



**US Army Corps  
of Engineers**

Kansas City District

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Peninsula Boulevard Groundwater Plume Site  
In-Situ Groundwater Treatment  
Nassau County, New York

## COST ENGINEERING REPORT

October 2014



**TETRA TECH**

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Description		Quantity	UOM	ContractCost	ProjectCost	C/O
<b>Project Cost Summary Report</b>				<b>2,487,058</b>	<b>2,487,058</b>	
<b>IN-SITU DESIGN</b>		<b>1.00</b>	<b>LS</b>	<b>2,487,058</b>	<b>2,487,058</b>	
				<i>2,487,057.82</i>	<i>2,487,057.82</i>	
<b>32 Hazardous and Toxic Waste</b>		<b>1.00</b>	<b>EA</b>	<b>2,487,058</b>	<b>2,487,058</b>	
				<i>2,487,057.82</i>	<i>2,487,057.82</i>	
<b>32 05 Collection and Injection of Groundwater</b>		<b>1.00</b>	<b>EA</b>	<b>2,487,058</b>	<b>2,487,058</b>	
<b>32 05 01 Work Element 01 - Work Plans</b>		<b>1.00</b>	<b>LS</b>	<b>51,798</b>	<b>51,798</b>	
<b>32 05 01 01 0001 - Prepare Work Plans</b>		<b>1.00</b>	<b>LS</b>	<b>51,798</b>	<b>51,798</b>	
<b>32 05 02 Work Element 02 - General Requirements</b>		<b>1.00</b>	<b>LS</b>	<b>337,467</b>	<b>337,467</b>	
<b>32 05 02 01 0002 - General Conditions</b>		<b>1.00</b>	<b>LS</b>	<b>101,615</b>	<b>101,615</b>	
<b>32 05 02 02 0003 - Safety, Health, and Emergency Response</b>		<b>1.00</b>	<b>LS</b>	<b>110,950</b>	<b>110,950</b>	
<b>32 05 02 03 0004 - Security</b>		<b>1.00</b>	<b>LS</b>	<b>122,603</b>	<b>122,603</b>	
<b>32 05 02 04 0005 - Decontamination</b>		<b>1.00</b>	<b>LS</b>	<b>2,298</b>	<b>2,298</b>	
<b>32 05 03 Work Element 03 - Mobilization/Demobilization</b>		<b>1.00</b>	<b>LS</b>	<b>87,163</b>	<b>87,163</b>	
<b>32 05 03 01 0006 - Perform Mobilization</b>		<b>1.00</b>	<b>LS</b>	<b>55,050</b>	<b>55,050</b>	
<b>32 05 03 02 0007 - Perform Demobilization</b>		<b>1.00</b>	<b>LS</b>	<b>32,113</b>	<b>32,113</b>	
<b>32 05 04 Work Element 04 - Bench-Scale Microcosm Study</b>		<b>1.00</b>	<b>LS</b>	<b>27,030</b>	<b>27,030</b>	
<b>32 05 04 01 0008 - Bench-Scale Microcosm Study</b>		<b>1.00</b>	<b>LS</b>	<b>27,030</b>	<b>27,030</b>	
<b>32 05 05 Work Element 05 - Installation of ISCR Barrier Across Plume Axis</b>		<b>1.00</b>	<b>LS</b>	<b>196,867</b>	<b>196,867</b>	
				<i>2,468.97</i>	<i>2,468.97</i>	
<b>32 05 05 01 0009 - ISCR Barrier Installation</b>		<b>45.00</b>	<b>EA</b>	<b>111,103</b>	<b>111,103</b>	
				<i>3.41</i>	<i>3.41</i>	
<b>32 05 05 02 0010 - EHC</b>		<b>25,150.00</b>	<b>LB</b>	<b>85,764</b>	<b>85,764</b>	
<b>32 05 06 Work Element 06 - Well Installation</b>		<b>1.00</b>	<b>LS</b>	<b>257,809</b>	<b>257,809</b>	
				<i>582.52</i>	<i>582.52</i>	
<b>32 05 06 01 0011 - Extraction/Injection Well Installation</b>		<b>375.00</b>	<b>LF</b>	<b>218,445</b>	<b>218,445</b>	
				<i>197.38</i>	<i>197.38</i>	
<b>32 05 06 02 0012 - Temporary Monitoring Well Installation</b>		<b>150.00</b>	<b>LF</b>	<b>29,608</b>	<b>29,608</b>	
<b>32 05 06 03 0013 Survey Well Locations</b>		<b>1.00</b>	<b>LS</b>	<b>9,756</b>	<b>9,756</b>	
<b>32 05 07 Work Element 07 - Baseline Sampling and Analysis</b>		<b>1.00</b>	<b>LS</b>	<b>42,029</b>	<b>42,029</b>	
<b>32 05 07 01 0014 - Baseline Sampling and Analysis</b>		<b>1.00</b>	<b>LS</b>	<b>29,864</b>	<b>29,864</b>	
<b>32 05 07 02 0015 - Lab Analysis</b>		<b>1.00</b>	<b>LS</b>	<b>12,164</b>	<b>12,164</b>	



Description	Quantity	UOM	ContractCost	ProjectCost	C/O
32 05 08 Work Element 08 - Management of Solid Waste	1.00	LS	14,482	14,482	
			965.45	965.45	
32 05 08 01 0016 - Management of Solid Waste	15.00	TON	14,482	14,482	
32 05 09 Work Element 09 - Management of Liquid Waste	1.00	LS	51,905	51,905	
			5.19	5.19	
32 05 09 01 0017 - Management of Liquid Waste	10,000.00	GAL	51,905	51,905	
32 05 10 Work Element 10 - Enhanced In-Situ Bioremediation System Equipment	1.00	LS	103,471	103,471	
32 05 10 01 0018 - Enhanced In-Situ Bioremediation System	1.00	LS	86,772	86,772	
32 05 10 02 0019 - Initial Startup Testing	1.00	LS	16,699	16,699	
			33,026.57	33,026.57	
32 05 11 Work Element 11 - Installation of Enhanced In-Situ Bioremediation System	6.00	EA	198,159	198,159	
			33,026.57	33,026.57	
32 05 11 01 0020 - Installation of Enhanced In-Situ Bioremediation System	6.00	EA	198,159	198,159	
32 05 12 Work Element 12 - Year One O&M	1.00	LS	614,064	614,064	
			60,889.57	60,889.57	
32 05 12 01 0021 - Biostimulation Event	2.00	EA	121,779	121,779	
			3.01	3.01	
32 05 12 02 0022 - Biostimulation Amendments	45,000.00	LB	135,275	135,275	
			18,113.52	18,113.52	
32 05 12 03 0023 - Bioaugmentation Event	1.00	EA	18,114	18,114	
			393.47	393.47	
32 05 12 04 0024 - Dehalococcoides Cultures	512.00	LIT	201,458	201,458	
			14,234.42	14,234.42	
32 05 12 05 0025 - Performance Monitoring	4.00	EA	56,938	56,938	
			6,903.97	6,903.97	
32 05 12 06 0026 - Process Monitoring	4.00	EA	27,616	27,616	
32 05 12 07 0027 - Lab Analysis	1.00	LS	52,885	52,885	
32 05 13 Work Element 13 - Years Two and Three O&M	1.00	LS	504,814	504,814	
			56,504.75	56,504.75	
32 05 12 01 0028 - Biostimulation Event	4.00	EA	226,019	226,019	
			3.01	3.01	
32 05 12 02 0029 - Biostimulation Amendments	9,000.00	LB	27,055	27,055	



Description	Quantity	UOM	ContractCost	ProjectCost	C/O
			11,931.16	11,931.16	
32 05 12 03 0030 - Bioaugmentation Event	4.00	EA	47,725	47,725	
			393.47	393.47	
32 05 12 04 0031 - Dehalococcoides Cultures	102.00	LIT	40,134	40,134	
			6,231.63	6,231.63	
32 05 12 05 0032 - Performance Monitoring	6.00	EA	37,390	37,390	
			5,895.47	5,895.47	
32 05 12 06 0033 - Process Monitoring	8.00	EA	47,164	47,164	
32 05 12 07 0034 - Lab Analysis	1.00	LS	79,328	79,328	



## **PENINSULA BOULEVARD GROUNDWATER PLUME SITE IN-SITU GROUNDWATER TREATMENT**

### **COST ESTIMATE NARRATIVE**

#### **1. Project Description**

- A. General: This project proposes to provide remedial action to complete construction of an in-situ groundwater treatment remedy for a highly contaminated area. The project site is located in the Village of Hewlett, Town of Hempstead, Nassau County, New York. The focus of this remediation is to extract groundwater prior to discharge, chemically treat areas of high concentration contaminants, provide institutional controls, and provide long-term monitoring of the site.
- B. Purpose: The purpose of this work is to develop a detailed cost estimate for the In-Situ Groundwater Remedial Design project – consistent to level of design – for the cost and quantities of the project features per USACE guidance.
- C. Design Features: Features include permanent and temporary well construction; equipment trailer purchase; submersible pumps with controls; permeable reactive barriers; baseline sampling; three years of injection and bioaugmentation events; and performance monitoring.

#### **2. Basis of Estimate**

- A. Basis of Design: The project's design documents are listed below. The project site plan is presented in Attachment A.
  - In-Situ Groundwater Treatment at the Peninsula Boulevard Groundwater Plume Superfund Site, Operable Unit 1, Basis of Design Report.
  - In-Situ Groundwater Treatment Remedial Design Drawings.
- B. Basis of Quantities: The cost estimate is based on project quantity take-offs that have been calculated from the documents listed above. The quantity take-offs are presented in Attachment B.

#### **3. Tentative Construction Schedule**

It is estimated that the capital construction would take approximately five months to complete. This duration of five (5) months has been used in the estimate to determine costs for the contractor to maintain field facilities and construction supervision. A simplified tentative construction schedule is presented in Attachment C.

