Remedial Action Construction

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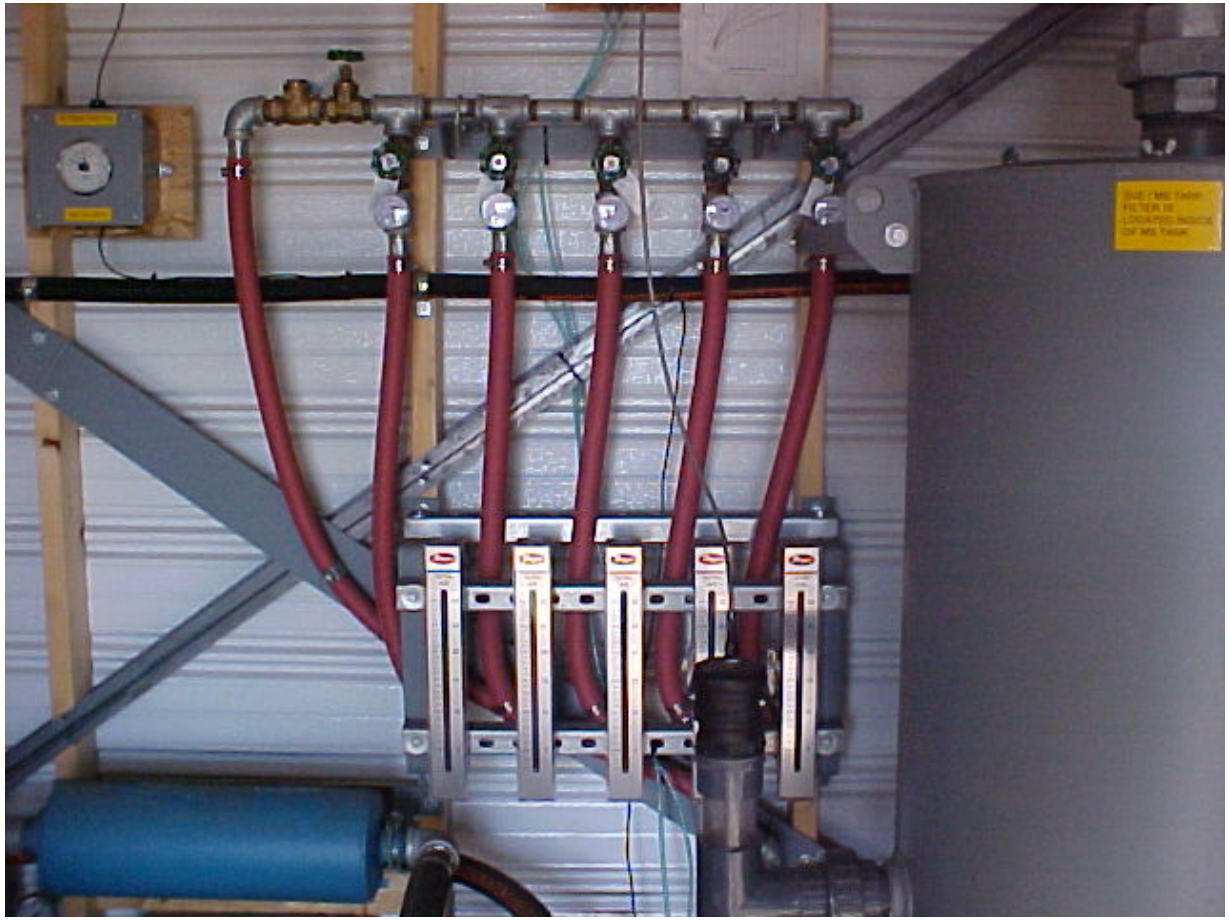
Remediation Methods

- Most Common:
  - Excavation
  - Air Sparging/Soil Vapor Extraction
  - Multi-Phase Extraction
  - Bio-Sparging
- Not as Common:
  - Biological Treatment
  - Chemical Treatment

Trenching

Air Sparging Compressor

Air Sparging Meters and Valves



Air Sparging/ Soil Vapor Extraction Trailer

Soil Vapor Extraction Blower

Pump and Treat

- Use Ground Water Pumps to Capture Contaminated Groundwater
- For Treatment use an Air Stripper or Activated Carbon to Remove Contaminants from Groundwater to Levels Acceptable for Disposal.
- Disposal - Transfer to Infiltration Gallery, Injection Well, or Surface Water

Regulation

- NPDES (National Pollutant Discharge Elimination System) Permit
  - For Disposal of Treated Water to a Lake or Stream or Storm Drain
- UIC (Underground Injection Control)
  - For Disposal of Treated Water to an Injection Well
  - For Injecting Chemicals into the Ground

Air Strippers

Off-Gas Treatment

- Treatment of Recovered Vapors
- Thermal Treatment
  - Vapors Are Incinerated
  - Thermal Treatment: Catalytic Oxidizer, Internal Combustion Engine
- Carbon Treatment
  - Vapors Are Absorbed On To Granular Activated Carbon (GAC)

Thermal Vapor Treatment Unit

Granular Activated Carbon

Granular Activated Carbon

Biological Treatment

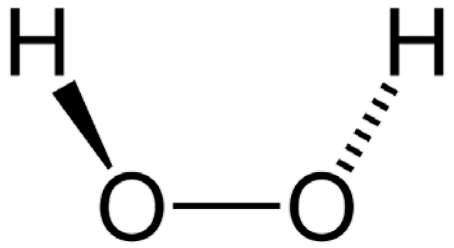
- Injection of Nutrients, Enzymes, etc.
- Used Alone and in Conjunction with Other Technologies
  - Enhanced Bio-Sparging
- Careful Planning Required
- Not Always Easy to Get Injected Material in Contact with Contamination

$$6NO_3^- + 6H^+ + C_6H_6 \longrightarrow 6CO_{2(g)} + 6H_2O + 3N_{2(g)}$$

Biological Treatment

Chemical Treatment

- **Oxidizing Chemicals are Injected Underground**
  - **Hydrogen Peroxide (H_2O_2)**
  - **Hydrogen Peroxide with Ozone (H_2O_2/O_3)**
  - **Fenton's Reagent (Iron-catalyzed Hydrogen Peroxide)**
  - **Potassium Permanganate ($KMnO_4$)**
- **Heat and Chemistry Destroy the Contamination**
- **Not Always Easy to Get Chemicals in Contact with Contamination**



Chemical Injection Treatment

Post Active Remediation Monitoring (PARM)

- **Following Source Removal**
  - **1 Groundwater Sampling Event if NO Previous Groundwater Contamination Existed**
  - **4 Quarters of Groundwater Sampling if Previous Groundwater Contamination Existed**
- **Following O&M**
  - **Four Quarters of Groundwater Monitoring**
  - **Soil Confirmation (if applicable)**

Scope of Work (SOW)

- Source Removal SOW
  - Schedule Pay Items
  - Attachment A
    - Source Removal Table
    - Water Sampling Table
    - Soil-Air Sampling Table
    - Well Abandonment (if applicable)
    - Well Installation (if applicable)
- Remedial Action Construction SOW
  - Schedule Pay Items
  - Attachment A
    - Remedial Action Construction (RAC) Table
      - Trenching Calculations Workbook
    - O&M Parameters Table (Optional)
    - Water Sampling Table
    - Soil-Air Sampling Table
    - Well Abandonment (if applicable)
    - Well Installation (if applicable)

