

Whiting Oil and Gas
Hill 6-6 Remediation
Soil Sample Analytical Confirmation Results - Excavation

			Sample Location					
COGCC Table 910-1 Analyte Suite	Table 910-1 Standard		North Wall, 4'	South Wall, 4'	South Wall, 4' (following over-excavation)	East Wall, 4'	West Wall, 4'	Bottom, 8'
		Lab ID →	15101947-01	K1513005-001	1512154-01	15101947-02	15101947-03	15101947-04
		Sample Date →	10/29/2015	11/10/2015	11/30/2015	10/29/2015	10/29/2015	10/29/2015
		Method ↓	Results					
Organics Compounds in Soils								
TEPH (DRO)	500	SW8015M	25	3,200	150	190	70	9.1
TVPH (GRO)	500		ND	ND	NA	ND	ND	ND
TPH (DRO+GRO)	500		25	3,200	150	190	70	9.1
BENZENE	0.17	SW8260B	ND	ND	NA	ND	ND	ND
TOLUENE	85		ND	ND	NA	ND	ND	ND
ETHYLBENZENE	100		ND	ND	NA	ND	ND	ND
XYLENE TOTAL	175	SW846 8270D	0.0015	ND	NA	ND	0.0031	ND
ACENAPHTHENE	1,000		ND	0.013	NA	ND	ND	ND
ANTHRACENE	1,000		ND	0.018	NA	ND	ND	ND
BENZO(A)ANTHRACENE	0.22		0.013	0.012	NA	ND	ND	ND
BENZO(A)PYRENE	0.022		0.014	0.017	NA	ND	ND	ND
BENZO(B)FLUORANTHENE	0.22		0.017	0.028	NA	ND	ND	ND
BENZO(K)FLUORANTHENE	2.2		ND	ND	NA	ND	ND	ND
CHRYSENE	22		0.012	0.380	NA	ND	ND	ND
DIBENZO(A,H)ANTHRACENE	0.022		ND	0.013	NA	ND	ND	ND
FLUORANTHENE	1,000		0.025	0.009	NA	ND	ND	ND
FLUORENE	1,000		ND	0.026	NA	ND	ND	ND
INDENO(1,2,3-CD)PYRENE	0.22		0.0079	0.013	NA	ND	ND	ND
NAPHTHALENE	23		ND	0.016	NA	ND	ND	ND
PYRENE	1,000		0.026	0.062	NA	ND	ND	ND
Metals in Soils								
MERCURY	23	SW7471B	0.026	0.013	NA	0.039	0.038	0.029
ARSENIC	0.39	SW846 6010C	5.8	5.6	NA	6.8	5.8	5.7
BARIUM	15,000		140	123	NA	160	140	140
CADMIUM	70		ND	0.268	NA	0.35	ND	ND
CHROMIUM (III)	120,000		8.7	6.72	NA	11	8.5	8.7
CHROMIUM (IV)	23		ND	0.12	NA	ND	ND	ND
COPPER	3,100		15	10.5	NA	22	18	17
LEAD	400		11	10.3	NA	21	11	11
NICKEL	1,600		11	9.78	NA	15	13	12
SELENIUM	390		0.68	0.35	NA	0.76	ND	0.70
SILVER	390		ND	0.074	NA	ND	ND	ND
ZINC	23,000		250	51.1	NA	100	66	67
Inorganics in Soils								
Sodium Absorption Ratio (unitless)	<12 ⁵	USAD H60	NA	NA	NA	NA	NA	NA
Electric Conductivity (mmhos/cm)	<4mmhos/cm or 2x background		NA	NA	NA	NA	NA	NA
pH (unitless)	6 to 9	SW9045D	NA	NA	NA	NA	NA	NA
Moisture (%)	NA	W160.3M	12.0	NA	NA	14.0	12.0	12.0

all results in mg/kg-dry unless noted

NA = not analyzed

ND = non detect

Above COGCC Table 910-1 Standard

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Soil Sample Analytical Background Results

			Sample Location		
COGCC Table 910-1 Analyte Suite	Table 910-1 Standard		BKGD 01	BKGD 02	BKGD 03
		Lab ID →	K1513005-002	K1513005-003 and K1514367-001	K1513005-004
		Sample Date →	11/10/2015	11/10/2015	11/10/2015
		Method ↓	Results		
Arsenic	0.17	SW846 6010C	5.59	5.73	5.91
Sodium Absorption Ratio (unitless)	<12 ⁵	USAD H60	12.4	33.2	36.6
Electric Conductivity (mmhos/cm)	<4mmhos/cm or 2x background		9.56	14.9	15.4
pH (unitless)	6 to 9	SW9045D	7.7	8.01	7.93

NA = not analyzed

ND = non detect

Above COGCC Table 910-1 Standard

all results in mg/kg unless noted

Whiting Oil and Gas
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Soil Sample Analytical Results - Stockpiles