#### **4. Acquisition Plan**

The cost estimate is based on a single contract being awarded to a prime contractor with subcontractors for the well drilling, laboratory analysis and electrical work. The prime contractor would be responsible for the preparatory work, and placing all associated site work as well as overseeing the subcontractors' work on the project.



## 5. Project Construction

- A. Mobilization/Demobilization: Mobilization costs account for the transportation of all construction equipment and personnel to the project site. All equipment and labor is assumed to be available in the New York City area.
- B. Staging and Site Access: No major staging area is assumed to be used for this work.
- C. Borrow/Disposal Areas and Materials: No typical borrow materials (earth, stone, etc.) are required for this project. Any materials removed from the site are assumed to be hauled to a disposal location in the greater New York City area.
- D. Construction Methodology: This project would provide in-situ treatment of local groundwater through use of an anaerobic reductive dechlorination (ARD) remedy. To complete this process the following features would be required:
- Conduct a bench-scale microcosm study.
  - Install five new remediation wells in two separate areas for distribution of biological amendments.
  - Install temporary PVC wells for monitoring groundwater concentrations during in-situ treatment.
  - Perform base-line monitoring, sampling and analysis.
  - Initially distribute biological amendments into the two targeted areas.
  - Install a permeable reactive barrier (PRB) at the area approximately halfway between the two injection areas.
  - Extend the existing PRB along Westervelt Place.
  - Conduct post-injection and post-barrier monitoring for three years.
- E. Unusual Conditions: (Soil, Water, Weather, Traffic). Traffic will be an issue as crews will be working from the roadways. However, the estimate accounts for traffic control costs.
- F. Unique Construction Techniques: None anticipated as contractor should be well equipped to handle the construction activities of this project.
- G. Equipment/Labor Availability and Distance Traveled: All equipment and labor is assumed to be available in the greater New York City area.

## 6. Effective Dates for Labor, Equipment and Material Pricing

The labor, equipment, and material pricing were developed using the MCACES 2012 English Unit Cost Library, 2014 Labor Library for Nassau County (see Attachment D), and the 2011 Equipment Library (Region I) for the base cost estimates. The index pricing data has been prepared in October 2014 dollars.



The cost estimate has been updated with current quoted fuel prices of \$3.40/gal for off-road diesel, \$4.15/gal for on-road diesel and \$3.91/gal for gasoline in the Hempstead area.

## **7. Estimated Production Rates**

The estimate contains some user created cost items that were developed outside of the MCACES Unit Cost Library. These developed cost items have had crews and production rates created in order to accurately calculate unit costs. See Attachment E for the Estimated Production Rate Calculations for these construction items.

## **8. Direct and Contractor Markups**

- A. Direct Markups: An 8.625% sales tax has been included in the estimate on all material costs.
- B. Contractor Markups: The prime contractor Job Office Overhead (JOOH) markup is a calculated percentage within MCACES. The JOOH calculation is based on the estimated duration for all construction components. A 10% running percentage has been used in the estimate for the prime contractor Home Office Overhead (HOOH) markup. Profit is included for the prime contractor and is calculated using the profit weighted guidelines calculation within MCACES.

## **9. Project Markups**

- A. Escalation: No escalation has been included Corps does not typically require escalation for estimates to be used for bid comparison purposes.
- B. Contingency: No contingency has been included as Corps does not typically require contingency markup at projects at this design stage.

## **10. MCACES Construction Cost Estimate**

The construction cost estimate was developed using MCACES 2<sup>nd</sup> Generation (MII) cost estimating software in accordance with guidance contained in ER 1110-2-1302, Civil Works Cost Engineering. See Attachment F for the MCACES construction cost estimate summary output report.



### 13. References

- U.S. Army Corps of Engineers, 1993, *Engineering and Design Cost Engineering Policy and General Requirements, Engineering Regulation 1110-1-1300*, Department of the Army, Washington D.C., 26 March 1993.
- U.S. Army Corps of Engineers, 1999, *Engineering and Design for Civil Works Projects, Engineering Regulation 1110-2-1150*, Department of the Army, Washington D.C., 31 August 1999.
- U.S. Army Corps of Engineers, 2008a, *Civil Works Cost Engineering, Engineering Regulation 1110-2-1302*, Department of the Army, Washington D.C., 15 September 2008.
- U.S. Army Corps of Engineers, 2008b, *Construction Cost Estimating Guide For Civil Works, Engineering Technical Letter 1110-2-573*, Department of the Army, Washington D.C., 30 September 2008.

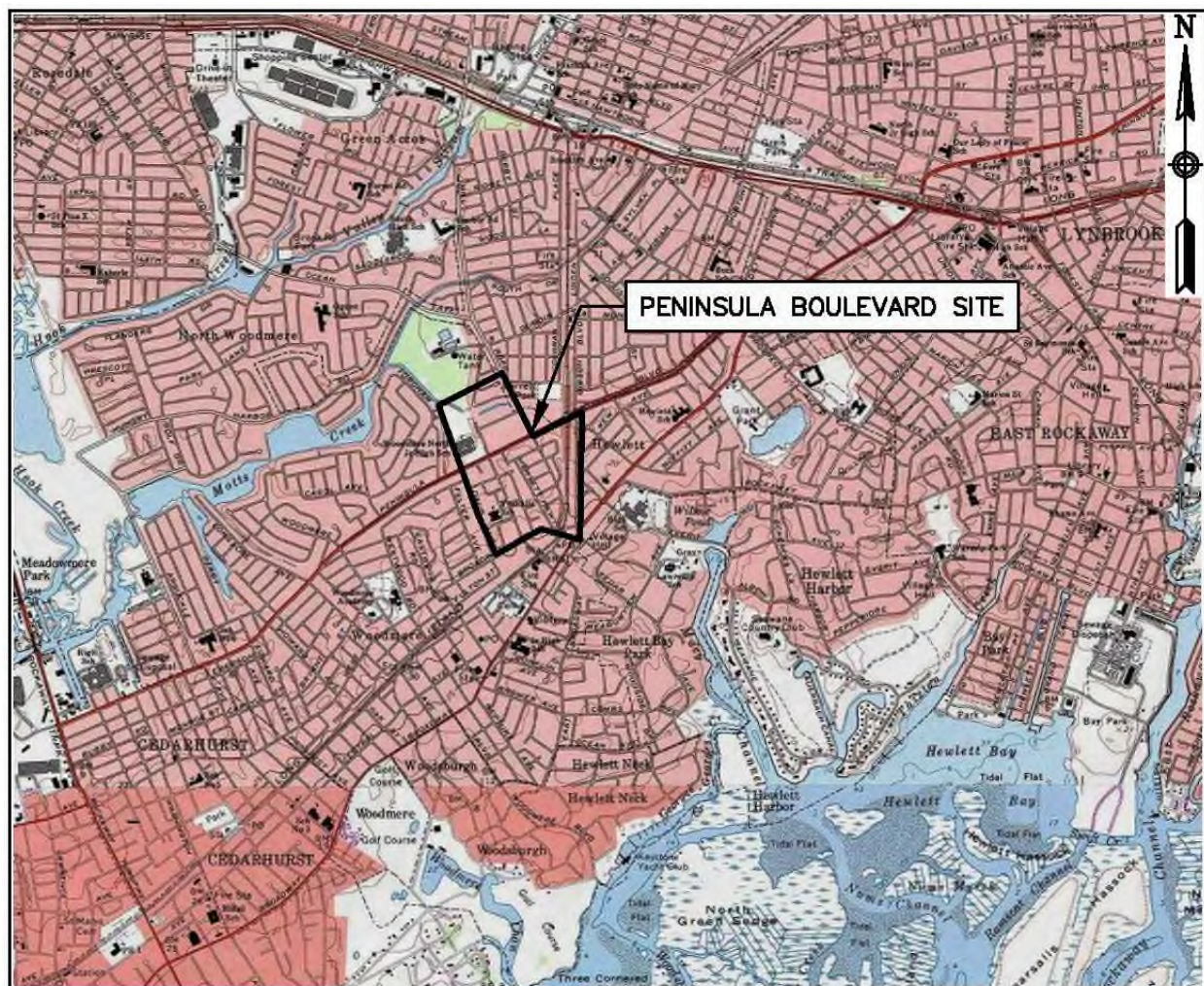


# ATTACHMENT A

## Site Location Map



## Site Location Map





# ATTACHMENT B

## Project Quantity Take-Offs





PROJECT: **Peninsula Blvd. - In-Situ Groundwater Treat.**  
 DETAIL: *Quantity Summary*  
 COMPUTED BY: SKV  
 CHECKED BY:

PROJECT NO:  
 DATE: 10/23/2014

Page: 1 of 1

**PENINSULA BLVD - IN-SITU GROUNDWATER TREATMENT QUANTITY SUMMARY**

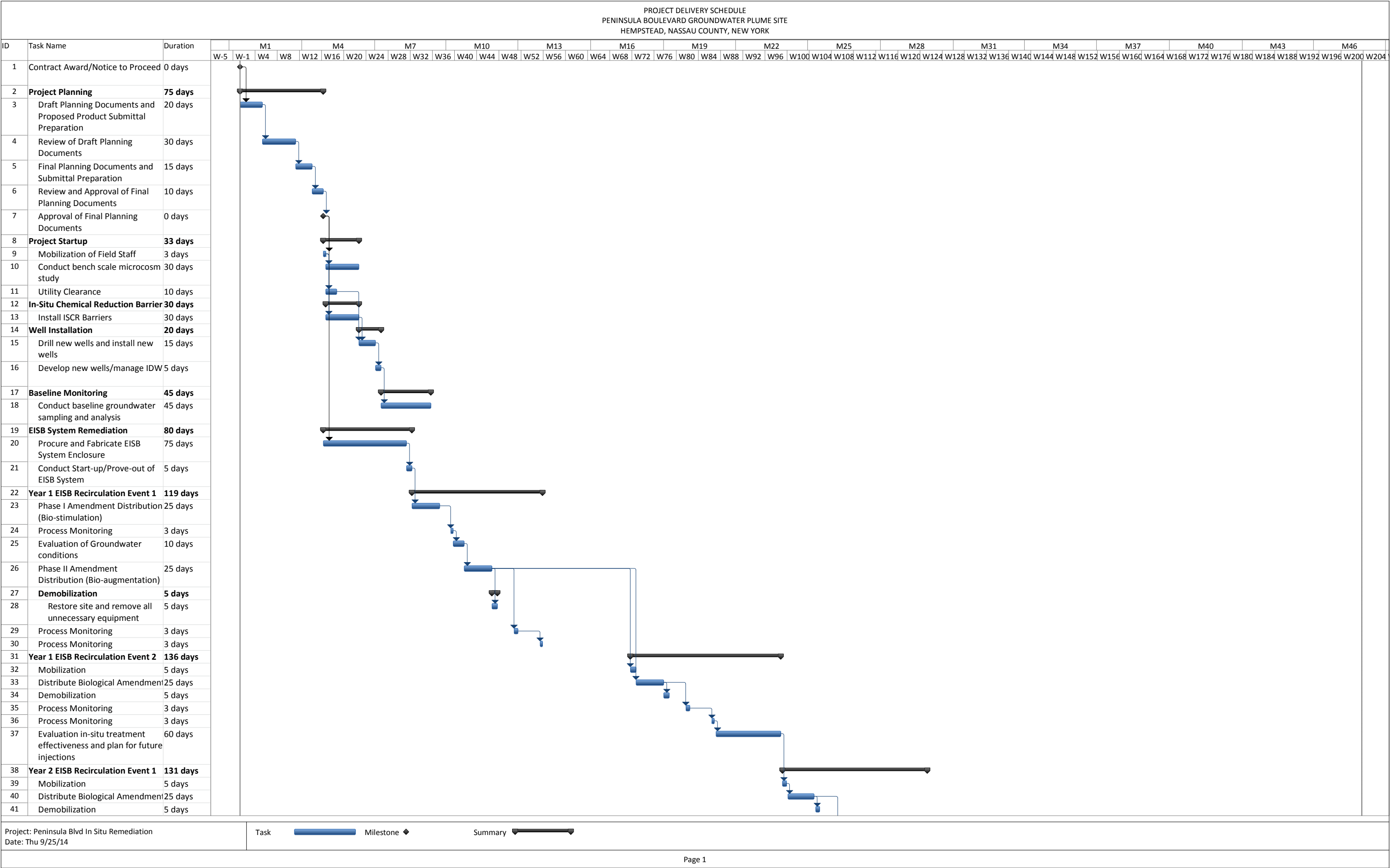
Item #	Item	UOM	Quantity
01	Work Element 01 - Work Plans	LS	1
0001	<i>Prepare Project Plans</i>	LS	1
02	Work Element 02 - General Requirements	LS	1
0002	<i>General Conditions</i>	LS	1
0003	<i>Safety, Health, and Emergency Response</i>	LS	1
0004	<i>Security</i>	LS	1
0005	<i>Decontamination</i>	LS	1
03	Work Element 03 - Mobilization/Demobilization	LS	1
0006	<i>Perform Mobilization</i>	LS	1
0007	<i>Perform Demobilization</i>	LS	1
04	Work Element 04 - Bench-Scale Microcosm Study	LS	1
0008	<i>Bench-Scale Microcosm Study</i>	LS	1
05	Work Element 05 - Installation of ISCR Barrier Across Plume Axis	LS	1
0009	<i>ISCR Barrier Installation</i>	EA	45
0010	<i>EHC</i>	LBS	25,150
06	Work Element 06 - Well Installation	LS	1
0011	<i>Extraction/Injection Well Installation</i>	LF	375
0012	<i>Temporary Monitoring Well Installation</i>	LF	150
0013	<i>Survey Well Locations</i>	LS	1
07	Work Element 07 - Baseline Sampling and Analysis	LS	1
0014	<i>Baseline Sampling and Analysis</i>	LS	1
0015	<i>Lab Analysis</i>	LS	1
08	Work Element 08 - Management of Solid Waste	LS	1
0016	<i>Management of Solid Waste</i>	TON	15
09	Work Element 09 - Management of Liquid Waste	LS	1
0017	<i>Management of Liquid Waste</i>	GAL	10,000
10	Work Element 10 - Enhanced In-Situ Bioremediation System Equipment	LS	1
0018	<i>Enhanced In-Situ Bioremediation</i>	LS	1
0019	<i>Initial Startup Testing</i>	LS	1
11	Work Element 11 - Installation of Enhanced In-Situ Bioremediation System	EA	6
0020	<i>Installation of Enhanced In-Situ Bioremediation System</i>	EA	6
12	Work Element 12 - Year One O&M	LS	1
0021	<i>Biostimulation Event</i>	EA	2
0022	<i>Biostimulation Amendments</i>	LBS	45,000
0023	<i>Bioaugmentation Event</i>	EA	1
0024	<i>Dehalococcoides Cultures</i>	LIT	512
0025	<i>Performance Monitoring</i>	EA	4
0026	<i>Process Monitoring</i>	EA	4
0027	<i>Lab Analysis</i>	LS	1
13	Work Element 13 - Years Two and Three O&M	LS	1
0028	<i>Biostimulation Event</i>	EA	4
0029	<i>Biostimulation Amendments</i>	LBS	9,000
0030	<i>Bioaugmentation Event</i>	EA	4
0031	<i>Dehalococcoides Cultures</i>	LIT	102
0032	<i>Performance Monitoring</i>	EA	6
0033	<i>Process Monitoring</i>	EA	8
0034	<i>Lab Analysis</i>	LS	1



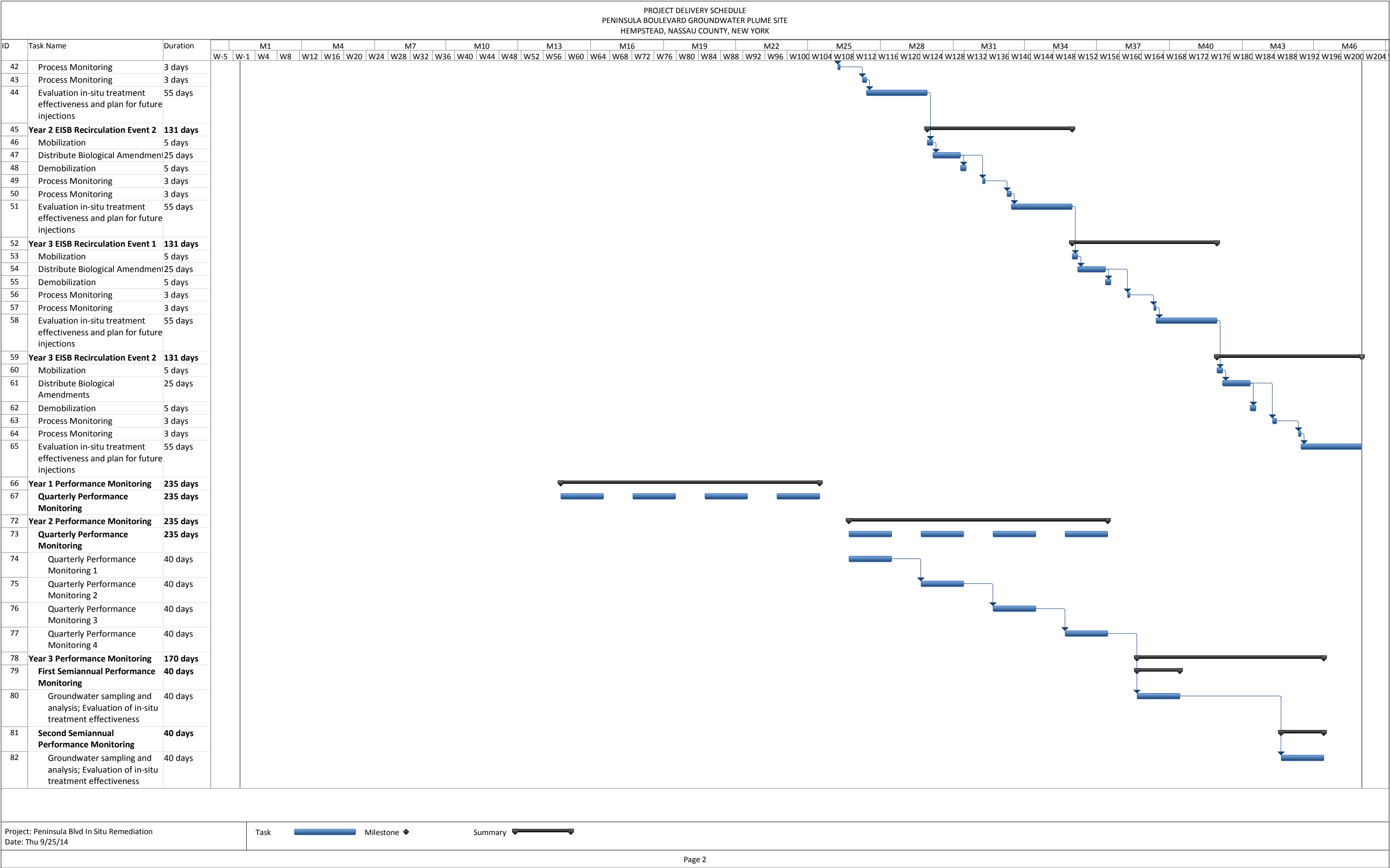
# ATTACHMENT C

## Tentative Construction Schedule











&gt;

General Decision Number: NY140012 07/11/2014 NY12

Superseded General Decision Number: NY20130012

State: New York

Construction Types: Building, Heavy, Highway and Residential

Counties: Nassau and Suffolk Counties in New York.

