

CITY OF SHERWOOD

Amec Foster Wheeler
 Environment & Infrastructure, Inc.
 7376 S.W. Durham Road
 Portland, OR 97224



FORMER FRONTIER
 LEATHER PROPERTY
 SHERWOOD, OREGON

SITE LOCATION MAP

DATE	JANUARY 2018
SCALE	1" = 2,000'
PROJECT NO.	5-61M-13082-03
FIGURE	1

DRAWN BY: SD CHECKED BY: EH

TABLE 1
Summary of Cleanup Alternatives Compared to Evaluation Criteria
Former Frontier Leather Tannery Property
Sherwood, Oregon

Alternative No. and Title	Protectiveness	Effectiveness		Long-term Reliability		Implementability		Implementation Risk			Sustainability		Climate Change Concerns			Rank (higher score = more desirable)	Cost
		Pass / Fail	Scoring		Scoring		Scoring		No. of Weeks	Scoring		Scoring					
			None	1	None	1	NA	1		None	1	None	1	None	1		
Alternative 1 No Action	Fail	None	0	None	0	Easy	3	None	0	0	Moderate	2	None	4	9	\$0	
Alternative 2 Removal and Disposal of Contaminated Soils and Hides	Pass	High	3	High	3	Easy	3	High	1	16	Moderate	2	None	4	16	\$3,850,000	
Alternative 3 Placement of Contaminated Soils and Hides in (HDPE)-Lined On-Site Containment Cell	Pass	High	3	Low	1	Difficult	1	Moderate	2	15	Moderate	2	Moderate	2	11	\$3,710,000	
Alternative 4 Placement of Contaminated Soils and Hides in Chemically Stabilized On-Site Containment Cell	Pass	High	3	Moderate	2	Easy	3	Moderate	2	13	High	3	Moderate	2	15	\$3,280,000	
Alternative 5 Placement of Contaminated Soils in Chemically-Stabilized On-Site Containment Cell; Removal and Disposal of Hides	Pass	High	3	Moderate	2	Easy	3	Moderate	2	12	Moderate	2	Moderate	2	14	\$4,310,000	
Alternative 6 Placement of Contaminated Soils in Chemically-Stabilized On-Site Containment Cell; Hides Managed In Place	Pass	High	3	Low to Moderate	2	Easy	3	Low	3	10	Low	1	Moderate	2	14	\$3,260,000	
Alternative 7 Removal and Disposal of Contaminated Soils; Hides Managed In-Place	Pass	High	3	Moderate	2	Easy	3	Moderate	2	11	High	3	None	4	17	\$2,630,000	

Notes:

No. of weeks - total weeks estimated for construction

Green highlight identifies the remedial alternatives with the highest rank

Yellow highlight identifies the alternatives of similar score below the highest ranked alternatives

