5.97	6.01	6.05	5.78	6.49	6.14	6.18
Chloride	mg/L	7.85	7.56	13.5	7.87	13.5	7.62	14.5
Fluoride	mg/L	0.271	0.384	0.289	0.275	0.255	0.266	0.222
Hardness	mg/L	244	243	244	251	251	234	232
Nitrate as N	mg/L	0.33	0.03 J	0.04 J	0.43	0.05 J	0.41	0.12
Nitrate/Nitrite as N	mg/L	0.328	0.0349 J	0.0376 J	0.432	0.0495 J	0.408	0.124
Sulfate as SO4	mg/L	43.9	36.4	47.3	42.1	49.3	40.6	46.8
Total Alkalinity	mg/L	160	180	170	200	160	200	180
Total Dissolved Solids	mg/L	262	244	240	448	292	246	232
Total Organic Carbon	mg/L	0.64 J	4.81	0.932 J	0.5 U	1.04	0.5 U	0.949 J
Total Phosphorus as P	mg/L	0.0353	0.845	0.135	0.0255	0.148	0.0228	0.0917
Total Sulfide	mg/L	1 U	3.27	1 U	1 U	1 U	1 U	1 U
Total Suspended Solids	mg/L	2 U	2 U	2 U	2 U	2 J	2 U	2 U
Metals and Metalloids								
Aluminum, Dissolved	mg/L	0.0076 U	0.0076 U	0.0076 U	0.0076 U	0.0076 U	0.0076 U	0.0076 U
Aluminum, Total	mg/L	0.0076 U	0.0076 U	0.0076 U	0.0076 U	0.0076 U	0.0076 U	0.0076 U
Antimony, Dissolved	mg/L	0.0000732 U	0.0000732 U	0.00014 J	0.0000732 U	0.00011 J	0.00011 J	0.00012 J
Antimony, Total	mg/L	0.00024 J	0.0000732 U	0.00016 J	0.0000732 U	0.00012 J	0.0001 J	0.00012 J
Arsenic, Dissolved	mg/L	0.00042 J	0.000398 U	0.000398 U	0.000398 U	0.000398 U	0.000398 U	0.000398 U
Arsenic, Total	mg/L	0.00047 J	0.000398 U	0.000398 U	0.000398 U	0.000398 U	0.000398 U	0.000398 U
Barium, Dissolved	mg/L	0.051	0.0512	0.0358	0.0478	0.0318	0.0503	0.0344
Barium, Total	mg/L	0.0534	0.0527	0.0372	0.0489	0.0329	0.0508	0.0351
Beryllium, Dissolved	mg/L	0.000047 U	0.000047 U	0.000047 U	0.000047 U	0.000047 U	0.000047 U	0.000047 U
Beryllium, Total	mg/L	0.000047 U	0.000047 U	0.000047 U	0.000047 U	0.000047 U	0.000047 U	0.000047 U
Boron, Dissolved	mg/L	0.0114 J	0.0118 J	0.0122 J	0.0111 J	0.0116 J	0.00944 J	0.00942 J
Boron, Total	mg/L	0.0119 J	0.0117 J	0.0122 J	0.0114 J	0.0114 J	0.0104 J	0.00988 J
Cadmium, Dissolved	mg/L	0.0000362 U	0.0000362 U	0.0000362 U	0.0000362 U	0.0000362 U	0.0000362 U	0.0000362 U
Cadmium, Total	mg/L	0.0000362 U	0.0000362 U	0.0000362 U	0.0000362 U	0.0000362 U	0.0000362 U	0.0000362 U
Chromium, Dissolved	mg/L	0.00077 J	0.00041 J	0.0002 J	0.0008 J	0.00023 J	0.00097 J	0.00034 J
Chromium, Total	mg/L	0.00076 J	0.00042 J	0.00019 J	0.00083 J	0.00021 J	0.00097 J	0.00031 J
Cobalt, Dissolved	mg/L	0.0002 J	0.00459	0.00705	0.00021 J	0.00405	0.0000318 U	0.00391
Cobalt, Total	mg/L	0.00021 J	0.00468	0.00714	0.00021 J	0.00408	0.0000318 U	0.00396
Copper, Dissolved	mg/L	0.0000418 U	0.00142	0.00243	0.0000418 U	0.00095 J	0.0000418 U	0.00044 J
Copper, Total	mg/L	0.0000418 U	0.00137	0.00242	0.0000418 U	0.00083 J	0.0000418 U	0.00044 J
Iron, Dissolved	mg/L	0.01 U	0.01 U	0.0187 J	0.01 U	0.01 U	0.01 U	0.0281 J
Iron, Total	mg/L	0.0152 J	0.01 U	0.331	0.0229 J	0.389	0.01 U	0.32
Lead, Dissolved	mg/L	0.0000554 U	0.0000554 U	0.0000554 U	0.0000554 U	0.0000554 U	0.0000554 U	0.0000554 U
Lead, Total	mg/L	0.0000554 U	0.0000554 U	0.0000554 U	0.0000554 U	0.0000554 U	0.0000554 U	0.0000554 U