BUILDING CONSTRUCTION PROJECTS, RESIDENTIAL CONSTRUCTION  
PROJECTS (including single family homes and apartments up to  
and including 4 stories), HEAVY CONSTRUCTION PROJECTS, HIGHWAY  
CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/03/2014
1	03/07/2014
2	04/04/2014
3	05/09/2014
4	05/16/2014
5	06/06/2014
6	06/13/2014
7	06/27/2014
8	07/04/2014
9	07/11/2014

ASBE0012-001 12/01/2013

	Rates	Fringes
Asbestos Workers/Insulator		
Includes application of		
all insulating materials,		
protective coverings,		
coatings and finishes to		
all types of mechanical		
systems.....	\$ 64.13	29.04
HAZARDOUS MATERIAL HANDLER.....	\$ 40.00	10.75

BOIL0005-001 01/01/2013

	Rates	Fringes
BOILERMAKER.....	\$ 49.47	33%+22.87+a

## FOOTNOTE:

a. PAID HOLIDAYS: New Year's Day, Thanksgiving Day, Memorial  
Day, Independence Day, Labor Day and Good Friday, Friday  
after Thanksgiving, Christmas Eve Day and New Year's Eve

BRNY0001-001 07/01/2013



# ATTACHMENT D

## Local Market Labor Rates



	Rates	Fringes
BRICKLAYER.....	\$ 49.09	22.93
MASON - STONE.....	\$ 55.56	26.75

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CARP0290-001 07/01/2014

	Rates	Fringes
Carpenters:		
Building.....	\$ 38.97	34.73
Heavy & Highway.....	\$ 38.97	34.73
Residential.....	\$ 31.18	29.62

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CARP0740-001 07/01/2014

	Rates	Fringes
MILLWRIGHT.....	\$ 48.44	49.83

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CARP1456-009 07/01/2014

	Rates	Fringes
Carpenters:		
DIVERS TENDERS.....	\$ 43.45	45.07
DIVERS.....	\$ 61.30	45.07
DOCKBUILDERS.....	\$ 48.35	45.07
PILEDRIVERMAN.....	\$ 43.61	45.07

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CARP1536-001 07/01/2014

	Rates	Fringes
Carpenters:		
TIMBERMEN.....	\$ 44.33	44.34

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ELEC0025-001 04/26/2014

	Rates	Fringes
ELECTRICIAN.....	\$ 49.20	16%+16.85

---

ELEC0025-002 04/26/2014

	Rates	Fringes
Electricians:		
Maintenance Unit.....	\$ 40.70	12%+\$16.03
Telephone Unit.....	\$ 36.38	16%+\$16.60
Wiring for single or multiple family dwellings and apartments up to and including 3 stories.....	\$ 26.71	13%+10.60

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ELEC1049-002 03/30/2014

	Rates	Fringes
Line Construction:		



Substation and Switching  
structures pipe type cable  
installation and  
maintenance jobs or  
projects; Railroad  
electrical distribution/  
transmission systems  
maintenance (when work is  
not performed by railroad  
employees) Overhead and  
Underground  
transmission/distribution  
line work. Fiber optic,  
telephone cable and  
equipment;

Groundman.....	\$ 29.71	18.9
Heavy Equipment Operator....	\$ 39.62	21.44
Lineman & Cable Splicer....	\$ 49.52	24.28
Material Man.....	\$ 41.00	28.5%+9.75

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ELEV0001-002 03/17/2013

	Rates	Fringes
ELEVATOR MECHANIC		
Elevator Constructor.....	\$ 57.01	27.605+a+b
Modernization and Repair....	\$ 45.14	27.455+a+b

FOOTNOTE:

a. PAID HOLIDAYS: New Year's Day, Good Friday, President's Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

b. PAID VACATION: An employee who has worked less than 5 years shall receive vacation pay credit on the basis of 4% of his hourly rate for all hours worked; an employee who has worked 5 to 15 years shall receive vacation pay credit on the basis of 6% of his hourly rate for all hours worked; an employee who has worked 15 or more years shall receive vacation pay credit on the basis of 8% of his hourly rate for all hours worked.

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ENGI0138-001 06/01/2013

BUILDING CONSTRUCTION

	Rates	Fringes
Power equipment operators:		
GROUP 1.....	\$ 41.89	31.65+a
GROUP 2.....	\$ 39.80	31.65+a
GROUP 3.....	\$ 38.40	31.65+a
GROUP 4.....	\$ 35.58	31.65+a
GROUP 5.....	\$ 34.17	31.65+a

NOTES:



## Hazmat premiums:

Level A	3.50
Level B	2.50
Level C	1.50

Oiler on truck cranes with boom length of 100 ft. or more  
.25

## FOOTNOTE:

a. Paid Holidays: New Year's Day, Lincoln's Birthday, Washington's Birthday or President's Day (in lieu of Lincoln's or Washington's Birthday), Good Friday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, Christmas Day or days celebrated as such. Any holiday that falls on a Saturday will be celebrated on Friday.

## POWER EQUIPMENT OPERATOR CASSIFICATIONS

GROUP 1: Asphalt spreader, backhoe crawler capacity over cater- piller 225 and lomatsu 300, Boiler (thermoplastic), Cherry picker, over 50 tons, CMI or maxim spreader, concrete pump (with oiler), crane (crawler truck), crane (on barge), crane (stone setting), crane (structural steel), crane (with clam shell), derrick, dragline, dredge, gradall, grader, hoist (3 drum), loading machine (bucket cap of 10 yds or over micro-trap, with compressor (negative air machine), milling machine, large pile driver, power winch, Stone setting/structural steel, power winch (truck mounted/stone steel) powerhouse, road paver scoop, carry-all, scraper in tandem shovel, sideboom tractor, sideboom tractor (used in tank work), stone spreader (self propelled tank work), zamboni (ice machine)

GROUP 2: Backhoe, boom truck, bulldozer, cherypicker, conveyor (multi), dinky locomotive, forklift, hoist, 2 drum, loading machine, loading machine (front end) mechanical compactors, (machine drawn), mulch machine (machine-fed), power winch, other than stone/structural steel, power winch (truck mounted other than stone steel) pump (hydraulic, with boring machine), roller, (asphalt), scoop (carry-all scraper), tower crane (maintenance man), trenching machine

GROUP 3: Compressor (structural steel), Compressor (2 or more in battery), concrete finishing mchine, concrete spreader, conveyor, curb machine (asphalt or concrete), curing machine, fireman, hoist (1 drum), micro-trap, (self contained, negative air machine), pump (4 inches or over), pump (hydraulic), pump (jet), pump (sumbersible), pump (well point), pulvi-mixer, ridge cutter, roller (dirt), striping machine, vac-all, welding and burning, welding machine (pile work), welding machine (structural steel)

GROUP 4: Compressor, compressor (on crane), compressor (pile work), compressor (stone setting), concrete breaker, concrete saw or cutter, forklift (walk behind, power operated), generator-pile work, generator, hydra hammer, mechanical compactors (hand operated), oiler (truck crane),



pin puller, portable heaters, powerbroom, power buggies,  
pump (double action diaphgrgm), pump (gypsum), trench  
machine (hand), welding machine

GROUP 5: Batching plant (on site of job), generator (small),  
mixer (with skip), mixer (2 small with or without skip),  
mixer (2 bag or over, with or without skip), mulch machine,  
oiler, pump (centrifugal, up to 3 inches), root cutter,  
stump chipper, tower crane (oiler), tractor (caterpillar or  
wheel vibrator)

-----  
ENGI0138-002 06/01/2013

#### HEAVY & HIGHWAY

	Rates	Fringes
Power equipment operators:		
GROUP 1.....	\$ 44.09	32.90
GROUP 2.....	\$ 41.27	32.90
GROUP 3.....	\$ 39.83	32.90
GROUP 4.....	\$ 36.94	32.90
GROUP 5.....	\$ 35.53	32.90
GROUP 6.....	\$ 33.98	10.23

#### NOTES:

##### Hazmat premiums:

Level A	3.50
Level B	2.50
Level C	1.50

##### Truck and Crawler Cranes long boom premiums:

boom lengths (including jib) 100-149 ft	.50
boom lengths (including jib) 150-249 ft	.75
boom lengths (including jib) 250-349 ft	1.00
boom lengths (including jib) 350 ft	1.50

Cranes using clamshell buckets	.25
Front end loader 10 yds and above	.25
Oiler on truck cranes with boom length of 100 ft. or more	.25

#### FOOTNOTE:

a. Paid Holidays: New Years Day, Lincoln's Birthday,  
Washington's Birthday or Presidents Day (in lieu of  
Lincoln's or Washington's Birthday, Good Friday, Memorial  
Day, Independence Day, Labor Day, Columbus Day, Veteran's  
Day, Thanksgiving Day, Christmas Day or days celebrated as  
such. Any holiday that falls on Saturday will be celebrated  
on Friday.

#### POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Asphalt spreader, backhoe crawler (capacity over  
caterpillar 225 and komatsu 300), boiler (thermoplastic),  
boring machine (post hole), cgherry picker (over 50 ton),  
CMI or maxim spreader, concrete pump, with oiler, crane  
(crawler truck), crane (on barge), crane (stone setting)



crane (structural steel), crane (with clam shell), derrick, dragline, dredge, gradall, grader, hoist (3 drums), loading machine (bucket) capacity of 10 yards or over, micro-trap (with compressor-negative air machine), milling machine (large), piledriver, power winch (stone setting structural steel), power winch (truck mounted/stone steel), power-house, road paver, scoop, carry all (scraper in tandem), shovel, sideboom tractor, sideboom tractor (used in tank work), stone spreader (self-propelled), tank work, tower crane

GROUP 2: Bulldozer, Backhoe, Boom Truck, Boring machine/auger, Cherrypicker, Conveyor (multi), Dinky Locomotive, Forklift, Hoist (2 drum), Loading Machine, Loading Machine (front end), Mechanical Compactor (machine drawn), Mulch Machine (machine-fed), Power Winch (other than stone/structural steel), Power Winch (truck mounted/other than stone steel), Pump Hydraulic (with boring machine), Roller (asphalt), Scoop (carry-all, scraper), Tower Crane (maintenance man), Trenching Machine, Vermeer Cutter, Work Boat

GROUP 3: Curb Machine (asphalt or concrete), Maintenance Engineer (small equipment), Maintenance engineer (well-point) Mechanic (fieldman), Micro-Trap (self contained, negative air machine), Milling Machine (small), Pulvi-mixer, Pump (4 inches or over), Pump Hydraulic, Pump Jet, Pump Submersible, Pump (well point), Roller Dirt, Vac-All, Welding and burning, Compressor (structural steel), Compressor (2 or more battery), Concrete Finishing Machine, Concrete Spreader, Conveyor, Curing Machine, Fireman, Hoist (one drum), Ridge Cutter, Striping Machine, Welding Machine (pile work), Welding Machine (structural Steel).

GROUP 4: Compressor, Compressor on crane, Compressor (pile work), Compressor (stone setting), Concrete Breaker, Concrete Saw or Cutter, Fork Lift (walk behind, power operated), Generator- Pile Work, Generator, Hydra Hammer, Mechanical Compoactors (hand operated), Oiler (truck crane), Pin Puller, Portable Heaters, Powerbroom, Power buggies, Power Grinders, Pump (double action diaphragm), Pump gypsum, Pump (single action 1 to 3 inches), Trench Machine hand, Welding Machine

GROUP 5: Batching Plant (on site of job), Generator (small), Grinder, Mixer (with skip), Mixer (2 small with or without skip), Mixer (2 bag or over, with or without skip), Mulch Machine, Oiler, Pump (centrifugal, up to 3 inches), Root Cutter, Stump Chipper, Tower Crane (oiler), Track Tamper (2 engineers, each), Tractor (caterpillar or wheel), Vibrator, Work boat (deckhand),

GROUP 6: Well drillers

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IRON0046-003 07/01/2013

Rates

Fringes



IRONWORKER		
METALLIC LATHERS AND REINFORCING IRONWORKERS.....	\$ 40.00	30.16
-----		
IRON0197-001 06/01/2013		
	Rates	Fringes
IRONWORKER		
STONE DERRICKMAN.....	\$ 41.00	36.57
-----		
IRON0361-001 07/01/2013		
	Rates	Fringes
IRONWORKER (STRUCTURAL).....		
	\$ 46.75	50.98
-----		
IRON0580-001 07/01/2013		
	Rates	Fringes
IRONWORKER, ORNAMENTAL.....		
	\$ 42.30	42.12
-----		
* LABO0066-001 07/01/2014		
BUILDING		
	Rates	Fringes
Laborers:		
Laborers.....	\$ 34.10	29.44
Plasterers Tenders.....	\$ 34.10	29.44
-----		
LABO0078-001 02/01/2013		
	Rates	Fringes
LABORERS		
BUILDING CONSTRUCTION ASBESTOS (Removal, Abatement, Encapsulation or Decontamination of asbestos); LEAD; & HAZARDOUS WASTE LABORERS (Hazardous Waste, Hazardous Materials, Biochemical and Mold Remediation, HVAC, Duct Cleaning, Re-spray Fireproofing, etc).....	\$ 35.90	14.75
-----		
LABO1298-001 06/01/2014		
HEAVY & HIGHWAY		
	Rates	Fringes
Laborers:		
Asphalt Rakers; Formsetters.	\$ 39.68	25.85+a
Asphalt Shovelers, Roller		



Boys & Tamperers.....	\$ 38.54	25.85+a
Regular Laborers.....	\$ 35.05	25.85+a

## A. FOOTNOTES:

Laborers working in a hazardous material hot zone shall receive an additional 20% premium.

Where the contract provides for night work outside the regular hours of work, the employees shall be paid at straight time plus a 25% night work premium for the 8 hours worked during the night.

Firewatch work performed after regular hours shall be paid an additional 10% premium. Second and Third Shift work will be paid at a 10% premium.

Contractor requesting laborers certified for hazardous material work and/or employed on hazardous material shall be required to pay an additional 10% premium.

-----  
PAIN0009-002 05/01/2014

	Rates	Fringes
Painters:		
GLAZIERS.....	\$ 51.00	26.59
Painters, Drywall Finishers..	\$ 41.75	20.87
Spray, Scaffold,		
Sandblasting.....	\$ 46.75	21.87

-----  
PAIN0806-010 10/01/2012

	Rates	Fringes
Painters:		
Stuctural Steel and Bridge..	\$ 47.00	32.08

-----  
PAIN1974-002 12/26/2012

	Rates	Fringes
Painters:		
DRYWALL TAPERS/POINTERS.....	\$ 43.82	22.01

-----  
PLAS0262-003 02/01/2012

	Rates	Fringes
PLASTERER.....	\$ 40.78	26.80

-----  
PLAS0780-001 07/01/2013

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 44.63	38.95

-----  
PLUM0200-001 11/01/2013



	Rates	Fringes
PLUMBER		
BUILDING CONSTRUCTION:.....	\$ 50.48	29.8
RESIDENTIAL CONSTRUCTION:....	\$ 29.46	10.91
-----		
PLUM0638-001 06/27/2012		

	Rates	Fringes
PLUMBER		
SERVICE FITTERS.....	\$ 26.30	2.55
SPRINKLER FITTERS,		
STEAMFITTERS.....	\$ 51.25	49.54

Service Fitter work shall consist of all repair, service and maintenance work on domestic, commercial and industrial refrigeration, air conditioning and air cooling, stoker and oil burner apparatus and heating apparatus etc., including but not exclusively the charging, evacuation, leak testing and assembling for all machines for domestic, commercial and industrial refrigeration, air conditioning and heating apparatus. Also, work shall include adjusting, including capacity adjustments, checking and repairing or replacement of all controls and start up of all machines and repairing all defects that may develop on any system for domestic, commercial and industrial refrigeration and all air conditioning, air cooling, stoker and oil burner apparatus and heating apparatus regardless of size or type.

-----		
ROOF0154-001 10/01/2012		
	Rates	Fringes
ROOFER.....	\$ 38.50	28.59

-----		
SHEE0028-002 09/15/2011		
	Rates	Fringes
SHEET METAL WORKER		
BUILDING CONSTRUCTION:.....	\$ 48.90	36.00
RESIDENTIAL CONSTRUCTION:....	\$ 27.22	16.48

-----		
* TEAM0282-002 07/01/2014		
	Rates	Fringes
TRUCK DRIVER.....	\$ 35.105	39.9825+a

FOOTNOTES:

a. PAID HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Election Day, Veterans' Day (Armistice Day), Thanksgiving Day, Day after Thanksgiving and Christmas Day. Employees working two (2) days in the calendar week in which a holiday falls are to be paid for such holiday, provided that they shape each remaining workday during such calendar week.



-----

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

=====

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

-----

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

#### Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters , PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable , i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rates.

0000/9999: weighted union wage rates will be published annually each January.

#### Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union majority rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the



wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

---

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor



200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION



# ATTACHMENT E

## Estimated Production Rates





TITLE: Peninsula Blvd. - In-Situ Groundwater Treatment  
SUBJECT: Production Rate Calculations  
MADE BY: SKV  
CHECKED BY:

JOB NO.:  
DATE: 7/15/2014

Sheet No. 1 of 2

**CSI TASK:**

**8.25" HSA DRILLING**

**CREW:** *8" Hollow Stem Auger Crew* 2 crew members  
1 Labor Foreman  
1 Laborers  
1 Auger  
1 Generator  
12.00 min/vlf

**OVERALL PRODUCTION RATE** 5.00 vlf/hr

---

**4.25" HSA DRILLING**

**CREW:** *4" Hollow Stem Auger Crew* 2 crew members  
1 Labor Foreman  
1 Laborers  
1 Auger  
1 Generator  
9.00 min/vlf

**OVERALL PRODUCTION RATE** 6.67 vlf/hr

---

**HOSE RAMP INSTALLATION**

**CREW:** *Hose Ramp Crew* 2 crew members  
1 Labor Foreman  
1 Laborers  
1 Pick Up Truck  
60.00 min/ea

**OVERALL PRODUCTION RATE** 1.00 ea/hr

---

**UNLOAD AND PLACE EQUIPMENT TRAILER**

**CREW:** *Trailer Positioning Crew* 3 crew members  
1 Labor Foreman  
1 Laborers  
1 Equip. Oper. Med.  
1 Hydraulic Crane  
8.00 hr/ea

**OVERALL PRODUCTION RATE** 0.125 ea/hr

---





TITLE: Peninsula Blvd. - In-Situ Groundwater Treatment  
SUBJECT: Production Rate Calculations  
MADE BY: SKV  
CHECKED BY:

JOB NO.:  
DATE: 7/15/2014

Sheet No. 2 of 2

---

**ELECTRICAL CONNECT/DISCONNECT**

**CREW:**                      *Electrician Crew*                      2 crew members  
1 Elec. Foreman  
1 Electrician  
  
4.00 hr/ea

**OVERALL PRODUCTION RATE**                      0.250 ea/hr

---

**POWER POLE PLACEMENT**

**CREW:**                      *Power Pole Crew*                      4 crew members  
1 Labor Foreman  
1 Electrician  
1 Carpenter  
1 Equip. Oper. Med.  
1 Hydraulic Crane  
  
16.00 hr/ea

**OVERALL PRODUCTION RATE**                      0.0625 ea/hr

---

**2" DPT BOREHOLE**

**CREW:**                      *4" Hollow Stem Auger Crew*                      2 crew members  
1 Labor Foreman  
1 Laborers  
1 Auger  
1 Generator  
  
3.00 min/vlf

**OVERALL PRODUCTION RATE**                      20.00 vlf/hr

---



# ATTACHMENT F

## Vendor Phone Logs, Emails and Quotes





**48" x 48" Fabricated Aluminum Hose & Cable Bridge**  
Steel hose ramp  
\$810 [online](#)

[Sign In](#)

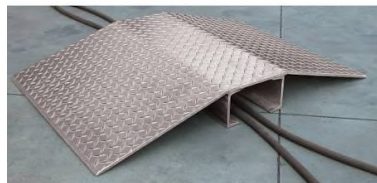
## 48" x 48" Fabricated Aluminum Hose & Cable Bridge

My Shortlist (0)

**\$810** [online](#)[Write a review](#)[Save to Shortlist](#)

Constructed of lightweight durable aluminum treadplate. All welded.