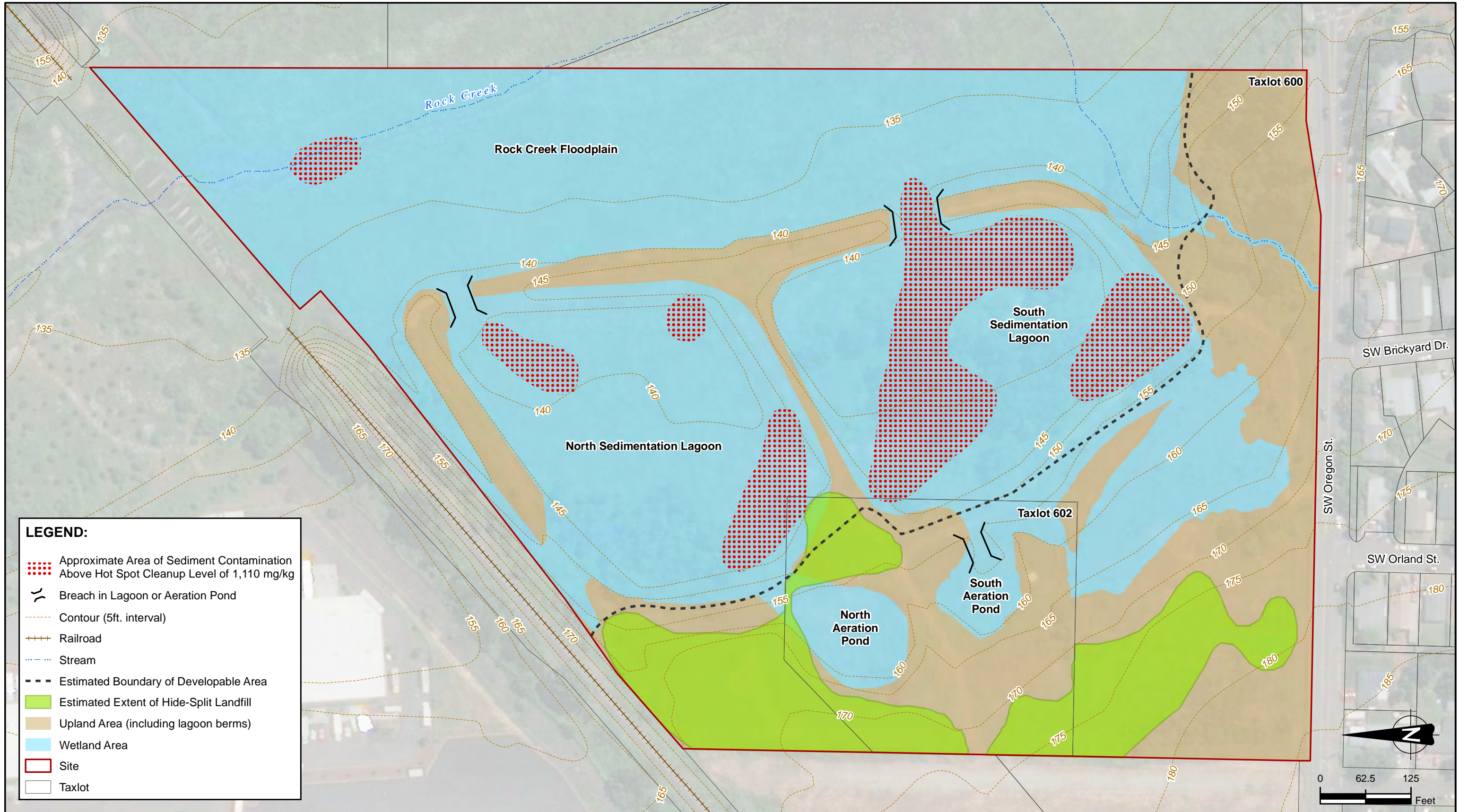
TABLE 2
Summary of Costs for Each Remedial Alternative
Former Frontier Leather Tannery Property
Sherwood, Oregon