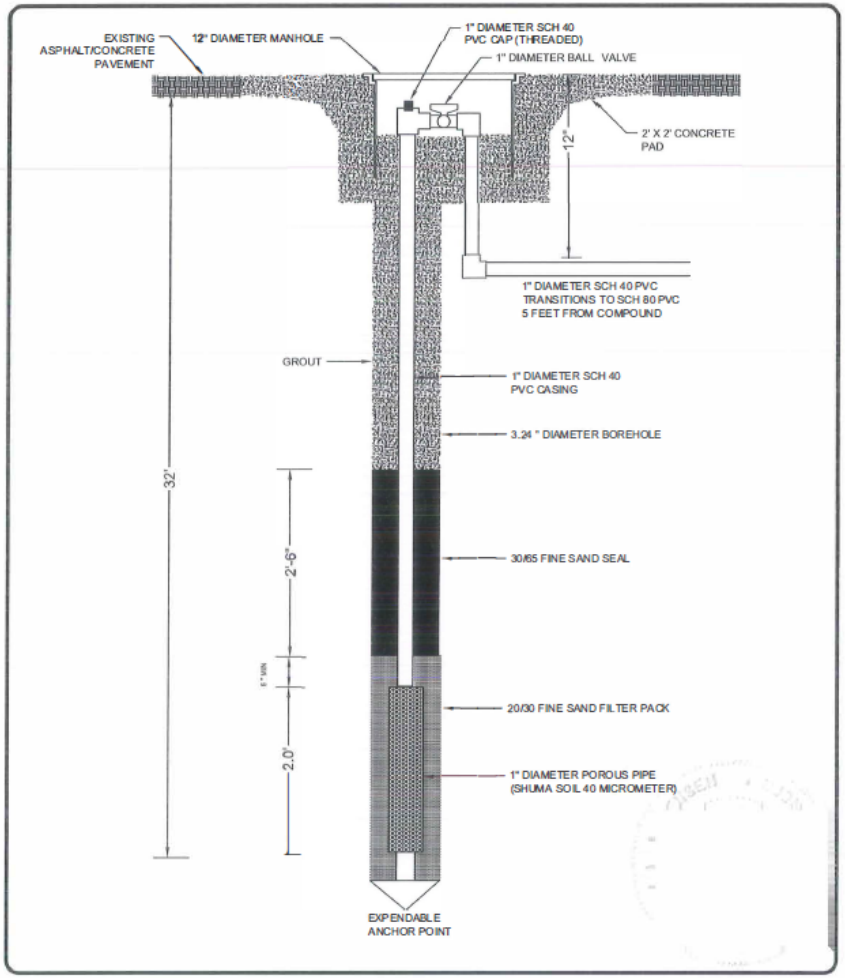
RAC Table

Remedial Action Construction Table					
SPI Section 5 and 6					
Well Installation Specifications					
Process Type (AS, SVE, MPX, GWT, etc)					
Total System Well Count					
Existing Wells to be Used					
New System Wells	0	0	0	0	
Well Type (HW, VW, AW)					
Well Diameter (inches)					
Boring Length (feet)					
Well Length (feet)					6-1 through 6-4, includes 8" and 12" diameter manhole
Screened Length (feet)					
Well Vaults					6-11 or 6-12 or Section 22 for specialty vaults. 8" and 1
Slot Size (inches)					
Well Material (HDPE, PVC)					
Installation Method (DPT, HSA, MR, Sonic, Open Trench)					
Boring Diameter (inches)					
Total Boring Length (feet)	**0**	**0**	**0**	**0**	5-6 through 5-23 or 15-1 for HWs. Total boring depth is
Total Well Length (feet)	**0**	**0**	**0**	**0**	6-1 through 6-4 for vertical and angled wells, includes 8
SPI Section 12					
Surface Removal	**Quantity**				
Concrete/Asphalt Removal (square feet)					12-1 See Trench Calculation.
Additional removal of concrete > 4-inch (square feet)					12-2 See Trench Calculation.
Transport & Disposal of Mixed Debris or Clean Concrete (ton)	0.0				12-4 and/or 12-5.
Transport & Disposal of Petroleum Impacted Soil *(Choose Contain*	**Well Installation**		**Trenching**		
Transport Petroleum Impacted Soil (ton)			0		12-7 or 12-8 Assumes that 1/2 of the soil in the trench
Disposal of Petroleum Impacted Soil (ton)			0		12-9 through 12-12
Transport and Disposal of Petroleum Impacted Soil (included drum)	0				12-6. Assumes a 10-inch borehole and that the 55 gallo
SPI Section 13					
Resurfacing	**Quantity**				
Asphalt Paving (square feet)					13-1 and 13-2.
Concrete Paving (square feet)					13-3.
Concrete Paving extra 1-inch (square feet) (calculation assumes 2" additiona	0				13-4.
Grass-Sod or Seed and Mulch (square feet)					13-6 or 13-7.
SPI Section 15					
Underground Piping Specifications	**0**	**0**	**0**	**0**	
Underground Piping Diameter (inches)					
Underground Piping Material (40/80 PVC, HDPE)					
Total footage of trench (feet)					See Trench Calculations (Total Scope Units)
Trench Installation and Plumbing (linear feet, 1 to 10 lines)					15-1.a Quantities from Trench Calculation workbook
Trench Installation and Plumbing (linear feet, 11 to 20 lines)					15-1.b Quantities from Trench Calculation workbook
Trench Installation and Plumbing (linear feet, 21 to 30 lines)					15-1.c Quantities from Trench Calculation workbook
Trench Installation and Plumbing (linear feet, additional > 30 lines)					15-1.d Quantities from Trench Calculation workbook
SPI Section 18					
Process Type	**SYSTEM 1**	**VAPOR TREATME**	**SYSTEM 2**	**VAPOR TREATME**	
Remedial Action Equipment					
System Size (S, M, L)					17-1 and 18-17 or 18-18.
Estimated Usage (Months) <= 6 months or > 6 months					18-35 or 18-38.
Vapor Treatment Vessel Size (pounds)					

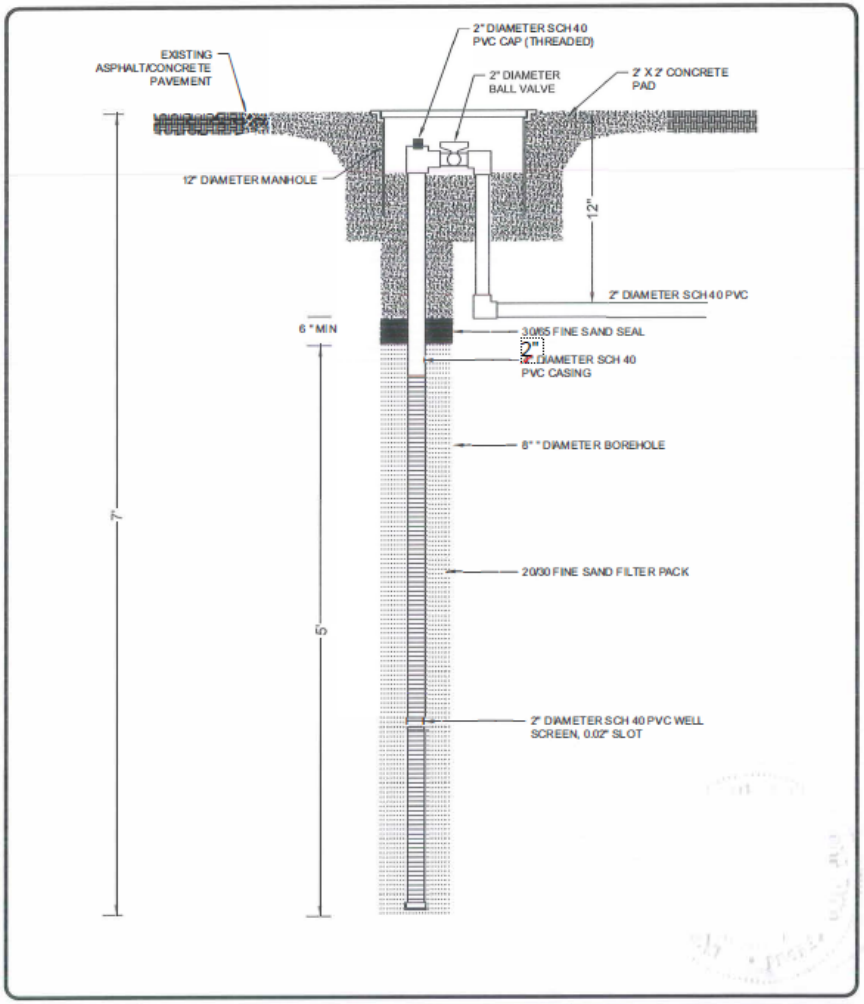
RAC Table Exercise

- Open your books to Construction Drawings 1 through 3.
- Fill out Section 5 and 6 of the RAC Table.
- You have 15 minutes to complete this exercise.

Construction Drawing 2



Construction Drawing 3



Exercise Solution

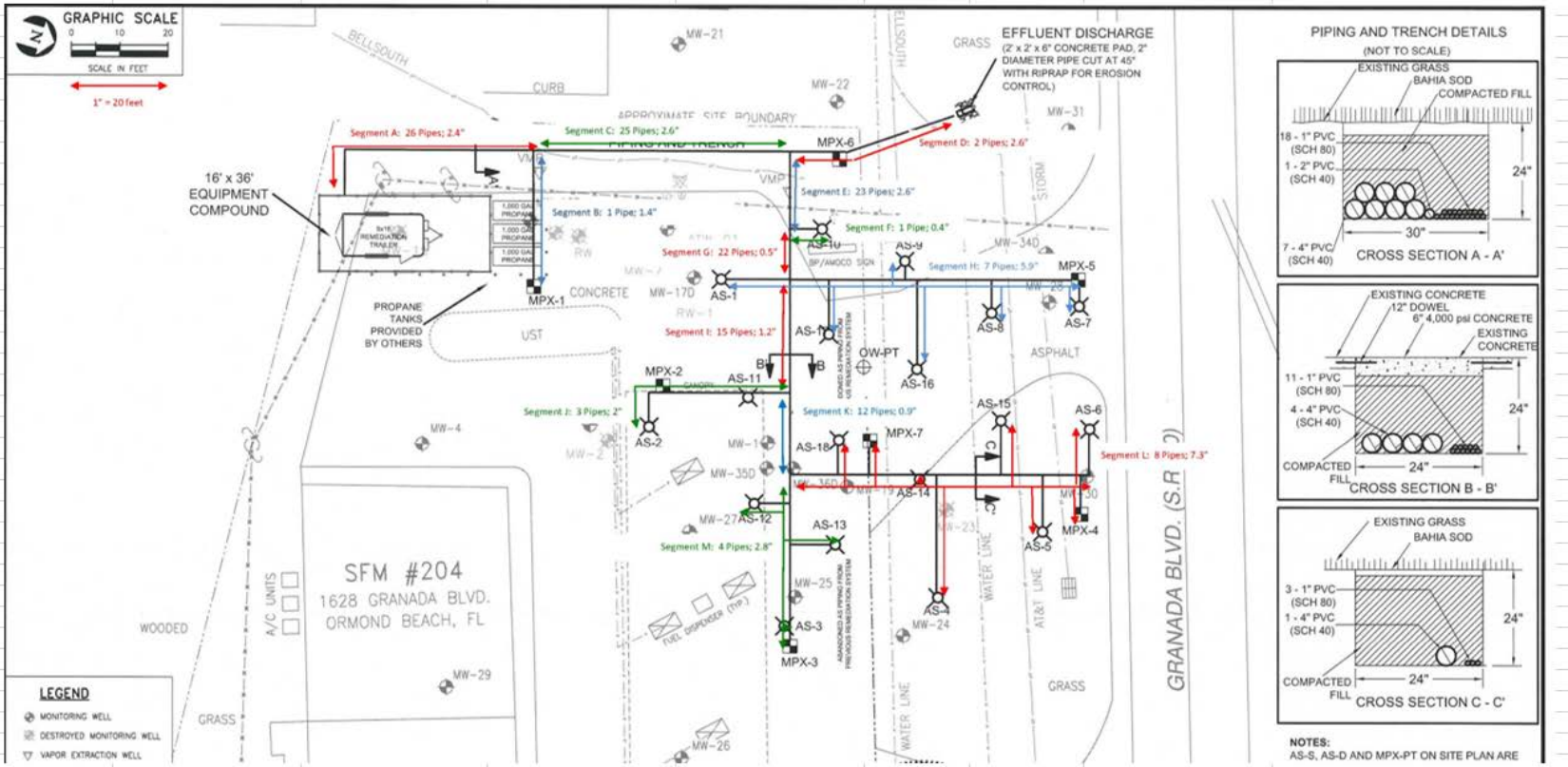
Any blank fields are not applicable to the scope of work.