Table 1.1
Laboratory Results Full Analyte List

		Week 0			Week 1		Week 3	
	Station >>	Influent	Bioreactor	Effluent	Influent	Effluent	Influent	Effluent
	Sample ID >>	SC0316-LSSHS-IN001	SC0316-LSSHS-BE001	SC0316-LSSHS-EF001	SC0416-LSSHS-IN001	SC0416-LSSHS-EF001	SC0416-LSSHS-IN003	SC0416-LSSHS-EF003
	Date >>	3/30/2016	3/30/2016	3/30/2016	4/6/2016	4/6/2016	4/20/2016	4/20/2016
Analyte	Units							
Manganese, Dissolved	mg/L	0.00179	0.0139	0.021	0.00103	0.0182	0.00079 J	0.0238
Manganese, Total	mg/L	0.00185	0.0142	0.0219	0.00108	0.0183	0.00079 J	0.0235
Mercury, Dissolved	mg/L	0.000004 U	0.000014 J	0.000004 U	0.000004 U	0.000004 U	0.000013 J	0.000009 J
Mercury, Total	mg/L	0.000138 J	0.000152 J	0.000131 J	0.000069 J	0.000084 J	0.000078 J	0.000072 J
Molybdenum, Dissolved	mg/L	0.00317	0.00512	0.00733	0.00292	0.00608	0.00269	0.00766
Molybdenum, Total	mg/L	0.00212	0.00471	0.00754	0.00193	0.00587	0.00198	0.00723
Nickel, Dissolved	mg/L	0.00049 J	0.00237	0.0282	0.0005 J	0.0223	0.00054 J	0.0163
Nickel, Total	mg/L	0.00051 J	0.00244	0.0282	0.00039 J	0.0219	0.00051 J	0.016
Se(IV)	µg/L	0.25 U	0.25 U	6.3				
Se(VI)	µg/L	112	0.3 U	0.3 U				
Selenate	mg/L						0.00027	0.00556
Selenite	mg/L						0.107	0.00021
Selenium, Dissolved	mg/L	0.136	0.00929	0.0101	0.12	0.00848	0.131	0.00811
Selenium, Total	mg/L	0.132	0.00651	0.00999	0.113	0.00859	0.13	0.0094
Silver, Dissolved	mg/L	0.0000172 U	0.0000172 U	0.0000172 U	0.0000172 U	0.0000172 U	0.0000172 U	0.0000172 U
Silver, Total	mg/L	0.0000172 U	0.0000172 U	0.0000172 U	0.0000172 U	0.0000172 U	0.0000172 U	0.0000172 U
Thallium, Dissolved	mg/L	0.0000657 U	0.0000657 U	0.0000657 U	0.0000657 U	0.0000657 U	0.0000657 U	0.0000657 U
Thallium, Total	mg/L	0.0000657 U	0.0000657 U	0.0000657 U	0.0000657 U	0.0000657 U	0.0000657 U	0.0000657 U
Uranium, Dissolved	mg/L	0.00168	0.00135	0.00144	0.00161	0.0017	0.00155	0.00132
Uranium, Total	mg/L	0.00175	0.00144	0.00151	0.00162	0.00173	0.00149	0.00127
Vanadium, Dissolved	mg/L	0.00142 J	0.00074 J	0.00037 J	0.00136 J	0.00046 J	0.00138 J	0.00022 J
Vanadium, Total	mg/L	0.00143 J	0.00078 J	0.00036 J	0.00139 J	0.00048 J	0.00138 J	0.00022 J
Zinc, Dissolved	mg/L	0.00137 J	0.000102 U	0.0124	0.00036 J	0.00186 J	0.00118 J	0.0046 J
Zinc, Total	mg/L	0.00165 J	0.000102 U	0.0123	0.00017 J	0.00137 J	0.00118 J	0.00442 J