Cost Categories	Rate	Units	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6		Alternative 7		Explanation
			No Action		Removal and Disposal of Contaminated Soils and Hides		Placement of Contaminated Soils and Hides in HDPE-Lined On-Site Containment Cell		Placement of Contaminated Soils and Hides in Chemically Stabilized On-Site Containment Cell		Placement of Contaminated Soils in Chemically-Stabilized On-Site Containment Cell; Removal and Disposal of Hides		Placement of Contaminated Soils in Chemically-Stabilized On-Site Containment Cell; Hides Managed In Place		Removal and Disposal of Contaminated Soils; Hides Managed In-Place		
			Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	
CONSULTANT COST																	
Workplan/Design (subtotal)			0	\$0	216	\$31,600	248	\$35,840	234	\$34,060	244	\$35,710	214	\$31,110	214	\$31,110	
Sr. Engineer	\$165	Per Hour	0	\$0	80	\$13,200	80	\$13,200	80	\$13,200	90	\$14,850	70	\$11,550	70	\$11,550	Estimated LOE in 2017 dollars
Jr. Engineer	\$120	Per Hour	0	\$0	48	\$5,760	40	\$4,800	36	\$4,320	36	\$4,320	36	\$4,320	36	\$4,320	Estimated LOE in 2017 dollars
PM - Geologist	\$155	Per Hour	0	\$0	48	\$7,440	48	\$7,440	48	\$7,440	48	\$7,440	48	\$7,440	48	\$7,440	Estimated LOE in 2017 dollars
CAD	\$130	Per Hour	0	\$0	40	\$5,200	80	\$10,400	70	\$9,100	70	\$9,100	60	\$7,800	60	\$7,800	Estimated LOE in 2017 dollars
Permitting (subtotal)			0	\$0	200	\$24,000	200	\$24,000	200	\$24,000	200	\$24,000	200	\$24,000	200	\$24,000	
Permit Specialist	\$120	Per Hour	0	\$0	200	\$24,000	200	\$24,000	200	\$24,000	200	\$24,000	200	\$24,000	200	\$24,000	Estimated LOE in 2017 dollars
Bid Support			0	\$0	60	\$9,000	64	\$9,480	64	\$9,480	64	\$9,480	64	\$9,480	64	\$9,480	
Sr. Engineer	\$165	Per Hour	0	\$0	40	\$6,600	40	\$6,600	40	\$6,600	40	\$6,600	40	\$6,600	40	\$6,600	Estimated LOE in 2017 dollars
Jr. Engineer	\$120	Per Hour	0	\$0	20	\$2,400	24	\$2,880	24	\$2,880	24	\$2,880	24	\$2,880	24	\$2,880	Estimated LOE in 2017 dollars
Construction Oversight (subtotal)			0	\$0	1148	\$115,980	1078	\$108,880	938	\$94,680	868	\$87,580	728	\$73,380	798	\$80,480	
Sr. Engineer	\$165	Per Hour	0	\$0	160	\$26,400	150	\$24,750	130	\$21,450	120	\$19,800	100	\$16,500	110	\$18,150	Estimated LOE in 2017 dollars based on schedule
Jr. Engineer	\$120	Per Hour	0	\$0	160	\$19,200	150	\$18,000	130	\$15,600	120	\$14,400	100	\$12,000	110	\$13,200	Estimated LOE in 2017 dollars based on schedule
Env. Tech	\$85	Per Hour	0	\$0	828	\$70,380	778	\$66,130	678	\$57,630	628	\$53,380	528	\$44,880	578	\$49,130	Estimated LOE in 2017 dollars based on schedule
Construction Report (subtotal)			0	\$0	208	\$30,060	220	\$31,500	220	\$31,500	230	\$33,150	230	\$33,150	230	\$33,150	
Sr. Engineer	\$165	Per Hour	0	\$0	100	\$16,500	100	\$16,500	100	\$16,500	110	\$18,150	110	\$18,150	110	\$18,150	Estimated LOE in 2017 dollars
Jr. Engineer	\$120	Per Hour	0	\$0	48	\$5,760	60	\$7,200	60	\$7,200	60	\$7,200	60	\$7,200	60	\$7,200	Estimated LOE in 2017 dollars