Remedial Action Construction Table					
SPI Section 5 and 6					
Well Installation Specifications					
Process Type (AS, SVE, MPX, GWT, etc)	**SVE**		**AS**		
Total System Well Count	7		6		
Existing Wells to be Used					
New System Wells	7	0	6	0	
Well Type (HW, VW, AW)	VW		VW		
Well Diameter (inches)	2		1		
Boring Length (feet)	7		32		
Well Length (feet)	7		32		6-1 through 6-4, includes 8"
Screened Length (feet)	5		2	Shuma Soil	
Well Vaults	12" MH		12" MH		6-11 or 6-12 or Section 22 fo
Slot Size (inches)	0.02		NA		
Well Material (HDPE, PVC)	PVC		PVC		
Installation Method (DPT, HSA, MR, Sonic, Open Trench)	HSA		HSA		
Boring Diameter (inches)	8.00		3.24		
Total Boring Length (feet)	**49**	**0**	**192**	**0**	5-6 through 5-23 or 15-1 for
Total Well Length (feet)	**49**	**0**	**192**	**0**	6-1 through 6-4 for vertical a

Trenching Calculation Workbook

Trench Segment	Number of Pipes in Trench	Length of Trench Segment (feet)	SPI Item 15-1.a. Trenching Installation of trench containing 1-10 Plumbing Lines (linear foot of trench)	SPI Item 15-1.b. Trenching Installation of trench containing 11-20 Plumbing Lines (linear foot of trench)	SPI Item 15-1.c. Trenching Installation of trench containing 21-30 Plumbing Lines (linear foot of trench)	Additional pipes >30	ADDITIONAL bundle of 1-10 lines	SPI Item 15-1.d. Trenching Installation of additional bundle of 1-10 lines greater than 30 lines in trench (linear foot of trench)	Notes
A			0	0	0	0	0	0	
B			0	0	0	0	0	0	
C			0	0	0	0	0	0	
D			0	0	0	0	0	0	
E			0	0	0	0	0	0	
F			0	0	0	0	0	0	
G			0	0	0	0	0	0	
H			0	0	0	0	0	0	
I			0	0	0	0	0	0	
J			0	0	0	0	0	0	
K			0	0	0	0	0	0	
L			0	0	0	0	0	0	
M			0	0	0	0	0	0	
N			0	0	0	0	0	0	
O			0	0	0	0	0	0	
P			0	0	0	0	0	0	
Q			0	0	0	0	0	0	
R			0	0	0	0	0	0	
S			0	0	0	0	0	0	
T			0	0	0	0	0	0	
U			0	0	0	0	0	0	
V			0	0	0	0	0	0	
	Actual Footage of Trench	0	0	0	0			0	
	10% Contingent (rounded)	0	0	0	0			0	
	Total Scoped Units	0	0	0	0			0	
			SPI Item 15-1.a.	SPI Item 15-1.b.	SPI Item 15-1.c.			SPI Item 15-1.d.	

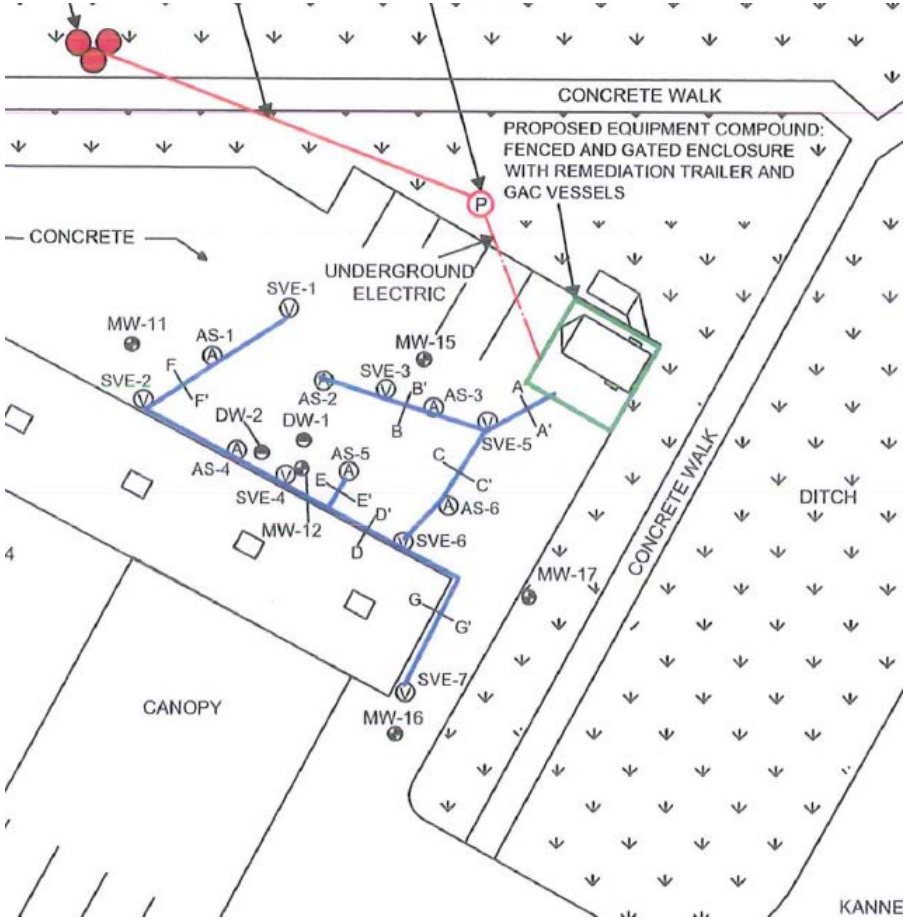
Trenching Example



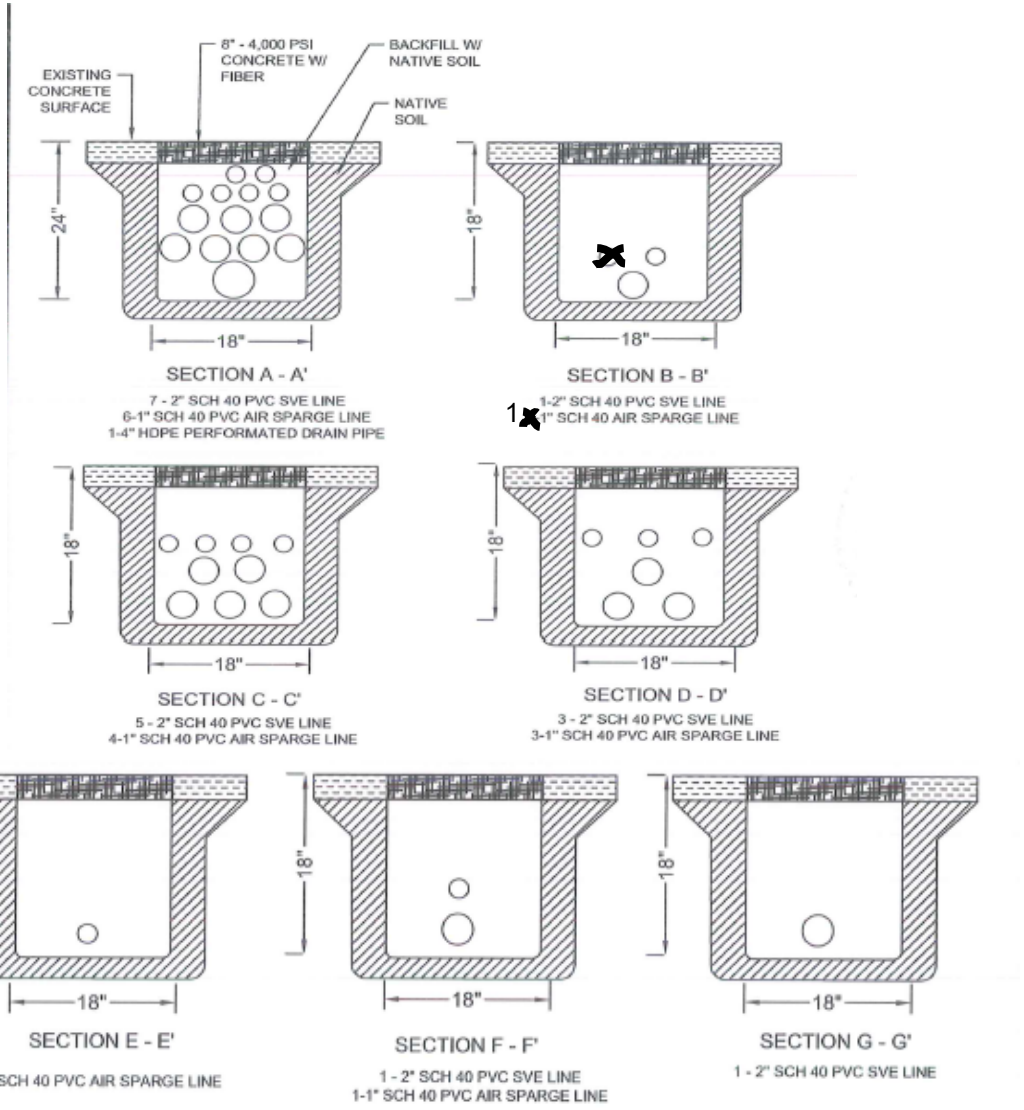
Trenching Calculation Exercise

- Open your books to Construction Drawing 1 and Drawing 4.
- Fill out the trenching workbook.
- You have 15 minutes to complete this exercise.