48" x 48" - \$810

[Online stores](#) [Related items](#) [Reviews](#) [Details](#)

### Online stores shipping to Beaverton, OR

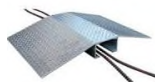
☐ Free shipping ☐ Refurbished / used

Sellers					Sponsored
Sellers	Seller Rating	Details	Base Price	Total Price	
<a href="#">Northern Tool</a>	(1,811)	No tax	\$809.99 +\$64.49 shipping	\$874.48	<a href="#">Shop</a>
<a href="#">MSC Industrial Supply</a>	(2,949)	No tax	\$1,067.67 +\$10.99 shipping	\$1,078.66	<a href="#">Shop</a>
<a href="#">Toolfetch.com</a> <small>Trusted Store</small>	(874)	No tax	\$1,056.00 +\$125.00 shipping	\$1,181.00	<a href="#">Shop</a>
<a href="#">FS Industries</a>	No rating	No tax	\$842.00 +\$168.40 shipping	\$1,010.40	<a href="#">Shop</a>

1 - 4 of 4



### Related items



**24" x 36" Fabricated Aluminum Hose & Cable Bridge**

**\$274**(\$536 less)

**48" x 44" Fabricated Aluminum Hose Cable Bridge**

**\$599**(\$211 less)

**48" x 44" Fabricated Aluminum Hose & Cable Bridge**

**\$770**(\$40 less)

1 - 3 of 3



### Reviews

No reviews - be the first to write a review.

[Write a review](#)

### Details



Brand		Vestil
	<b>48" x 48" Fabricated Aluminum Hose &amp; Cable Bridge</b>	
	Price	FHCR-48-48-16
GTIN		00691215020282

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### Feedback

Want to suggest a feature, report a bug, or tell us about incorrect data? [Send feedback](#) or [Report a Violation](#)

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# EHC<sup>®</sup> Original ISCR Reagent Demand Calculations



7-Jul-2014

**Customer:** TetraTech  
**Contact:** Neil Teamerson | Senior PM  
**Site Location:** Town of Hempstead, Nassau  
**Proposal Number:** PeroxyChem-FA11-742

**Prepared by:**  
**Ravi Srirangam PhD**  
**1-312-480-5250**  
**Ravi.Srirangam@peroxychem.com**

## PRODUCT OVERVIEW

EHC is composed of controlled-release carbon, zero valent iron (ZVI) particles and nutrients used for stimulating in situ chemical reduction (ISCR) of otherwise persistent organic compounds in groundwater. Following placement of EHC into the subsurface environment, a number of physical, chemical and microbiological processes combine to create very strong reducing conditions that stimulate rapid and complete dechlorination of organic solvents and other recalcitrant compounds (e.g., explosives and organochlorine pesticides).

EHC is delivered as a dry powder in 50-lb / 25-kg bags or super-sacs. EHC can be placed into the saturated zones in a variety of ways including direct push injections, hydraulic and pneumatic fracturing, and direct soil mixing. EHC is completely non-hazardous and safe to handle. EHC is manufactured in the USA, EU and Brazil.



## SITE INFORMATION / ASSUMPTIONS

	<u>Value</u>	<u>Unit</u>	<u>Comment</u>
<b>Treatment Area Dimensions:</b>			
Width of targeted zone (perpendicular to gw flow)	175	ft	customer supplied
Length of targeted zone (parallel to gw flow)	5	ft	customer supplied
Depth to top of treatment zone	50	ft bgs	customer supplied
Treatment zone thickness	30	ft	customer supplied
Treatment volume	26,250	ft3	calculated value
Total Porosity	30	%	default value
Groundwater volume	7,875	ft3	calculated value
Soil bulk density	110	lbs/ft3	default value
Soil mass	1,444	ton	calculated value
<b>Transport characteristics:</b>			
Treatment time / design life for one application	5	years	default value
Linear groundwater flow velocity	365	ft/year	calculated value
Distance of inflowing gw over design life	1,825	ft	calculated value
Effective porosity for groundwater flow	20	%	default value
Volume of water passing region over design life	1916250	ft3	calculated value
Soil type	high permeability		customer supplied
Fraction organic carbon in soil, foc	0.001		estimated value



**CONTAMINANTS OF CONCERN (COCs)**

<b><u>Constituent</u></b>	<b><u>GW</u> <u>(mg/L)</u></b>	<b><u>Soil*</u> <u>(mg/kg)</u></b>	<b><u>Total Mass**</u> <u>(lb)</u></b>
PCE	5	1.315	604.5

\*Unless provided, sorbed concentrations were roughly estimated based on expected groundwater concentrations, foc and Koc values. For a more refined estimate, it is recommended that actual values be verified via direct sampling of the targeted treatment interval.

\*\*The total COC mass was estimated based on concentrations in soil and groundwater within the targeted area plus expected contributions from inflowing groundwater over the projected design life.

**GEOCHEMICAL DATA**

<b><u>Competing Electron Acceptors</u></b>	<b><u>GW</u> <u>(mg/L)</u></b>	
Dissolved oxygen	0	customer provided
Nitrate (as N)	0	customer provided
Manganese (dissolved)*	10	default value
Iron (III)*	10	default value
Sulfate	30	customer provided

\*An estimated projection of dissolved concentrations of Mn and Fe following ERD/ISCR were used to estimate H demand from the reduction of oxidized Fe and Mn minerals (typically only a portion of actual soil concentrations will be reduced).

ORP (mV)	190
pH	7

**STOICHIOMETRIC DEMAND CALCULATIONS**

	<b><u>GW</u> <u>(mg/L)</u></b>	<b><u>Soil</u> <u>(mg/kg)</u></b>
H2 Demand from COIs	0.2	0.1
H2 Demand from Competing Electron Acceptors	2.9	0.0
Total H2 Demand	3.2	0.1
H2 Demand from Soil within Targeted Area	0.2	lb
H2 Demand from GW within Targeted Area	1.6	lb
H2 Demand from Influx over Design Life	378.8	lb
Total Estimated H2 Demand	380.5	lb



## EHC DEMAND CALCULATIONS

The Stoichiometric demand for the targeted area was calculated using available data presented above, noting that the Stoichiometric demand represents minimum requirements and require a complete geochemical data set to be calculated accurately. Therefore, the resulting EHC dosing required to meet the estimated Stoichiometric demand was compared to our minimum guidelines for the selected type of application, selecting the higher number.

**Application type:** Injection PRB

	<u>Value</u>	<u>Unit</u>
Minimum EHC application rate to meet H2 demand	0.14	% by soil mass
Minimum recommended application rate for PRB*	0.5	% by soil mass
Recommended EHC application rate	0.50	% by soil mass
Mass of EHC required	14,438	lbs
Mass of EHC per bag	50	lbs
Number of bags required	289	bags
Mass EHC (rounded up based on bag size)	14,450	lbs

\*Our general recommended minimum guideline for the proposed application exceeds the dose rate required based on hydrogen demand calculations and was therefore used for the purpose of this dosing calculation.

## OPTIONAL DHC INOCULANT

Although not typically required for ISCR, DHC inoculants have shown to improve removal kinetics, in particular for potential daughter products such as cis-DCE and VC. The DHC will be added after EHC application, once favorable redox conditions (ORP < -75 mV, DO <0.2 mg/L, pH between 6 and 8.5) have been attained. The DHC inoculant will contain at least  $5 \times 10^{10}$  cfu/L of live bacteria including high numbers of dehalococcoides species with known abilities to biodegrade DCE. The target density of DHC cells in the treated aquifer is  $1 \times 10^6$  cfu/L.

	<u>Value</u>	<u>Unit</u>
Dechlorinating consortium concentration in inoculant	5.00E+10	DHC/L
Design final concentration after dilution in aquifer	1.00E+06	DHC/L
Volume of Inoculant Required	15	L



## COST ESTIMATE

<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Price</u>	<u>Cost</u>
EHC <sup>1, 2</sup>	14,450	lbs	\$2.40	\$34,680
Shipping Estimate <sup>3</sup>	1	lump sum	\$2,900	\$2,900
<b>Sub Total Cost</b>				<b>\$37,580</b>
<b>Optional items:</b>				
DHC Inoculum	15	L	\$90	\$1,350
DHC Shipping Estimate <sup>4</sup>	1	per canister	\$225	\$225
<b>TOTAL COST <sup>5</sup></b>				<b>\$39,155</b>

1) Price valid for 90 days from date at top of document. Terms: net 30 days.

2) Any applicable taxes not included. Please provide a copy of your tax exempt certificate or resale tax number when placing your order. In accordance with the law, applicable state and local taxes will be applied at the time of invoicing if PeroxyChem has not been presented with your fully executed tax exemption documentation.