CAD Specialist	\$130	Per Hour	0	\$0	60	\$7,800	60	\$7,800	60	\$7,800	60	\$7,800	60	\$7,800	60	\$7,800	Estimated LOE in 2017 dollars
5-Year Operations & Maintenance (subtotal)			0	\$0	0	\$0	160	\$21,200	160	\$21,200	160	\$21,200	280	\$36,150	135	\$17,250	
Sr. Engineer	\$165	Per Hour	0	\$0	0	\$0	40	\$6,600	40	\$6,600	40	\$6,600	50	\$8,250	20	\$3,300	Estimated LOE in 2017 dollars covering a 5-year period
Jr. Engineer	\$120	Per Hour	0	\$0	0	\$0	100	\$12,000	100	\$12,000	100	\$12,000	200	\$24,000	100	\$12,000	Estimated LOE in 2017 dollars covering a 5-year period
CAD Specialist	\$130	Per Hour	0	\$0	0	\$0	20	\$2,600	20	\$2,600	20	\$2,600	30	\$3,900	15	\$1,950	Estimated LOE in 2017 dollars covering a 5-year period
Project Mgmt/Communication (subtotal)			0	\$0	384	\$56,360	364	\$53,540	332	\$48,420	316	\$45,860	284	\$40,740	300	\$43,300	
PM - Geologist	\$155	Per Hour	0	\$0	256	\$39,680	244	\$37,820	220	\$34,100	208	\$32,240	184	\$28,520	196	\$30,380	Estimated LOE in 2017 dollars based on schedule plus pre- and post-construction communications
Admin/WP Support	\$65	Per Hour	0	\$0	52	\$3,380	48	\$3,120	48	\$3,120	48	\$3,120	48	\$3,120	48	\$3,120	Estimated LOE in 2017 dollars
Principal Review	\$175	Per Hour	0	\$0	76	\$13,300	72	\$12,600	64	\$11,200	60	\$10,500	52	\$9,100	56	\$9,800	Estimated LOE in 2017 dollars plus pre-construction communications
Labor Markup	6	%		\$0		\$17,066		\$17,066		\$15,800		\$15,419		\$14,881		\$14,326	
TOTAL CONSULTANT LABOR COST				\$0		\$283,020		\$301,506		\$279,140		\$272,399		\$262,891		\$253,096	
Expenses (subtotal)			0	\$0	2748	\$49,077	2443	\$43,473	2153	\$42,291	2008	\$41,700	1574	\$38,358	1866	\$41,154	
Mileage	\$0.65	Per Mile	0	\$0	2240	\$1,456	2100	\$1,365	1820	\$1,183	1680	\$1,092	1400	\$910	1540	\$1,001	No. of weeks * 5 days/week * roundtrip miles
Van	\$216	Per Week	0	\$0	16	\$3,456	3	\$648	3	\$648	3	\$648	3	\$648	3	\$648	No. of weeks * cost/week
Analytical - Total Chromium	\$15	Per Sample	0	\$0	411	\$6,165	264	\$3,960	264	\$3,960	264	\$3,960	120	\$1,800	267	\$4,005	Variable per alternative based on 1 bottom sample per 1,000SF and 1 sidewall sample per 100LF
Permitting	\$30,000	Lump Sum	0	\$0	1	\$30,000	1	\$30,000	1	\$30,000	1	\$30,000	1	\$30,000	1	\$30,000	Professional judgement (may change based on future dialogue with permitting agencies)
Other	\$100	Lump Sum	0	\$0	80	\$8,000	75	\$7,500	65	\$6,500	60	\$6,000	50	\$5,000	55	\$5,500	Other direct costs proportional to scale of each alternative
Expense Markup	15	%		\$0		\$7,362		\$6,521		\$6,344		\$6,255		\$5,754		\$6,173	
TOTAL CONSULTANT EXPENSE COST				\$0		\$56,439		\$49,994		\$48,635		\$47,955		\$44,112		\$47,327	
TOTAL CONSULTANT COST (LABOR + EXPENSE)				\$0		\$339,459		\$351,500		\$327,775		\$320,354		\$307,002		\$300,423	
CONTRACTOR COST																	
Site Prep/Mob/Demob	\$1,000	Lump Sum	0	\$0	64	\$64,000	60	\$60,000	52	\$52,000	48	\$48,000	40	\$40,000	44	\$44,000	Proportional to equipment and manpower requirements to complete each alternative