Construction Drawing 1

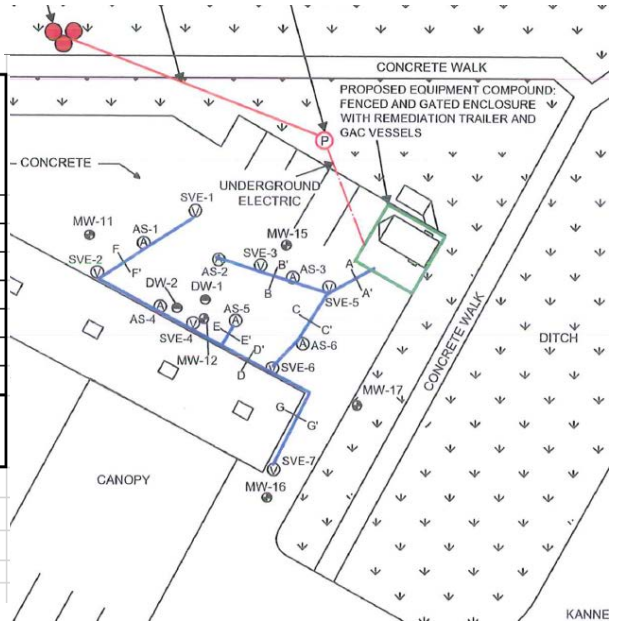


Construction Drawing 4



Exercise Solution

Trench Segment	Number of Pipes in Trench	Length of Trench Segment (feet)	Trenching Installation of trench containing 1-10 Plumbing Lines (linear foot of trench)	Trenching Installation of trench containing 11-20 Plumbing Lines (linear foot of trench)	SPI Item 15-1.c. Trenching Installation of trench containing 21-30 Plumbing Lines (linear foot of trench)	Notes
A	14	15	0	15	0	Trailer to SVE-5
B	3	30	30	0	0	SVE-5 to AS-2
C	9	15	15	0	0	SVE-5 to AS-6
	8	10	10	0	0	AS-6 to SVE-6
G	1	31	31	0	0	SVE-6 to SVE-7
D	6	80	80	0	0	SVE-6 to SVE-1
E	1	7	7	0	0	AS-5 Leg
Actual Footage of Trench		188	173	15	0	
10% Contingent (rounded)		19	17	2	0	
Total Scoped Units		207	190	17	0	
			SPI Item 15-1.a.	SPI Item 15-1.b.	SPI Item 15-1.c.	



Exercise Solution

Trench Segment	Number of Pipes in Trench	Length of Trench Segment (feet)	Trenching Installation of trench containing 1-10 Plumbing Lines (linear foot of trench)	Trenching Installation of trench containing 11-20 Plumbing Lines (linear foot of trench)	Trenching Installation of trench containing 21-30 Plumbing	Notes
A	14	15	0	15	0	Trailer to SVE-5
B	3	30	30	0	0	SVE-5 to AS-2
C	10	143	143	0	0	SVE-5 to end
Actual Footage of Trench		188	173	15	0	
10% Contingent (rounded)		19	17	2	0	
Total Scoped Units		207	190	17	0	
			SPI Item 15-1.a.	SPI Item 15-1.b.	SPI Item 15-1.c.	

SPI Section 15					
Underground Piping Specifications	**SVE**	**0**	**AS**	**0**	
Underground Piping Diameter (inches)	2		1		
Underground Piping Material (40/80 PVC, HDPE)	SCH 40		SCH 40		
Total footage of trench (feet)	207				See Tre
Trench Installation and Plumbing (linear feet, 1 to 10 lines)	190				15-1.a
Trench Installation and Plumbing (linear feet, 11 to 20 lines)	17				15-1.b
Trench Installation and Plumbing (linear feet, 21 to 30 lines)					15-1.c
Trench Installation and Plumbing (linear feet, additional >30 lines)					15-1.d
SPI Section 18					

ATC Contract

- 17. Remediation System O&M Packaged Work Scopes (Excluding Remediation System Equipment)
  - All inclusive packages on a monthly basis of
    - Mobilization, Per Diem, Labor, and Materials
    - Equipment necessary for conduction operation monitoring, system related sampling, preventative maintenance, trouble shooting after startup in accordance with the approved RAP.
    - Excluding quarterly monitoring well sampling.

Treatment/Recovery Points	1 Technology	2 Technologies	3 Technologies
<10 Treat/Recovery Points	Small	Small	Small
10-20 Treat/Recovery Points	Medium	Medium	Medium
21-40 Treat/Recovery Points	Large	Large	Large
>40 Treat/Recovery Points	n/a	Extra Large	Extra Large

17.	MONTHLY REMEDIATION SYSTEM O&M PACKAGED WORK SCOPES (Excluding Remediation System Equipment)	
17-1.	System O&M Package - Small	Per Month
17-2.	System O&M Package - Medium	Per Month
17-3.	System O&M Package - Large	Per Month
17-4.	System O&M Package - Extra Large	Per Month
17-5.	Supplemental System O&M Package - Add Thermox or Catox Treatment	Per Month

ATC Contract

- 18. Remedial Action Equipment/System Use (Equipment Only, Excluding O&M)
  - Unless otherwise specified, the following pay items include:
    - All equipment, material and non-O&M labor costs.
    - All down well groundwater pumps, if applicable
    - Carbon polishing equipment and initial carbon.
    - Major repairs or replacement items including remediation equipment in need of replacement, and associated mobilizations to and form site for that purpose.
    - Costs for equipment and liability insurance and/or liability damage waivers.
    - Mobilization to and from the site for replacement remediation system.
    - Excluding mobilization of personnel and equipment to and from site for initial installation and final removal.

ATC Contract

System size is defined by the blower size (or water flow), number of legs, and air flow capacity

Groundwater Treatment System Requirements: System must include a control panel, multi-well inlet manifold, down well groundwater pumps, oil/water separator, equalization tank, transfer pump, tray air stripper with blower, carbon polishing capability, inlet and outlet ports, valves, totalizing flow meters, switches, thermal overload and overflow shut off capability.

System Size	Minimum Water Flow Capacity	Minimum Number of Legs Manifold	Minimum Air Flow Capacity (SCFM)
Small	75	5	300
Medium	150	10	750
Large	250	20	1500

Air Sparging System Requirements: System must provide compressed oil free air at a temperature compatible with schedule 40 PVC pipe. The system must include control panel, applicable filters, a manifold to distribute air to each air sparging well, and means to measure air flow and pressure to each air sparging well, a pressure relief valve, discharge silencers/noise control, and a means of condensate removal.

System Size	Minimum Blower Size (HP)	Minimum Number of Legs in Manifold	Minimum Air Flow Capacity (SCFM)
Small	5	5	50
Medium	10	10	150
Large	20	20	250

Vapor Extraction System Requirements: The system must include a SVE blower/pump, air dilution valves, vacuum relief valves, transfer pump, moisture separator device, telemetry, control panel and applicable filters and meters. The system must include the capacity to add and remove vapor treatment equipment as needed. The system must include a manifold to withdraw air from VE wells and include sampling port for all applicable parameters.

System Size	Minimum Blower Size (HP)	Minimum Number of Legs in Manifold	Minimum Air Flow Capacity (SCFM)
Small	5	5	100
Medium	10	10	250
Large	20	20	500

ATC Contract

Carbon Off-Gas Treatment Add-On size is defined by pounds of carbon.

Air Sparging/Soil Vapor Extraction System Requirements: System must provide oil free air at a temperature compatible with schedule 40 PVC pipe. The system must include a manifold to distribute and measure air flow and pressure to each air sparging well. The system must include a moisture separator device. The system must include a manifold to withdraw air from vacuum extraction (VE) wells and include sampling port for all applicable parameters. The system must include an interlock that prevents operation of the air sparging system in the event the VES is not operating.

System Size	Minimum Blower Size (HP)	Minimum Number of Legs in Manifold	Minimum Air Flow Capacity (SCFM)
Small	See individual specs for AS and SVE above		
Medium			
Large			

Multiphase Extraction System Requirements: System must include MPE blower or pump, heat exchanger, moisture separator, vacuum relief, and air stripper. The system must include the capacity to add and remove vapor treatment equipment as needed. The system must include a manifold to withdraw air and water from MPE wells and include sampling ports for all applicable parameters.