3) Shipping rate provided is an estimate. Standard delivery time can vary from 1-3 weeks from time of order, depending upon volume. Expedited transport can be arranged at extra cost. Unless requested otherwise, costs assume standard ground transport via truck, with no need for a lift gate or pallet jack.

4) Shipping rate via FedEx. For larger volumes, upon request the culture may be concentrated into a smaller volume to reduce shipping charges.

5) All sales are per PeroxyChem's Terms and Conditions.

### Disclaimer:

The estimated dosage and recommended application methodology described in this document are based on the site information provided to us, but are not meant to constitute a guaranty of performance or a predictor of the speed at which a given site is remediated. The calculations in the Cost Estimate regarding the amount of product to be used in your project are based on stoichiometry or default minimum guideline values, and do not take into account the kinetics, or speed of the reaction. Note that the Stoichiometric mass represents the minimum anticipated amount needed to address the constituents of concern (COCs). As a result, these calculations should be used as a general approximation for purposes of an initial economic assessment. PeroxyChem recommends that you or your consultants complete a comprehensive remedial design that takes into consideration the precise nature of the COC impact and actual site conditions.



## INSTALLATION

EHC is supplied as a dry powder which can be mixed with soil or slurried in water. Installation techniques vary widely depending on the application. For example, the powder can be directly mixed into the soil using deep soil mixing equipment or placed into an open excavation where prior soil removal has been conducted. A slurry can be made and the mixture can be injected into the subsurface using techniques such as direct injection through Geoprobe rods or hydraulic fracturing. Injection through fixed wells is not recommended given that the product does not dissolve in water. If application via wells or injection networks were to be the preferred installation method at your site, we instead recommend our soluble ISCR substrate EHC-L.

### EHC Slurry Preparation:

The EHC slurry can be prepared in a variety of ways, including using paddle mixers, recirculation and manual mixing using a hand-held drill with a mixing attachment. However, particularly for larger projects, PeroxyChem recommends having a mechanical mixing system available on site. In general we recommend continuous mixing in smaller batches (<100 USG / 400 L) to avoid settling of solids at the bottom. For example Chem Grout's high pressure mixing and injection units are ideal for continuous preparation and injection of EHC.

The amount of water to prepare the EHC slurry could be varied depending on the desired injection volume and slurry properties. When applied via direct injection, normally a concentration of between 25 and 35% is targeted. The below table shows the amount of water needed per 50-lb / 25-kg bag depending on the targeted concentration and the resulting total injection volumes and percent pore fill (injection volume to total pore volume). Note that a thinner slurry will promote permeation into more permeable formations, whereas a more concentrated/more viscous slurry will promote fracturing and horizontal propagation into more fine-grained formations.

#### **Target concentration**

<b>(% solids):</b>	<b><u>25%</u></b>	<b><u>30%</u></b>	<b><u>35%</u></b>
Mass EHC per bag (lbs)	50	50	50
Volume water per bag (USG)	18.0	14.0	11.1
Volume slurry per bag (lbs)	22.0	18.0	15.2
Total mass EHC (lbs)	14,450	14,450	14,450
Total volume water (USG)	5195	4041	3216
Total injection volume (USG)	6344	5199	4384
Injection volume to <u>total</u> pore volume	10.8%	8.8%	7.4%





## INSTALLATION (continued)

### **Injection recommendations (can be altered):**

The EHC slurry can be injected into the ground in a variety of ways including direct injection and hydraulic/pneumatic fracturing. The injection spacing will be determined based on the radius of influence and soil acceptance for the given application method, lithology and depth. Assuming installation via direct push injections and a radius of influence (ROI) of 5 to 8 ft (1.7 to 2.5 m), an injection spacing of 10 to 15 ft (3 to 5 m) is normally applied. For injection PRB applications, a closer spacing is normally recommended to create some overlap or the PRB may be made up of multiple off-set injection lines to improve contact.

Unless specified by the consultant, the below recommendations was based on our experience from other similar lithologies and considers both the estimated ROI and the estimated soil acceptance (maximum injection volume per vertical foot for lithology and depth) using direct injection. However, please note that actual ROI and soil acceptance can vary widely and are also highly influenced by the injection method employed (slurry viscosity, injection pressures and flow rates). **Therefore, PLEASE NOTE that the construction estimates presented below can be readily modified in the field as required (for example, the density of the slurry can be changed to modify the total injection volume or the injections spacing could be altered based in installation technology).**

	<u>Value</u>	<u>Unit</u>	<u>Comment</u>
Total EHC mass	14,450	lbs	calculated value
Concentration of EHC slurry to inject	25%	by weight	can be altered
Total volume of water required	5,194	U.S. gallons	calculated value
Approximate volume of slurry to inject	6,344	U.S. gallons	calculated value
Number of lines for PRB	2	lines	
Injection spacing within lines	10	ft	customer provided
Number of injection points	35	locations	calculated value
Mass EHC per injection point	413	lbs	calculated value
Mass EHC per vertical foot	14	lbs	calculated value
Injection volume to total pore space volume	10.8%	by volume	calculated value



# EHC<sup>®</sup> Original ISCR Reagent Demand Calculations



7-Jul-2014

**Customer:** TetraTech  
**Contact:** Neil Teamerson | Senior PM  
**Site Location:** Town of Hempstead, Nassau  
**Proposal Number:** PeroxyChem-FA11-742

**Prepared by:**  
**Ravi Srirangam PhD**  
**1-312-480-5250**  
**Ravi.Srirangam@peroxychem.com**

## PRODUCT OVERVIEW

EHC is composed of controlled-release carbon, zero valent iron (ZVI) particles and nutrients used for stimulating in situ chemical reduction (ISCR) of otherwise persistent organic compounds in groundwater. Following placement of EHC into the subsurface environment, a number of physical, chemical and microbiological processes combine to create very strong reducing conditions that stimulate rapid and complete dechlorination of organic solvents and other recalcitrant compounds (e.g., explosives and organochlorine pesticides).

EHC is delivered as a dry powder in 50-lb / 25-kg bags or super-sacs. EHC can be placed into the saturated zones in a variety of ways including direct push injections, hydraulic and pneumatic fracturing, and direct soil mixing. EHC is completely non-hazardous and safe to handle. EHC is manufactured in the USA, EU and Brazil.



## SITE INFORMATION / ASSUMPTIONS

	<u>Value</u>	<u>Unit</u>	<u>Comment</u>
<b>Treatment Area Dimensions:</b>			
Width of targeted zone (perpendicular to gw flow)	150	ft	customer supplied
Length of targeted zone (parallel to gw flow)	5	ft	customer supplied
Depth to top of treatment zone	50	ft bgs	customer supplied
Treatment zone thickness	30	ft	customer supplied
Treatment volume	22,500	ft3	calculated value
Total Porosity	30	%	default value
Groundwater volume	6,750	ft3	calculated value
Soil bulk density	110	lbs/ft3	default value
Soil mass	1,238	ton	calculated value
<b>Transport characteristics:</b>			
Treatment time / design life for one application	5	years	default value
Linear groundwater flow velocity	365	ft/year	calculated value
Distance of inflowing gw over design life	1,825	ft	calculated value
Effective porosity for groundwater flow	20	%	default value
Volume of water passing region over design life	1642500	ft3	calculated value
Soil type	high permeability		customer supplied
Fraction organic carbon in soil, foc	0.001		estimated value



**CONTAMINANTS OF CONCERN (COCs)**

<b><u>Constituent</u></b>	<b><u>GW</u></b> <b><u>(mg/L)</u></b>	<b><u>Soil*</u></b> <b><u>(mg/kg)</u></b>	<b><u>Total Mass**</u></b> <b><u>(lb)</u></b>
PCE	5	1.315	518.1

\*Unless provided, sorbed concentrations were roughly estimated based on expected groundwater concentrations, foc and Koc values. For a more refined estimate, it is recommended that actual values be verified via direct sampling of the targeted treatment interval.

\*\*The total COC mass was estimated based on concentrations in soil and groundwater within the targeted area plus expected contributions from inflowing groundwater over the projected design life.

**GEOCHEMICAL DATA**

<b><u>Competing Electron Acceptors</u></b>	<b><u>GW</u></b> <b><u>(mg/L)</u></b>	
Dissolved oxygen	0	customer provided
Nitrate (as N)	0	customer provided
Manganese (dissolved)*	10	default value
Iron (III)*	10	default value
Sulfate	30	customer provided

\*An estimated projection of dissolved concentrations of Mn and Fe following ERD/ISCR were used to estimate H demand from the reduction of oxidized Fe and Mn minerals (typically only a portion of actual soil concentrations will be reduced).

ORP (mV)	190
pH	7

**STOICHIOMETRIC DEMAND CALCULATIONS**

	<b><u>GW</u></b> <b><u>(mg/L)</u></b>	<b><u>Soil</u></b> <b><u>(mg/kg)</u></b>
H2 Demand from COIs	0.2	0.1
H2 Demand from Competing Electron Acceptors	2.9	0.0
Total H2 Demand	3.2	0.1
H2 Demand from Soil within Targeted Area	0.2	lb
H2 Demand from GW within Targeted Area	1.3	lb
H2 Demand from Influx over Design Life	324.7	lb
Total Estimated H2 Demand	326.1	lb



## EHC DEMAND CALCULATIONS

The Stoichiometric demand for the targeted area was calculated using available data presented above, noting that the Stoichiometric demand represents minimum requirements and require a complete geochemical data set to be calculated accurately. Therefore, the resulting EHC dosing required to meet the estimated Stoichiometric demand was compared to our minimum guidelines for the selected type of application, selecting the higher number.

**Application type:** Injection PRB

	<u>Value</u>	<u>Unit</u>
Minimum EHC application rate to meet H2 demand	0.14	% by soil mass
Minimum recommended application rate for PRB*	0.5	% by soil mass
Recommended EHC application rate	0.50	% by soil mass
Mass of EHC required	12,375	lbs
Mass of EHC per bag	50	lbs
Number of bags required	248	bags
Mass EHC (rounded up based on bag size)	12,400	lbs

\*Our general recommended minimum guideline for the proposed application exceeds the dose rate required based on hydrogen demand calculations and was therefore used for the purpose of this dosing calculation.