Grubbing/Tree Removal	\$2,000	Per Acre	0	\$0	17.3	\$34,676	17.3	\$34,676	17.3	\$34,676	17.3	\$34,676	17.3	\$34,676	17.3	\$34,676	Total acres (10.2) * 1.7 to cover equipment and disposal costs (engineer's experience)
Excavation/Grading	\$14.00	Per CY	0	\$0	50,352	\$704,932	50,352	\$704,932	50,352	\$704,932	50,352	\$704,932	38,974	\$545,631	38,974	\$545,631	Total CY to be moved
Transport to Hillsboro (soil)	\$9.00	Per Ton	0	\$0	27,595	\$248,356	0	\$0	0	\$0	0.0	\$0	0.0	\$0	27,595	\$248,356	Total tons to be transported to Hillsboro Landfill
Disposal Hillsboro	\$33.32	Per Ton	0	\$0	27,595	\$919,467	0	\$0	0	\$0	0.0	\$0	0.0	\$0	27,595	\$919,467	Total tons to be disposed at Hillsboro Landfill
Transport to Riverbend (hides)	\$15.30	Per CY	0	\$0	22,757	\$348,185	0	\$0	0	\$0	22,757	\$348,185	0.0	\$0	0.0	\$0	Total CY to be transported to Riverbend Landfill
Disposal (hide splits only) Riverbend	\$38.20	Per CY	0	\$0	22,757	\$869,325	0	\$0	0	\$0	22,757	\$869,325	0.0	\$0	0.0	\$0	Total CY to be disposed at Riverbend Landfill
Liner Installation	\$1.85	Per SF	0	\$0	0	\$0	398,861	\$737,892	199,430	\$368,946	199,430	\$368,946	199,430	\$368,946	0.0	\$0	SF of South lagoon * 1.2 to account for topography
CAP Cover/Backfill	\$32.00	Per CY	0	\$0	0	\$0	25,852	\$827,267	25,852	\$827,267	25,852	\$827,267	43,552	\$1,393,668	17,700	\$566,401	CY of cap * 1.4 to account for compaction
Phosphate Mixing	\$1,200	Per Ton	0	\$0	0	\$0	0	\$0	48.5	\$58,210	48.5	\$58,210	48.5	\$58,210	0.0	\$0	No. tons * mixing ratio of 0.003 per ton
Wetlands Mitigation ¹	\$155,000	Per Acre	0	\$0	-3.9	-\$599,756	1.2	\$188,728	1.2	\$188,728	-1.3	-\$205,514	-1.3	-\$205,514	-3.9	-\$599,756	See note at bottom of table
Wetlands Restoration	\$0.25	Per SF	0	\$0	544,895	\$136,224	136,773	\$34,193	136,773	\$34,193	136,773	\$34,193	136,773	\$34,193	136,773	\$34,193	SF of wetland area * 1.5 for to meet state restoration requirements
Upland Hydroseeding	\$4,356	Per Acre	0	\$0	4	\$17,068	8.1	\$35,240	8.1	\$35,240	8.1	\$35,240	8.1	\$35,240	4	\$17,068	\$0.10 per SF for 1-acre or more; no. of acres * 1.5 to account for topography
Contractor Markup	15	%		\$0		\$411,372		\$393,439		\$345,629		\$468,519		\$345,758		\$271,506	
TOTAL CONTRACTOR COST				\$0		\$3,153,849		\$3,016,368		\$2,649,821		\$3,591,980		\$2,650,809		\$2,081,543	
TOTAL PROJECT COST																	
CONSULTANT + CONTRACTOR COST (INCL O&M)				\$0		\$3,493,307		\$3,367,868		\$2,977,596		\$3,912,334		\$2,957,812		\$2,381,967	
Contingency	10	%		\$0		\$349,331		\$336,787		\$297,760		\$391,233		\$295,781		\$238,197	Accounts for unknown conditions and volumes. Applied to consultant and contractor costs.
TOTAL PROJECT COST (CAPITAL COST + O&M)				\$0		\$3,842,638		\$3,704,655		\$3,275,356		\$4,303,567		\$3,253,593		\$2,620,163	
TOTAL PROJECT COST (CAPITAL COST + O&M) - ROUNDED				\$0		\$3,850,000		\$3,710,000		\$3,280,000		\$4,310,000		\$3,260,000		\$2,630,000	For use in comparative evaluation
Schedule (weeks)² =				0		16		15		13		12		10		11	See note at bottom of table