System Size	Minimum Blower Size (HP)	Minimum Number of Legs in Manifold	Minimum Air Flow Capacity (SCFM)
Small	5 to <10	5-10	35 to 60
Medium	10 to 20	10 to20	60 to 150
Large	20 to 40	20 to 40	150 to 300

Air Sparging/Multiphase Extraction System Requirements: System must provide oil free air at a temperature compatible with schedule 40 PVC pipe. The system must include a manifold to distribute and measure air flow and pressure to each air sparging well. System must include MPE blower or pump, heat exchanger, moisture separator, vacuum relief, and air stripper. The system must include a manifold to withdraw air from MPE wells and include sampling port for all applicable parameters. The system must include an interlock that prevents operation of the air sparging system in the event the MPE is not operating.

System Size	Minimum Blower Size (HP)	Minimum Number of Legs in Manifold	Minimum Air Flow Capacity (SCFM)
Small	See individual specs for AS and MPE above		
Medium			
Large			

Carbon Off-Gas Treatment Add-On: Carbon canisters must be equipped with standard size inlet/outlet connections and drain for accumulated condensate.

System Size	Pounds of Granular Activated Carbon
Small	<500
Medium	500-1000
Large	>1000-2000

Schedule of Pay Items

Section 18 in the SPI lists the holding tanks and systems per month, per term, and per size.

18.	REMEDIAL ACTION SYSTEM/EQUIPMENT USE (Equipment Only, Excluding O&M)	
18-1.	Medium Holding Tank - 2,000 to 6,000 gal. capacity - Short Term ≤ 6 mos.	Per Month
18-2.	Medium Holding Tank - 2,000 to 6,000 gal. capacity - Long Term > 6 mos.	Per Month
18-3.	Large Holding Tank > 6,000 to 10,000 gal. capacity - Short Term ≤ 6 mos.	Per Month
18-4.	Large Holding Tank > 6,000 to 10,000 gal. capacity - Long Term > 6 mos.	Per Month
18-5.	Groundwater Treatment System - Stand Alone Small - Short Term ≤ 6 mos.	Per Month
18-6.	Groundwater Treatment System - Stand Alone Small - Long Term > 6 mos.	Per Month
18-7.	Groundwater Treatment System - Stand Alone Medium - Short Term ≤ 6 mos.	Per Month
18-8.	Groundwater Treatment System - Stand Alone Medium - Long Term > 6 mos.	Per Month
18-9.	Groundwater Treatment System - Stand Alone Large - Short Term ≤ 6 mos.	Per Month
18-10.	Groundwater Treatment System - Stand Alone Large - Long Term > 6 mos.	Per Month
18-11.	Air Sparge System - Small - Short Term ≤ 6 mos.	Per Month
18-12.	Air Sparge System - Small - Long Term > 6 mos.	Per Month
18-13.	Air Sparge System - Medium - Short Term ≤ 6 mos.	Per Month
18-14.	Air Sparge System - Medium - Long Term > 6 mos.	Per Month
18-15.	Air Sparge System - Large - Short Term ≤ 6 mos.	Per Month
18-16.	Air Sparge System - Large - Long Term > 6 mos.	Per Month
18-17.	AS/SVE System - Small - Short Term ≤ 6 mos.	Per Month
18-18.	AS/SVE System - Small - Long Term > 6 mos.	Per Month
18-19.	AS/SVE System - Medium - Short Term ≤ 6 mos.	Per Month
18-20.	AS/SVE System - Medium - Long Term > 6 mos.	Per Month
18-21.	AS/SVE System - Large - Short Term ≤ 6 mos.	Per Month
18-22.	AS/SVE System - Large - Long Term > 6 mos.	Per Month

Schedule of Pay Items

Section 18 in the SPI lists the off gas treatment per month, per term, and per size.

18-29.	Groundwater Treatment - Add On - Small - Short Term ≤ 6 mos.	Per Month
18-30.	Groundwater Treatment - Add On - Medium - Short Term ≤ 6 mos.	Per Month
18-31.	Groundwater Treatment - Add On - Large - Short Term ≤ 6 mos.	Per Month
18-32.	Groundwater Treatment - Add On - Small - Long Term > 6 mos.	Per Month
18-33.	Groundwater Treatment - Add On - Medium - Long Term > 6 mos.	Per Month
18-34.	Groundwater Treatment - Add On - Large - Long Term > 6 mos.	Per Month
18-35.	Carbon Off Gas Treatment - Add On - Small - Short Term ≤ 6 mos.	Per Month
18-36.	Carbon Off Gas Treatment - Add On - Medium - Short Term ≤ 6 mos.	Per Month
18-37.	Carbon Off Gas Treatment - Add On - Largely - Short Term ≤ 6 mos.	Per Month
18-38.	Carbon Off Gas Treatment - Add On - Small- Long Term > 6 mos.	Per Month
18-39.	Carbon Off Gas Treatment - Add On - Medium - Long Term > 6 mos.	Per Month
18-40.	Carbon Off Gas Treatment - Add On - Large - Long Term > 6 mos.	Per Month
18-41.	Thermox/Catox Off Gas Treatment - Add On - Small - Short Term ≤ 6 mos.	Per Month
18-42.	Thermox/Catox Off Gas Treatment - Add On - Medium - Short Term ≤ 6 mos.	Per Month
18-43.	Thermox/Catox Off Gas Treatment - Add On - Large - Short Term ≤ 6 mos.	Per Month
18-44.	Thermox/Catox Off Gas Treatment - Add On - Small - Long Term > 6 mos.	Per Month
18-45.	Thermox/Catox Off Gas Treatment - Add On - Medium - Long Term > 6 mos.	Per Month
18-46.	Thermox/Catox Off Gas Treatment - Add On - Large - Long Term > 6 mos.	Per Month

RAC SPI Well Installation

PAY ITEM	DESCRIPTION	UNIT OF MEASURE	UNITS
Task 2			
1-4.	Permit Fees (actual fee only, cost to obtain permit is included in applicable pay items)	Reimbursable*	500
1-7.	6% Handling Fee for Cost Reimbursable Items	% Surcharge	500
3-1.	Mobilization, Light Duty Vehicle (car or 1/2 ton truck) - ≤ 100 miles each way	Per Round Trip	1
3-9.a.	Drill Rig and Support Vehicles Mobilization (hollow stem auger, mud rotary or sonic) - ≤ 100 miles each way	Per Round Trip	1
4-1.a.	Per Diem - For travel > 1 consecutive day (prorated in quarter day incrementsin accordance with 112.061, F.S.) - Travel Voucher required and quoted rate should be per person per day	Per Person, Per Day	16
5-6.	HSA or MR Boring, ≤ 6 inch diameter, < 50 foot total depth	Per Foot	192
5-9.	HSA or MR Boring, > 6 to 10 inch diameter, < 50 foot total depth	Per Foot	49
6-1.	Well Installation - 1 inch diameter	Per Foot	192
6-2.a.	Well Installation - 2 inch diameter (vertical)	Per Foot	49
8-11.	Electronic Data Deliverables (EDD)	Per Sampling Event	1
9-11.	Soil, Arsenic (EPA 6010 or EPA 6020)	Per Sample	1
9-12.	Soil, Cadmium (EPA 6010 or EPA 6020)	Per Sample	1
9-13.	Soil, Chromium (EPA 6010 or EPA 6020)	Per Sample	1
9-14.	Soil, Lead (EPA 6010 or EPA 6020)	Per Sample	1
9-15.	Soil, Toxicity Characteristic Leaching Procedure-Extraction Only (EPA 1311)	Per Sample	1
9-41.	Water, Lead, Total (EPA 200.7, EPA 200.8, EPA 6010 or EPA 6020)	Per Sample	1
12-6.	Transport and Disposal of Petroleum Impacted Soil (includes drum)	Per Drum	20
		RETAINAGE	

RAC SPI Construction

PAY ITEM	DESCRIPTION	UNIT OF MEASURE	UNITS
Task 3			
1-7.	6% Handling Fee for Cost Reimbursable Items	% Surcharge	8875
3-1.	Mobilization, Light Duty Vehicle (car or 1/2 ton truck) - ≤ 100 miles each way	Per Round Trip	2
3-3.	Heavy Duty/Stakebed Truck (3/4 ton +) - ≤ 100 miles each way	Per Round Trip	2
3-5.	Work Trailer - ≤ 100 miles each way	Per Round Trip	2
3-15.	Loader/Backhoe Mobilization - ≤ 100 miles each way	Per Round Trip	1
4-1.a.	Per Diem - For travel > 1 consecutive day (prorated in quarter day incrementsin accordance with 112.061, F.S.) - Travel Voucher required and quoted rate should be per person per day	Per Person, Per Day	32
12-1.	Removal and Loading of Asphalt and/or Concrete - up to 4 inch thickness	Per Square Foot	322.5
12-5.	Transport and Disposal of Mixed Debris	Per Ton	26.9
12-7.	Transport Petroleum Impacted Soil (bulk) ≤ 100 miles	Per Ton	13
12-9.	Disposal of Petroleum Impacted Soil at a Landfill (bulk) ≤ 450 tons	Per Ton	13
12-17.	Delivery, Pick Up and Rental of 20 Cubic Yard Roll-Off Container	Per Week	1
12-18.	Additional Rental of 20 Cubic Yard Roll-Off Container	Per Week	1
13-3.	Concrete Paving - 4 inch thickness (includes sub-base)	Per Square Foot	322.5
13-4.	Concrete Paving - additional 1 inch thickness	Per Square Foot	645
15-1.a.	Trenching and Installation of 1-10 Plumbing (and Electrical) Lines in Trench	Per Linear Foot of Trench	198
15-1.b.	Trenching and Installation of 11 - 20 Lines	Per Linear Foot of Trench	17
15-3.	Plumbing and Electrical Materials/Equipment Installed in Trench (If FDEP authorizes, submit quote(s) with Change Order)	Reimbursable*	2700
15-7.	Compound Construction/Fencing (materials)	Reimbursable*	1875
15-8.	Utility Drop	Reimbursable*	3800
15-9.	Utility Connection	Reimbursable*	500

SPI Section 12			
Surface Removal	**Quantity**		
Concrete/Asphalt Removal (square feet)	322.5		12-1
Additional removal of concrete > 4-inch (square feet)	645		12-2
Transport & Disposal of Mixed Debris or Clean Concrete (ton)	26.9		12-4
Transport & Disposal of Petroleum Impacted Soil *(Choose Container Method)*	**Well Installation**	**Trenching**	
Transport Petroleum Impacted Soil (ton)		13	12-7
Disposal of Petroleum Impacted Soil (ton)		13	12-9
Transport and Disposal of Petroleum Impacted Soil (included drum)	20		12-6.
SPI Section 13			
Resurfacing	**Quantity**		
Asphalt Paving (square feet)			13-1
Concrete Paving (square feet)	322.5		13-3.
Concrete Paving extra 1-inch (square feet) {calculation assumes 2" additional}	645		13-4.