			Sample Location	
COGCC Table 910-1 Analyte Suite	Table 910-1 Standard		Overburden Stockpile	Impacted Stockpile
		Lab ID →	15101947-05	10101947-06
		Sample Date →	10/29/2015	10/29/2015
		Method ↓	Results	
Organics Compounds in Soils				
TEPH (DRO)	500	SW8015M	200	3,000
TVPH (GRO)	500	SW8015D	ND	200
TPH (DRO+GRO)	500		200	3,200
BENZENE	0.17	SW8260B	ND	0.083
TOLUENE	85		0.0031	0.46
ETHYLBENZENE	100		ND	0.18
XYLENE TOTAL	175		0.0079	2.4
ACENAPHTHENE	1,000	SW846 8270D	ND	NA
ANTHRACENE	1,000		ND	NA
BENZO(A)ANTRHACENE	0.22		ND	NA
BENZO(A)PYRENE	0.022		ND	NA
BENZO(B)FLUORANTHENE	0.22		ND	NA
BENZO(K)FLUORANTHENE	2.2		ND	NA
CHRYSENE	22		ND	NA
DIBENZO(A,H)ANTHRANCENE	0.022		ND	NA
FLUORANTHENE	1,000		ND	NA
FLUORENE	1,000		ND	NA
INDENO(1,2,3-CD)PYRENE	0.22		ND	NA
NAPHTHALENE	23		0.0077	NA
PYRENE	1,000		ND	NA
Metals in Soils				
MERCURY	23	SW7471B	0.039	NA
ARSENIC	0.39	SW846 6010C	6.3	NA
BARIUM	15,000		250	NA
CADMIUM	70		ND	NA
CHROMIUM (III)	120,000		16	NA
CHROMIUM (IV)	23		ND	NA
COPPER	3,100		18	NA
LEAD	400		22	NA
NICKEL	1,600		15	NA
SELENIUM	390		1.1	NA
SILVER	390		ND	NA
ZINC	23,000		110	NA
Inorganics in Soils				
Sodium Absorption Ratio (unitless)	<12 ⁵	USAD H60	39.0	NA
Electric Conductivity (mmhos/cm)	<4mmhos/cm or 2x background		30.0	NA
pH (unitless)	6 to 9	SW9045D	NA	NA
Moisture (%)	NA	W160.3M	11.0	18.0

all results in mg/kg-dry unless noted

NA = not analyzed

ND = non detect

Above COGCC Table 910-1 Standard

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Soil Sample Analytical - Stockpile LTU

			Sample Location		
COGCC Table 910-1 Analyte Suite	Table 910-1 Standard		SS01 (LTU 01)	SS02 (LTU 02)	SS03 (LTU 03)
		Lab ID →	15111215-01	15111215-02	15111215-03
		Sample Date →	11/19/2015	11/19/2015	11/19/2015
		Method ↓	Results		
Organics Compounds in Soils					
TEPH (DRO)	500	SW8015M	170	110	170
TVPH (GRO)	500		ND	82	81
TPH (DRO+GRO)	500		170	192	251
BENZENE	0.17	SW8260B	ND	ND	ND
TOLUENE	85		ND	ND	ND
ETHYLBENZENE	100		ND	ND	ND
XYLENE TOTAL	175		ND	ND	ND
ACENAPHTHENE	1,000	SW846 8270D	ND	ND	ND
ANTHRACENE	1,000		ND	ND	ND
BENZO(A)ANTRHACENE	0.22		ND	ND	ND
BENZO(A)PYRENE	0.022		ND	ND	ND
BENZO(B)FLUORANTHENE	0.22		ND	ND	ND
BENZO(K)FLUORANTHENE	2.2		ND	ND	ND
CHRYSENE	22		ND	ND	ND
DIBENZO(A,H)ANTHRANCENE	0.022		ND	ND	ND
FLUORANTHENE	1,000		ND	ND	ND
FLUORENE	1,000		ND	0.033	ND
INDENO(1,2,3-CD)PYRENE	0.22		ND	ND	ND
NAPHTHALENE	23		0.015	ND	0.026
PYRENE	1,000		ND	ND	ND
Metals in Soils					
MERCURY	23	SW7471B	0.027	0.03	0.045
ARSENIC	0.39	SW846 6010C	5.9	6.3	6.1
BARIUM	15,000		210	290	240
CADMIUM	70		0.42	0.45	0.43
CHROMIUM (III)	120,000		13	23	18
CHROMIUM (IV)	23		ND	ND	ND
COPPER	3,100		18	19	19
LEAD	400		17	23	19
NICKEL	1,600		15	15	15
SELENIUM	390		1.3	1.2	1.1
SILVER	390		ND	ND	ND
ZINC	23,000		100	150	130
Inorganics in Soils					
Sodium Absorption Ratio (unitless)	<12 ⁵	USAD H60	NA	NA	NA
Electric Conductivity (mmhos/cm)	<4mmhos/cm or 2x background		NA	NA	NA
pH (unitless)	6 to 9	SW9045D	NA	NA	NA
Moisture (%)	NA	W160.3M	17.0	16.0	16.0

all results in mg/kg-dry unless noted

NA = not analyzed

ND = non detect

Above COGCC Table 910-1 Standard