Notes:

¹ The wetland mitigation unit cost is derived from estimated costs, as of 2017, for credits available from wetland mitigation banks within the designated watershed of the site. This unit rate cost is subject to change. Costs for wetland mitigation reflect the requirement for the purchase or sale of wetland credits depending upon the overall impact or restoration of site wetlands as proposed in each alternative. A negative quantity and cost for wetland mitigation indicates that a wetland mitigation bank would be established at the site and banked credits would be sold over time. A positive quantity and cost indicates that banked credits would be purchased from an established mitigation bank within the watershed to offset the estimated impact to site wetlands.

² Schedule is based on the number of weeks for on-site or off-site transport of contaminated materials, plus 2 weeks for mob/demob, plus between 1 and 5 additional weeks not covered by transport time.



LEGEND:

- Approximate Area of Sediment Contamination Above Hot Spot Cleanup Level of 1,110 mg/kg
- Breach in Lagoon or Aeration Pond
- Contour (5ft. interval)
- Railroad
- Stream
- Estimated Boundary of Developable Area
- Estimated Extent of Hide-Split Landfill
- Upland Area (including lagoon berms)
- Wetland Area
- Site
- Taxlot

DRAFT

CITY OF SHERWOOD

Amec Foster Wheeler
Environment & Infrastructure, Inc.
7376 S.W. Durham Road
Portland, OR 97224

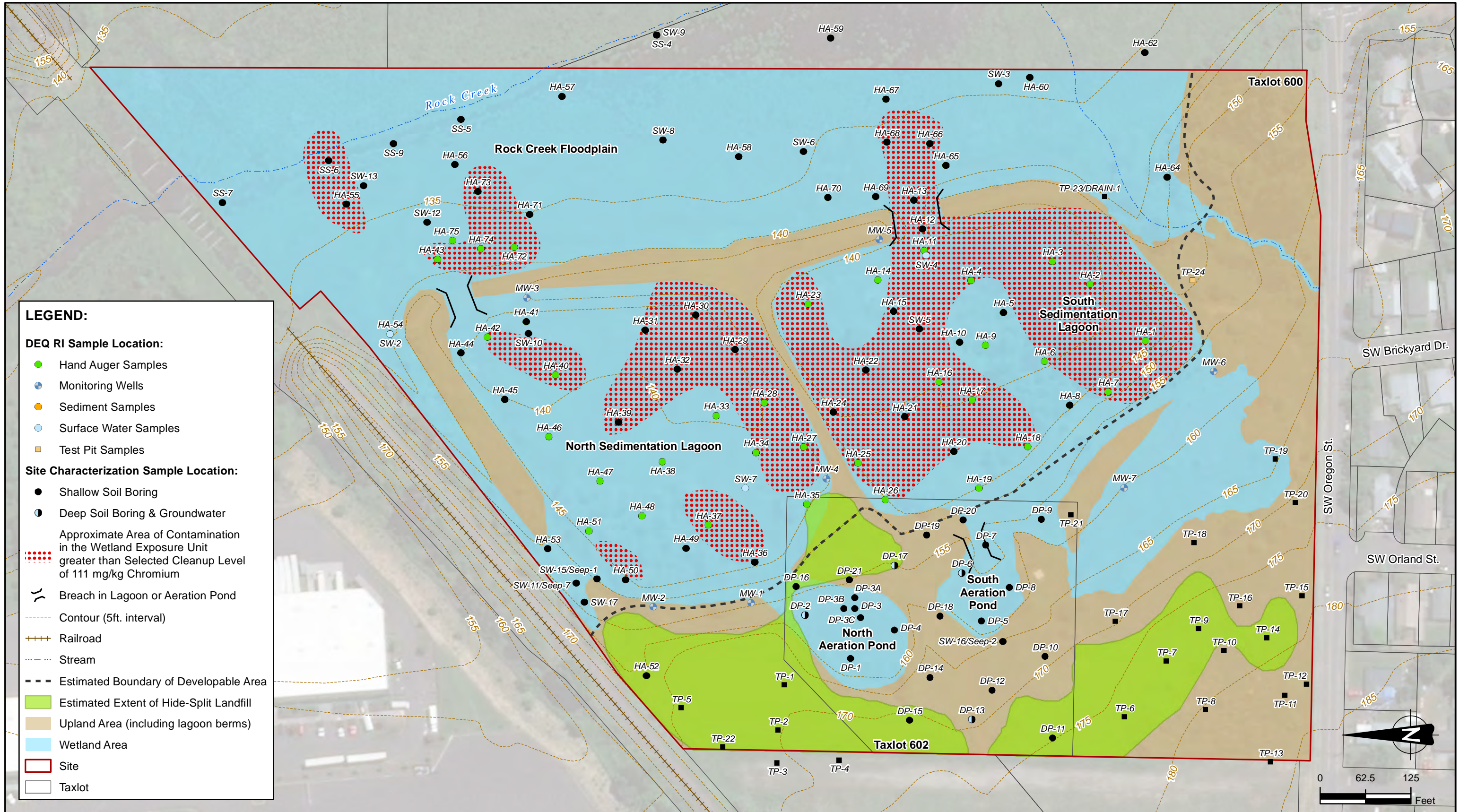


FORMER FRONTIER LEATHER PROPERTY
SHERWOOD, OREGON

CLEANUP PLANNING MAP

DATE	JANUARY 2018
SCALE	1" = 125'
PROJECT NO.	5-61M-130820-03
FIGURE	2

DRAWN BY: SD CHECKED BY: EH



LEGEND:

DEQ RI Sample Location:

- Hand Auger Samples
- Monitoring Wells
- Sediment Samples
- Surface Water Samples
- Test Pit Samples

Site Characterization Sample Location:

- Shallow Soil Boring
- Deep Soil Boring & Groundwater

●●●● Approximate Area of Contamination in the Wetland Exposure Unit greater than Selected Cleanup Level of 111 mg/kg Chromium

) Breach in Lagoon or Aeration Pond

--- Contour (5ft. interval)

++++ Railroad

--- Stream

--- Estimated Boundary of Developable Area

■ Estimated Extent of Hide-Split Landfill

■ Upland Area (including lagoon berms)

■ Wetland Area

■ Site

■ Taxlot

CITY OF SHERWOOD

Amec Foster Wheeler
 Environment & Infrastructure, Inc.
 7376 S.W. Durham Road
 Portland, OR 97224



FORMER FRONTIER LEATHER PROPERTY
 SHERWOOD, OREGON

CLEANUP PLANNING MAP

DATE	JULY 2018
SCALE	1" = 125'
PROJECT NO.	5-61M-130820-03
FIGURE	2

DRAWN BY: SD CHECKED BY: GT

K:\130001\1300013082\DWG_ABACA_Revise_2018\Figure 2 - Cleanup Planning Map.mxd - stephane.descombes - 7/3/2018 - 10:04:54 AM



LEGEND:

DEQ RI Sample Location:

- Hand Auger Samples
- Monitoring Wells
- Sediment Samples
- Surface Water Samples
- Test Pit Samples

Site Characterization Sample Location:

- Shallow Soil Boring
- Deep Soil Boring & Groundwater

Proposed Excavation Depth:

- ▨ 1.5' Excavation Depth
- ▨ 2' Excavation Depth
- ▨ 3' Excavation Depth
- ▨ 4' Excavation Depth

~ Breach in Lagoon or Aeration Pond
 --- Contour (5ft. interval)
 +++ Railroad
 --- Stream
 - - - Estimated Boundary of Developable Area
 ■ Estimated Extent of Hide-Split Landfill
 ■ Upland Area (including lagoon berms)
 ■ Wetland Area
 ■ Site
 ■ Taxlot