RAC SPI Baseline & Startup

PAY ITEM	DESCRIPTION	UNIT OF MEASURE	UNITS	N I
Task 4				
3-1.	Mobilization, Light Duty Vehicle (car or 1/2 ton truck) - ≤ 100 miles each way	Per Round Trip	1	$
8-1.	Monitoring Well Sampling with Water Level, ≤ 100 foot depth	Per Well	13	$
8-11.	Electronic Data Deliverables (EDD)	Per Sampling Event	1	$
9-27.	Water, BTEX + MTBE (EPA 602, EPA 624, EPA 8021 or EPA 8260)	Per Sample	13	$
9-30.	Water, Polycyclic Aromatic Hydrocarbons, including 1-methylnaphthalene + 2-methylnaphthalene (EPA 610 [HPLC], EPA 625, EPA 8270 or EPA 8310)	Per Sample	13	$
9-68.	Air, Total Petroleum Hydrocarbons (EPA Method 18 or TO-3)	Per Sample	3	$
15-4.b.	System Installation/Integration/Startup - 1 Technology Component - 11-20 Recovery/Treatment Points	Per Startup	1	$
15-5.	System Installation/Integration/Startup – Addition of 1 Technology Component	Per Additional Tech Component	1	$
19-19.	Remedial Action Startup Report	Per Report	1	$
21-6.b.	P.E. Project Oversight for Remediation System Integration and Startup - Medium System	Per System	1	$
21-29.	P.E. Review, Evaluation and Certification of As-Built Drawings (P.E. sealed red lined modifications)	Per Set of Drawings	1	$

SOIL and AIR SAMPLING TABLE

Task #	Soil /Air Sample Locations	Frequency (if applicable)	Expedited Turnaround (TA)	Depth Interval (if applicable)	(9-68.) Air-Total Petroleum Hydrocarbons (TO-3)
4	Influent	Day 3			1
4	Mid-pt carbon	Day 3			1
4	Effluent	Day 3			1
5	Inf/Mid/Eff	Week 2			3
5	Inf/Mid/Eff	Week 3			3
5	Inf/Mid/Eff	Week 4			3
5	Inf/Mid/Eff	Month 2			3
5	Inf/Mid/Eff	Month 3			3
6	Inf/Mid/Eff	Monthly			9
				Task 4 Subtotal	3
				Task 5 Subtotal	15
				Task 6 Subtotal	9

RAC SPI Example O&M Task

Task 5				
3-1.	Mobilization, Light Duty Vehicle (car or 1/2 ton truck) - ≤ 100 miles each way	Per Round Trip	1	$
8-1.	Monitoring Well Sampling with Water Level, ≤ 100 foot depth	Per Well	13	$
8-11.	Electronic Data Deliverables (EDD)	Per Sampling	1	$
9-27.	Water, BTEX + MTBE (EPA 602, EPA 624, EPA 8021 or EPA 8260)	Per Sample	13	$
9-30.	Water, Polycyclic Aromatic Hydrocarbons, including 1-methylnaphthalene + 2-methylnaphthalene (EPA 610 [HPLC], EPA 625, EPA 8270 or EPA 8310)	Per Sample	13	$
9-68.	Air, Total Petroleum Hydrocarbons (EPA Method 18 or TO-3)	Per Sample	15	$
17-2.	System O&M Package - Medium	Per Month	3	$
18-20.	AS/SVE System - Medium - Long Term > 6 mos.	Per Month	3	$
19-21.	Operation & Maintenance Report, Quarterly or Non-Annual	Per Report	1	$
21-8.	P.E. Project Oversight for Remediation System Operation and Maintenance	Per Month	3	$
		RETAINAGE		

Any blank fields are not applicable to this scope of work.

O&M (System) Parameters Table

TASK #(s)	Location (e.g., MW-X, Manifold, Influent, Effluent, etc.)	Frequency (if applicable)	Depth to Water (DTW)	Dissolved Oxygen (DO)	Pressure/ Vacuum	Flow	OVA	Hour Meter Reading	Observations	
4	Manifold	Daily			X	X				
4	AS wells	Daily			X	X				
4	SVE wells	Daily			X	X	X			
4	Key MWs	Daily	X	X	X				X	
4	Major components AS/SVE	Daily						X		
5	Manifold	Monthly	X	X						
5	Key Wells	Monthly	X	X	X					
5	Major components AS/SVE	Per visit						X		

Soil Excavation

Large Diameter Auger (LDA)