Notes:
Results presented are preliminary, and have not been validated at the time of this report.
U - Analyte not detected above the method detection limit (MDL).
J - Result is estimated.

Table 1.2
Laboratory Results Focused Analyte List

		Week 2		Week 4	
	Station >>	**Influent**	**Effluent**	**Influent**	**Effluent**
	Sample ID >>	SC0416-LSSHS-IN002	SC0416-LSSHS-EF002	SC0416-LSSHS-IN004	SC0416-LSSHS-EF004
	Date >>	4/13/2016	4/13/2016	4/28/2016	4/28/2016
Analyte	**Units**				
General Chemistry					
Nitrate as N	mg/L	0.41	0.04 J	0.95	0.12
Total Phosphorus as P	mg/L	0.0161	0.151	0.0184	0.0784
Total Sulfide	mg/L	1 U	1 U	1 U	1 U
Metals and Metalloids					
Selenium, Dissolved	mg/L	0.122	0.00731	0.126	0.00907
Selenium, Total	mg/L	0.122	0.00843	0.122	0.00894

Notes:
Results presented are preliminary, and have not been validated at the time of this report.
U - Analyte not detected above the method detection limit (MDL).
J - Result is estimated.

Table 2
Field Water Quality Data

Week 0	Station >>	Influent	Bioreactor	Effluent
	Sample ID >>	SC0316-LSSHS-IN001	SC0316-LSSHS-BE001	SC0316-LSSHS-EF001
	Date >>	3/30/2016	3/30/2016	3/30/2016
Analyte	Units			
Dissolved Oxygen	mg/L	7.95	3.13	8.03
ORP	mV	115	-175	10
pH	SU	7.48	6.37	7.1
SC	umhos/cm	455	460	465
Temperature	C	11.95	12.72	12.15
Turbidity	NTU	1.5	8.2	7.3

Week 1	Station >>	Influent	Effluent
	Sample ID >>	SC0416-LSSHS-IN001	SC0416-LSSHS-EF001
	Date >>	4/6/2016	4/6/2016
Analyte	Units		
Dissolved Oxygen	mg/L	8.24	7.68
ORP	mV	281	168
pH	SU	7.79	6.83
SC	umhos/cm	456	477
Temperature	C	12.52	12.31
Turbidity	NTU	0.8	8.4

Week 2	Station >>	Influent	Effluent
	Sample ID >>	SC0416-LSSHS-IN002	SC0416-LSSHS-EF002
	Date >>	4/13/2016	4/13/2016
Analyte	Units		
Dissolved Oxygen	mg/L	8.35	6.45
ORP	mV	296	205
pH	SU	7.9	7.12
SC	umhos/cm	452	468
Temperature	C	12.73	12.28
Turbidity	NTU	1.1	7.4

Week 3	Station >>	Influent	Effluent
	Sample ID >>	SC0416-LSSHS-IN003	SC0416-LSSHS-EF003
	Date >>	4/20/2016	4/20/2016
Analyte	Units		
Dissolved Oxygen	mg/L	7.61	6.67
ORP	mV	265	151
pH	SU	7.67	6.95
SC	umhos/cm	455	465
Temperature	C	12.55	12.37
Turbidity	NTU	0	6.2

Table 2
Field Water Quality Data

Week 4	Station >>	Influent	Effluent
	Sample ID >>	SC0416-LSSHS-IN004	SC0416-LSSHS-EF004
	Date >>	4/28/2016	4/28/2016
Analyte	**Units**		
Dissolved Oxygen	mg/L	7.42	6.17
ORP	mV	154	110
pH	SU	7.35	6.87
SC	umhos/cm	440	467
Temperature	C	12.35	12.19
Turbidity	NTU	3.3	9.7