DRAWN BY: SD CHECKED BY: GT

CITY OF SHERWOOD

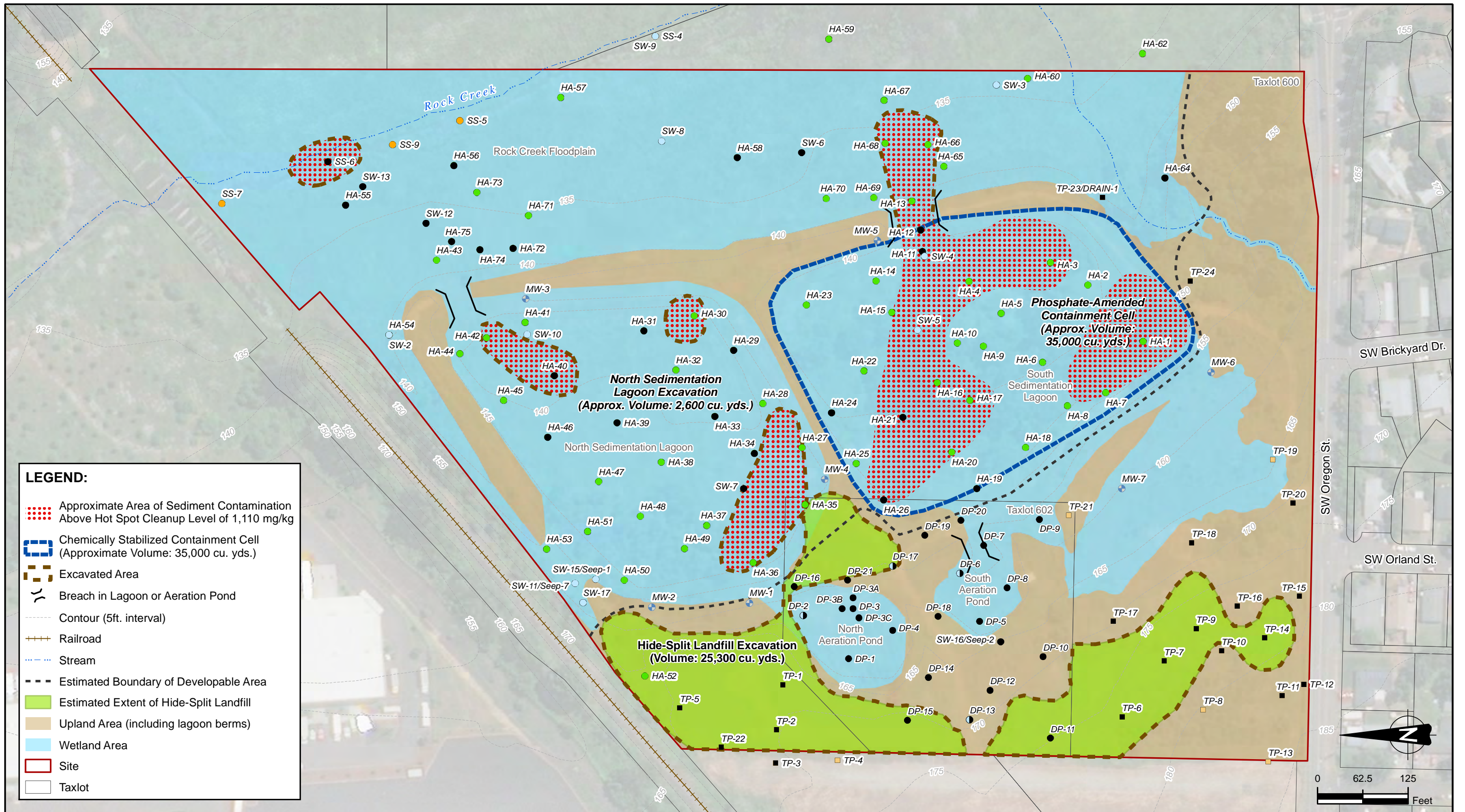
Amec Foster Wheeler
Environment & Infrastructure, Inc.
7376 S.W. Durham Road
Portland, OR 97224



**FORMER FRONTIER LEATHER PROPERTY
SHERWOOD, OREGON**

**CLEANUP PLANNING MAP
WITH EXCAVATION DEPTHS**

DATE	JULY 2018
SCALE	1" = 125'
PROJECT NO.	5-61M-130820-03
FIGURE	3



NOTE: Containment cell would be capped with 3 feet of suitable fill.

DRAFT

CITY OF SHERWOOD

Amec Foster Wheeler
Environment & Infrastructure, Inc.
7376 S.W. Durham Road
Portland, OR 97224



FORMER FRONTIER LEATHER PROPERTY
SHERWOOD, OREGON

SELECTED REMEDIAL ALTERNATIVE MAP
REVISED

DATE
JANUARY 2018

SCALE
1" = 125'

PROJECT NO.
5-61M-130820-03

FIGURE
4

DRAWN BY: SD CHECKED BY: EH



LEGEND:

- Approximate Area of Contamination in the Wetland Exposure Unit greater than Selected Cleanup Level of 111 mg/kg Chromium
- Chemically Stabilized Containment Cell (Approximate Volume: 35,000 cu. yds.)
- Excavated Area
- Breach in Lagoon or Aeration Pond
- Contour (5ft. interval)
- Railroad
- Stream
- Estimated Boundary of Developable Area
- Estimated Extent of Hide-Split Landfill
- Upland Area (including lagoon berms)
- Wetland Area
- Site
- Taxlot

CITY OF SHERWOOD

Amec Foster Wheeler
 Environment & Infrastructure, Inc.
 7376 S.W. Durham Road
 Portland, OR 97224



FORMER FRONTIER LEATHER PROPERTY
 SHERWOOD, OREGON

SELECTED REMEDIAL ALTERNATIVE MAP

DATE
 JULY 2018

SCALE
 1" = 125'

PROJECT NO.
 5-61M-130820-03

FIGURE
 4

DRAWN BY: SD CHECKED BY: GT