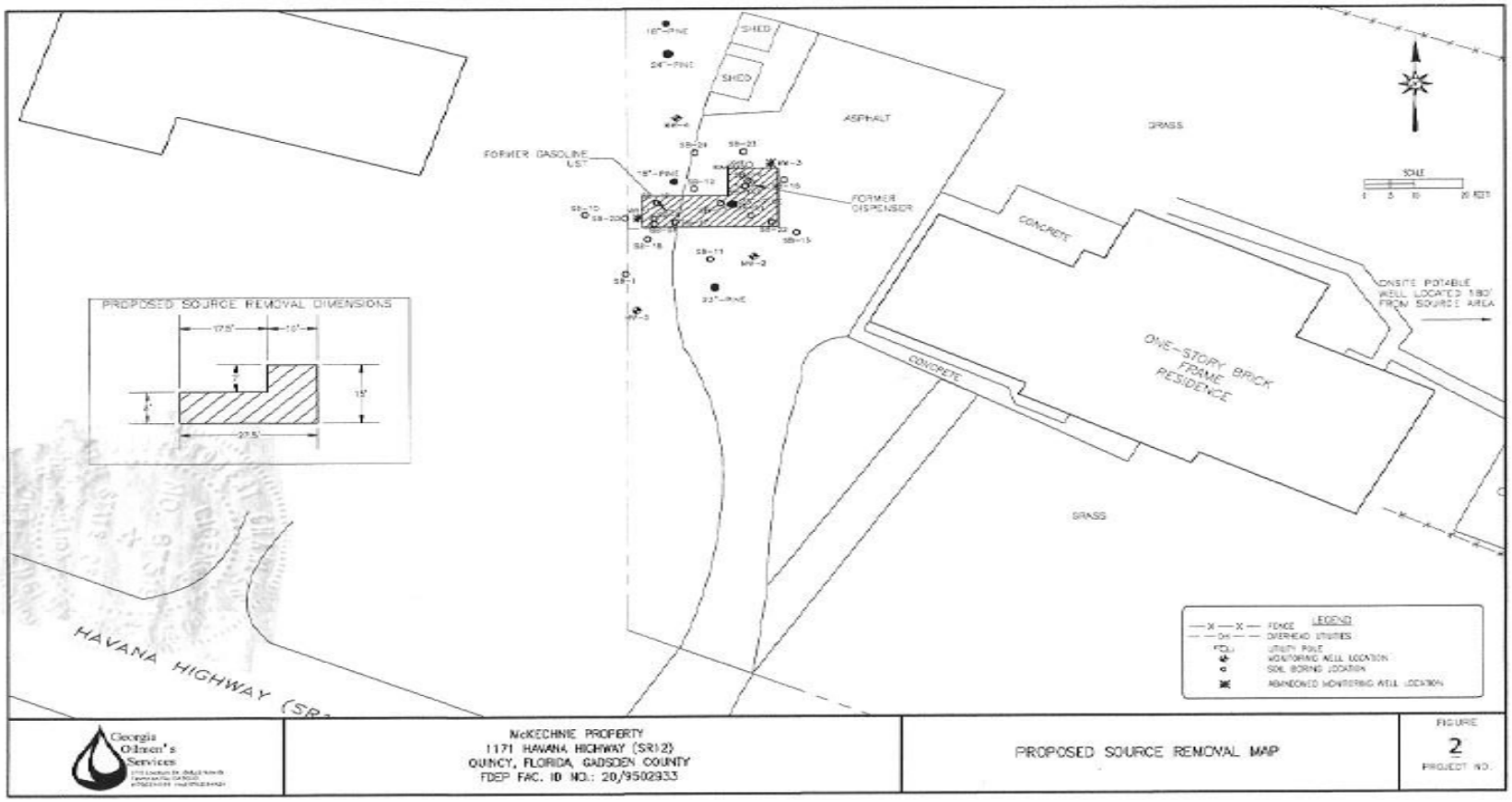
Excavation, Dewatering and Sheet Piling

Source Removal Table

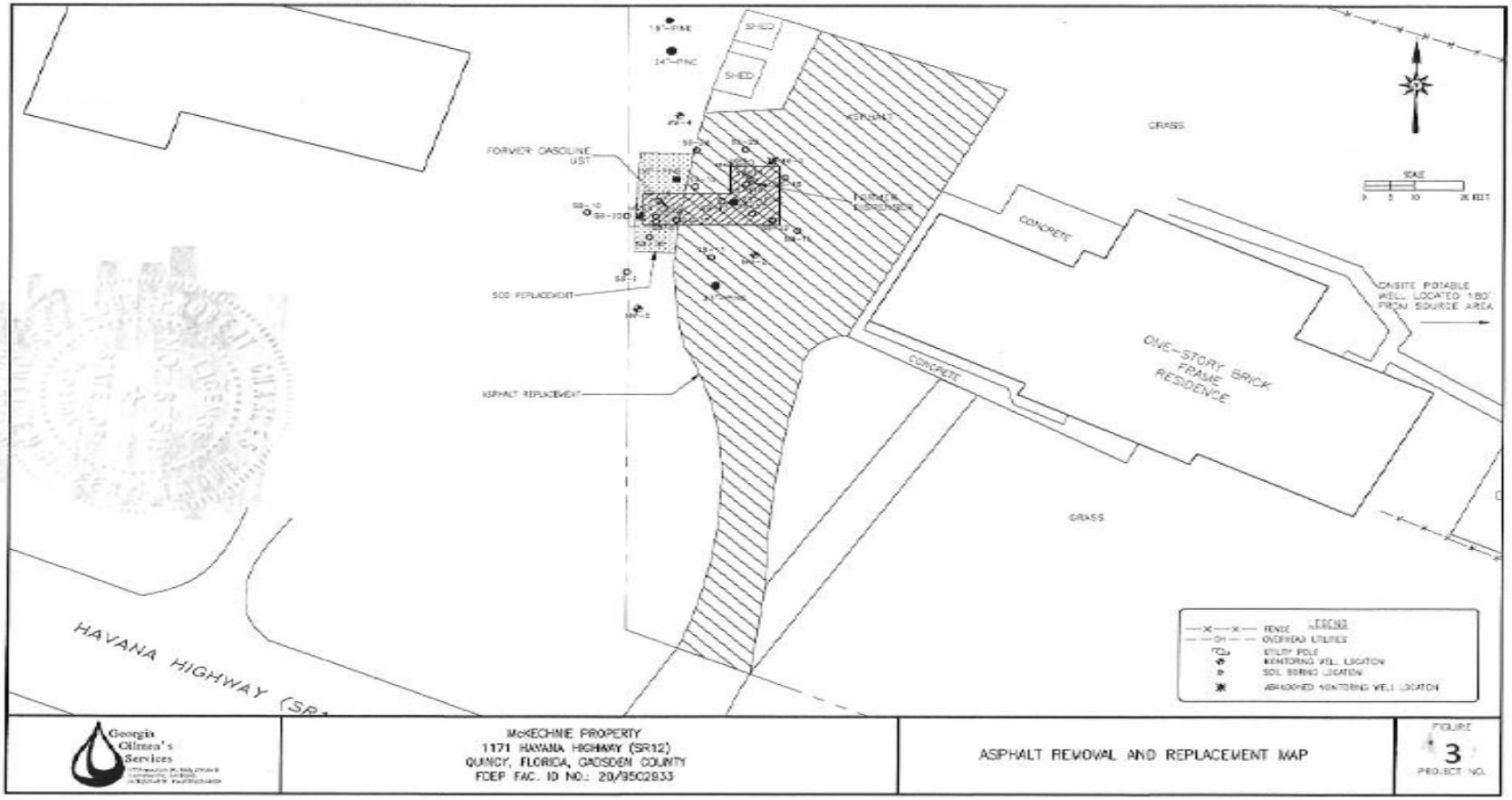
Any blank fields are not applicable to the scope of work.

Source Removal Table					
SPI Section 10					
Sheet Piling					
Sheet Piling Length (feet)					
Sheet Piling Depth (feet)					
Sheet Piling Area (square feet)	**0**				
Sheet Piling Duration (number of days/weeks/months)					1
Conventional Excavation Volume	**Area 1**	**Area 2**	**Area 3**	**Total**	
Excavation Length (feet)					
Excavation Width (feet)					
Excavation Area (square feet)	0	0	0		
Excavation Depth (feet)					
Excavation Volume (cubic yards)	0	0	0		
Contingent Excavation (10% of volume) (cubic yards)	0	0	0		
Maximum Excavation (cubic yard)	**0**	**0**	**0**	**0**	1
LDA Excavation Volume	**Area 1**	**Area 2**	**Area 3**	**Total**	
Diameter of LDA (feet)					
LDA boring area (square feet)	0	0	0		
Number of LDA borings					
LDA Depth (feet)					
One LDA boring volume - (cubic yards)	0	0	0		
Excavation Volume (cubic yards)	0	0	0		
Contingent Excavation (10%) (cubic yards)	0	0	0		
Maximum Excavation (cubic yard)	**0**	**0**	**0**	**0**	1
Flowable Fill, Backfill, Clean Overburden					
Flowable Fill Volume (cubic yards)	0				1
Clean Backfill based on Proposed Volume (cubic yards)	0				
Clean Backfill based on Contingent Volume (cubic yards)	0				
Clean Backfill to allow for Compaction (20%) (cubic yards)	0				
timum Clean Backfill Volume with Approval (cubic yards)	**0**				1
Clean Overburden Reuse with Approval (cubic yards)					1
Dewatering					
Groundwater Treatment Technology					
Number of Dewatering Points					1
Depth of Dewatering Points					
Point of Discharge					
Permits Required? (NPDES, Local, etc)					
Dewatering Duration (number of days/weeks/months)					
SPI Section 12					
Surface Removal					
Concrete Removal and Loading (square feet)					1
Concrete Removal and Loading > 4" (square feet)					
Asphalt Removal and Loading (square feet)					1
Mixed Debris for Transport and Disposal (tons)	**0**				1
Transport and Disposal					
Maximum Excavation Mass @ 1.4 tons/cy (tons)	0.0				
Contingent Transport and Disposal (10%) (tons)	0.0				
Maximum Transport and Disposal (tons)	**0.0**				1
SPI Section 13					
Resurfacing					
Asphalt Paving 2" thickness (square feet).	**0**				1
Asphalt Paving additional 1" thickness (square feet).					
Concrete Paving 4" thickness (square feet)	**0**				1
Concrete Paving additional 1" thickness (square feet)					
Grass - Sod or Seed and Mulch (square feet)					1

Source Removal Example



Source Removal Example



Source Removal Example

	A	B	C	D	E	F	G	H	I	J
1	**FDEP Facility ID#:**		209502933		**STCM Facility Name:**		McKechnie Property			
2										
3	*Any blank fields are not applicable to the scope of work.*									
4	**Source Removal Table**									
5	**SPI Section 10**									
6	**Sheet Piling**									
7	Sheet Piling Length (feet)									
8	Sheet Piling Depth (feet)									
9						**Sheet Piling Area (square feet)**	**0**			
10	Sheet Piling Duration (number of days/weeks/months)									
11	**Conventional Excavation Volume**						**Area 1**	**Area 2**	**Area 3**	**Total**
12	Excavation Length (feet)						10	27.5	29	
13	Excavation Width (feet)						7	8	10	
14	Excavation Area (square feet)						70	220	290	
15	Excavation Depth (feet)						14	14	6	
16	Excavation Volume (cubic yards)						36	114	64	
17	Contingent Excavation (10% of volume) (cubic yards)						4	11	6	
18						**Maximum Excavation (cubic yard)**	**40**	**125**	**71**	236
19	**LDA Excavation Volume**						**Area 1**	**Area 2**	**Area 3**	**Total**
20	Diameter of LDA (feet)									
21	LDA boring area (square feet)						0	0	0	
22	Number of LDA borings									
23	LDA Depth (feet)									
24	One LDA boring volume - (cubic yards)						0	0	0	
25	Excavation Volume (cubic yards)						0	0	0	
26	Contingent Excavation (10%) (cubic yards)						0	0	0	
27						**Maximum Excavation (cubic yard)**	**0**	**0**	**0**	0
28	**Flowable Fill, Backfill, Clean Overburden**									
29	Flowable Fill Volume (cubic yards)						0			
30	Clean Backfill based on Proposed Volume (cubic yards)						150			
31	Clean Backfill based on Contingent Volume (cubic yards)						15			
32	Clean Backfill to allow for Compaction (20%) (cubic yards)						33			
33						**Maximum Clean Backfill Volume with Approval (cubic yards)**	**198**			
34	**Clean Overburden Reuse with Approval (cubic yards)**						**71**			
35	**Dewatering**									
36	Groundwater Treatment Technology									
37	Number of Dewatering Points									
38	Depth of Dewatering Points									

Source Removal Example

34	**Clean Overburden Reuse with Approval (cubic yards)**	**71**		
35	**Dewatering**			
36	Groundwater Treatment Technology			
37	Number of Dewatering Points			
38	Depth of Dewatering Points			
39	Point of Discharge			
40	Permits Required? (NPDES, Local, etc)			
41	Dewatering Duration (number of days/weeks/months)		Week(s)	
42	**SPI Section 12**			
43	**Surface Removal**			
44	Concrete Removal and Loading (square feet)			
45	Concrete Removal and Loading >4" (square feet)			
46	Asphalt Removal and Loading (square feet)	**5016**		
47	**Mixed Debris for Transport and Disposal (tons)**	**124**		
48	**Transport and Disposal**			
49	Maximum Excavation Mass @ 1.4 tons/cy (tons)	231.0		
50	Contingent Transport and Disposal (10%) (tons)	23.1		
51	**Maximum Transport and Disposal (tons)**	**254.1**		
52	**SPI Section 13**			
53	**Resurfacing**			
54	Asphalt Paving 2" thickness (square feet).	**5016**		
55	Asphalt Paving additional 1" thickness (square feet).			
56	Concrete Paving 4" thickness (square feet)			
57	Concrete Paving additional 1" thickness (square feet)			
58	Grass - Sod or Seed and Mulch (square feet)	235		
59	**Notes:**			
60	Top 6 feet of excavation will be used for clean overburden, remaining 14 feet will be removed for disposal.			

Source Removal SPI Example

Petroleum Contamination Site Response Action Services

SCHEDULE OF PAY ITEMS WORKSHEET

Facility Name: MCKECHNIE PROPERTY
7-Digit Facility ID #: 9502933
County: 20
Region: North
Site Manager Name: DONNA BURMEISTER
Site Manager Phone: (850)245-8889
Site Manager Email: donna.burmeister@dep.state.fl.us

PAY ITEM	DESCRIPTION	UNIT OF MEASURE	CONTRACTED ITEM PRICE	NEGOTIATED ITEM PRICE	TOTAL QUANTITIES	☑ TASK 1 QUANT.	☑ TASK 2 QUANT.	☑ TASK 3 QUANT.	☑ TASK 4 QUANT.	☑ TASK 5 QUANT.	☑ TASK 6 QUANT.	☐ TASK 7 QUANT.	☐ TASK 8 QUANT.	☐ TASK 9 QUANT.	☐ TASK 10 QUANT.
1-2.a.	Site Health & Safety Plan for Continued Work (no cost to FDEP)	Per Site	$ -	$ -	1	1									
1-7.	6% Handling Fee for Cost Reimbursable Items	% Surcharge	$ 0.06	$ 0.06	5165.16	0	5165.16	0	0	0	0	0	0	0	0
3-1.	Mobilization, Light Duty Vehicle (car or 1/2 ton truck) - ≤ 100 miles each way	Per Round Trip	$ 417.25	$ 417.25	8		3	2	1	1	1				
3-10.a.	Drill Rig and Support Vehicles Mobilization (hollow stem auger, mud rotary or sonic) - > 100 miles each way	Per Round Trip	$ 1,900.00	$ 1,900.00	1			1							
3-11.	Excavator Mobilization - ≤ 100 miles each way	Per Round Trip	$ 626.33	$ 626.33	1		1								
3-17.	Mini Excavator/Loader (Bobcat™) Mobilization - ≤ 100 miles each way	Per Round Trip	$ 341.63	$ 341.63	1		1								
3-19.	Drum Compactor mobilization - ≤ 100 miles each way	Per Round Trip	$ 405.00	$ 405.00	1		1								
4-1.a.	Per Diem - For travel > 1 consecutive day (prorated in quarter day incrementsin accordance with 112.061, F.S.) - Travel Voucher required and quoted rate should be per person per day	Per Person, Per Day	$ 80.00	$ 80.00	10		10								
5-2.	Hand Auger Boring ≤ 10 foot total depth	Per Boring	$ 182.20	$ 182.20	2		2								
5-6.	HSA or MR Boring, ≤ 6 inch diameter, < 50 foot total depth	Per Foot	$ 23.69	$ 23.69	60			60							
5-12.	HSA or MR Boring, > 10 to 14 inch diameter, < 50 foot total depth	Per Foot	$ 45.96	$ 45.96	46			46							
6-2.a.	Well Installation - 2 inch diameter (vertical)	Per Foot	$ 36.00	$ 36.00	60			60							
6-5.	Surface Casing - 6 inch diameter	Per Foot	$ 43.27	$ 43.27	46			46							
8-1.	Monitoring Well Sampling with Water Level, ≤ 100 foot depth	Per Well	$ 115.30	$ 115.30	16			4	4	4	4				
8-6.	Soil/Sediment Sample Collection	Per Sample	$ 51.76	$ 51.76	6		6								
8-11.	Electronic Data Deliverables (EDD)	Per Sampling Event	$ 160.00	$ 160.00	6		2	1	1	1	1				
9-2.	Soil, BTEX + MTBE (EPA 8021 or EPA 8260)	Per Sample	$ 39.86	$ 39.86	5		5								
9-5.	Soil, Polycyclic Aromatic Hydrocarbons (EPA 8270 or EPA 8310)	Per Sample	$ 55.80	$ 55.80	5		5								
9-6.	Soil, Priority Pollutant Volatile Organics (EPA 8260)	Per Sample	$ 45.55	$ 45.55	1		1								
9-7.	Soil, Priority Pollutant Extractable Organics-Base Neutral and Acid Extractables (EPA 8270 list [e.g., EPA 8081/8082 + EPA 8270])	Per Sample	$ 112.74	$ 112.74	1		1								
9-8.	Soil, Total Recoverable Petroleum Hydrocarbons (FL-PRO)	Per Sample	$ 39.86	$ 39.86	6		6								
9-10.	Soil, 8 RCRA Metals (EPA 6010 or EPA 6020 [Arsenic, Barium, Cadmium, Chromium, Lead, Selenium, Silver] and EPA 6020 or EPA 7471 [Mercury])	Per Sample	$ 51.24	$ 51.24	1		1								
9-15.	Soil, Toxicity Characteristic Leaching Procedure-Extraction Only (EPA 1311)	Per Sample	$ 61.49	$ 61.49	1		1								
9-27.	Water, BTEX + MTBE (EPA 602, EPA 624, EPA 8021 or EPA 8260)	Per Sample	$ 28.47	$ 28.47	17		1	4	4	4	4				

Source Removal SPI Example

Petroleum Contamination Site Response Action Services
SCHEDULE OF PAY ITEMS WORKSHEET

PAY ITEM	DESCRIPTION	UNIT OF MEASURE	CONTRACTED ITEM PRICE	NEGOTIATED ITEM PRICE	TOTAL QUANTITIES	☑ TASK 1 QUANT.	☑ TASK 2 QUANT.	☑ TASK 3 QUANT.	☑ TASK 4 QUANT.	☑ TASK 5 QUANT.	☑ TASK 6 QUANT.	☐ TASK 7 QUANT.	☐ TASK 8 QUANT.	☐ TASK 9 QUANT.	☐ TASK 10 QUANT.
9-30.	Water, Polycyclic Aromatic Hydrocarbons, including 1-methylnaphthalene + 2-methylnaphthalene (EPA 610 [HPLC], EPA 625, EPA 8270 or EPA 8310)	Per Sample	$ 61.49	$ 61.49	16			4	4	4	4				
10-7.	Conventional Soil Excavation and Loading ≤ 300 cubic yards	Per Cubic Yard	$ 60.36	$ 60.36	236		236								
10-14.	Clean Backfill Material, Compaction and Testing (includes transport) ≤ 300 cubic yards	Per Cubic Yard	$ 86.14	$ 86.14	198		198								
10-15.a.	Clean Overburden Used As Backfill, Compaction and Testing ≤ 300 cubic yards	Per Cubic Yard	$ 24.00	$ 24.00	71		71								
12-1.	Removal and Loading of Asphalt and/or Concrete - up to 4 inch thickness	Per Square Foot	$ 2.56	$ 2.56	5016		5016								
12-5.	Transport and Disposal of Mixed Debris	Per Ton	$ 49.37	$ 49.37	124		124								
12-6.	Transport and Disposal of Petroleum Impacted Soil (includes drum)	Per Drum	$ 170.53	$ 170.53	16			16							
12-7.	Transport Petroleum Impacted Soil (bulk) ≤ 100 miles	Per Ton	$ 28.07	$ 28.07	254.1		254.1								
12-10.	Disposal of Petroleum Impacted Soil at a Landfill (bulk) > 450 tons	Per Ton	$ 35.56	$ 35.56	254.1		254.1								
13-1.	Asphalt Paving - 2 inch thickness (includes sub-base)	Per Square Foot	$ 6.22	$ 6.22	5016		5016								
13-6.	Grass - Sod	Per Square Foot	$ 1.55	$ 1.55	235		235								
19-1.	Soil Source Removal Report	Per Report	$ 1,775.45	$ 1,775.45	1		1								
19-7.	Natural Attenuation or Post RA Monitoring Report, Quarterly or Non-Annual	Per Report	$ 1,242.30	$ 1,242.30	3			1	1	1					
19-8.	Natural Attenuation or Post RA Monitoring Report, Annual	Per Report	$ 1,490.76	$ 1,490.76	1						1				
21-20.	P.G or P.E. Review, Evaluation and Certification of an Annual Natural Attenuation Monitoring Report	Per Report	$ 100.00	$ 100.00	1						1				
22-1.	POWER POLE REMOVAL AND REPLACEMENT	Reimbursable*	$ -	$ 1.00	1750		1750								
22-2.	TREE REMOVAL (3 PINE TREES)	Reimbursable*	$ -	$ 1.00	1600		1600								
22-3.	ORC ADVANCED	Reimbursable*	$ -	$ 1.00	1815.16		1815.16								

Version: 9.2

*For reimbursable pay items the cost listed is a "not to exceed" amount. Fees will be reimbursed for the pay item based on the actual invoice. Please note, the unit of measure for these items will be displayed as dollars for invoicing purposes. Please refer to the Scope of Work for additional description of these items.