## OPTIONAL DHC INOCULANT

Although not typically required for ISCR, DHC inoculants have shown to improve removal kinetics, in particular for potential daughter products such as cis-DCE and VC. The DHC will be added after EHC application, once favorable redox conditions (ORP < -75 mV, DO <0.2 mg/L, pH between 6 and 8.5) have been attained. The DHC inoculant will contain at least  $5 \times 10^{10}$  cfu/L of live bacteria including high numbers of dehalococcoides species with known abilities to biodegrade DCE. The target density of DHC cells in the treated aquifer is  $1 \times 10^6$  cfu/L.

	<u>Value</u>	<u>Unit</u>
Dechlorinating consortium concentration in inoculant	5.00E+10	DHC/L
Design final concentration after dilution in aquifer	1.00E+06	DHC/L
Volume of Inoculant Required	15	L



**COST ESTIMATE**

<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Price</u>	<u>Cost</u>
EHC <sup>1, 2</sup>	12,400	lbs	\$2.40	\$29,760
Shipping Estimate <sup>3</sup>	1	lump sum	\$2,500	\$2,500
<b>Sub Total Cost</b>				<b>\$32,260</b>
<b>Optional items:</b>				
DHC Inoculum	15	L	\$90	\$1,350
DHC Shipping Estimate <sup>4</sup>	1	per canister	\$225	\$225
<b>TOTAL COST <sup>5</sup></b>				<b>\$33,835</b>

1) Price valid for 90 days from date at top of document. Terms: net 30 days.

2) Any applicable taxes not included. Please provide a copy of your tax exempt certificate or resale tax number when placing your order. In accordance with the law, applicable state and local taxes will be applied at the time of invoicing if PeroxyChem has not been presented with your fully executed tax exemption documentation.

3) Shipping rate provided is an estimate. Standard delivery time can vary from 1-3 weeks from time of order, depending upon volume. Expedited transport can be arranged at extra cost. Unless requested otherwise, costs assume standard ground transport via truck, with no need for a lift gate or pallet jack.

4) Shipping rate via FedEx. For larger volumes, upon request the culture may be concentrated into a smaller volume to reduce shipping charges.

5) All sales are per PeroxyChem's Terms and Conditions.

**Disclaimer:**

The estimated dosage and recommended application methodology described in this document are based on the site information provided to us, but are not meant to constitute a guaranty of performance or a predictor of the speed at which a given site is remediated. The calculations in the Cost Estimate regarding the amount of product to be used in your project are based on stoichiometry or default minimum guideline values, and do not take into account the kinetics, or speed of the reaction. Note that the Stoichiometric mass represents the minimum anticipated amount needed to address the constituents of concern (COCs). As a result, these calculations should be used as a general approximation for purposes of an initial economic assessment. PeroxyChem recommends that you or your consultants complete a comprehensive remedial design that takes into consideration the precise nature of the COC impact and actual site conditions.



## INSTALLATION

EHC is supplied as a dry powder which can be mixed with soil or slurried in water. Installation techniques vary widely depending on the application. For example, the powder can be directly mixed into the soil using deep soil mixing equipment or placed into an open excavation where prior soil removal has been conducted. A slurry can be made and the mixture can be injected into the subsurface using techniques such as direct injection through Geoprobe rods or hydraulic fracturing. Injection through fixed wells is not recommended given that the product does not dissolve in water. If application via wells or injection networks were to be the preferred installation method at your site, we instead recommend our soluble ISCR substrate EHC-L.

### EHC Slurry Preparation:

The EHC slurry can be prepared in a variety of ways, including using paddle mixers, recirculation and manual mixing using a hand-held drill with a mixing attachment. However, particularly for larger projects, PeroxyChem recommends having a mechanical mixing system available on site. In general we recommend continuous mixing in smaller batches (<100 USG / 400 L) to avoid settling of solids at the bottom. For example Chem Grout's high pressure mixing and injection units are ideal for continuous preparation and injection of EHC.

The amount of water to prepare the EHC slurry could be varied depending on the desired injection volume and slurry properties. When applied via direct injection, normally a concentration of between 25 and 35% is targeted. The below table shows the amount of water needed per 50-lb / 25-kg bag depending on the targeted concentration and the resulting total injection volumes and percent pore fill (injection volume to total pore volume). Note that a thinner slurry will promote permeation into more permeable formations, whereas a more concentrated/more viscous slurry will promote fracturing and horizontal propagation into more fine-grained formations.

#### **Target concentration**

<b>(% solids):</b>	<b><u>25%</u></b>	<b><u>30%</u></b>	<b><u>35%</u></b>
Mass EHC per bag (lbs)	50	50	50
Volume water per bag (USG)	18.0	14.0	11.1
Volume slurry per bag (lbs)	22.0	18.0	15.2
Total mass EHC (lbs)	12,400	12,400	12,400
Total volume water (USG)	4458	3467	2760
Total injection volume (USG)	5444	4462	3762
Injection volume to <u>total</u> pore volume	10.8%	8.8%	7.4%





## INSTALLATION (continued)

### Injection recommendations (can be altered):

The EHC slurry can be injected into the ground in a variety of ways including direct injection and hydraulic/pneumatic fracturing. The injection spacing will be determined based on the radius of influence and soil acceptance for the given application method, lithology and depth. Assuming installation via direct push injections and a radius of influence (ROI) of 5 to 8 ft (1.7 to 2.5 m), an injection spacing of 10 to 15 ft (3 to 5 m) is normally applied. For injection PRB applications, a closer spacing is normally recommended to create some overlap or the PRB may be made up of multiple off-set injection lines to improve contact.

Unless specified by the consultant, the below recommendations was based on our experience from other similar lithologies and considers both the estimated ROI and the estimated soil acceptance (maximum injection volume per vertical foot for lithology and depth) using direct injection. However, please note that actual ROI and soil acceptance can vary widely and are also highly influenced by the injection method employed (slurry viscosity, injection pressures and flow rates). **Therefore, PLEASE NOTE that the construction estimates presented below can be readily modified in the field as required (for example, the density of the slurry can be changed to modify the total injection volume or the injections spacing could be altered based in installation technology).**

	<u>Value</u>	<u>Unit</u>	<u>Comment</u>
Total EHC mass	12,400	lbs	calculated value
Concentration of EHC slurry to inject	25%	by weight	can be altered
Total volume of water required	4,457	U.S. gallons	calculated value
Approximate volume of slurry to inject	5,444	U.S. gallons	calculated value
Number of lines for PRB	2	lines	
Injection spacing within lines	10	ft	customer provided
Number of injection points	30	locations	calculated value
Mass EHC per injection point	413	lbs	calculated value
Mass EHC per vertical foot	14	lbs	calculated value
Injection volume to total pore space volume	10.8%	by volume	calculated value



# ATTACHMENT G

## MCACES Construction Cost Estimate



Print Date Mon 3 November 2014  
Eff. Date 10/28/2014

U.S. Army Corps of Engineers  
Project : PENINSULA BOULEVARD COST ESTIMATES  
COE Standard Report Selections

Time 10:10:47

Title Page

Estimated by Tetra Tech, Inc  
Designed by Tetra Tech, Inc.  
Prepared by Tetra Tech, Inc  
Preparation Date 10/28/2014  
Effective Date of Pricing 10/28/2014  
Estimated Construction Time 150 Days

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Description		Quantity	UOM	ContractCost	ProjectCost	C/O
<b>Project Cost Summary Report</b>				<b>2,487,058</b>	<b>2,487,058</b>	
<b>IN-SITU DESIGN</b>		<b>1.00</b>	<b>LS</b>	<b>2,487,058</b>	<b>2,487,058</b>	
				2,487,057.82	2,487,057.82	
<b>32 Hazardous and Toxic Waste</b>		<b>1.00</b>	<b>EA</b>	<b>2,487,058</b>	<b>2,487,058</b>	
				2,487,057.82	2,487,057.82	
<b>32 05 Collection and Injection of Groundwater</b>		<b>1.00</b>	<b>EA</b>	<b>2,487,058</b>	<b>2,487,058</b>	
<b>32 05 01 Work Element 01 - Work Plans</b>		<b>1.00</b>	<b>LS</b>	<b>51,798</b>	<b>51,798</b>	
<b>32 05 01 01 0001 - Prepare Work Plans</b>		<b>1.00</b>	<b>LS</b>	<b>51,798</b>	<b>51,798</b>	
<b>32 05 02 Work Element 02 - General Requirements</b>		<b>1.00</b>	<b>LS</b>	<b>337,467</b>	<b>337,467</b>	
<b>32 05 02 01 0002 - General Conditions</b>		<b>1.00</b>	<b>LS</b>	<b>101,615</b>	<b>101,615</b>	
				20,323.09	20,323.09	
<b>32 05 02 01 01 Supervision and Management</b>		<b>5.00</b>	<b>MO</b>	<b>101,615</b>	<b>101,615</b>	
				16,121.86	16,121.86	
<b>32 05 02 01 01 01 Supervision Personnel</b>		<b>5.00</b>	<b>MO</b>	<b>80,609</b>	<b>80,609</b>	
				3,041.26	3,041.26	
<b>32 05 02 01 01 02 Management Vehicles</b>		<b>5.00</b>	<b>MO</b>	<b>15,206</b>	<b>15,206</b>	
				1,159.97	1,159.97	
<b>32 05 02 01 01 04 Partnering Sessions</b>		<b>5.00</b>	<b>MO</b>	<b>5,800</b>	<b>5,800</b>	
				927.97	927.97	
<b>Monthly Partnering Sessions</b>		<b>5.00</b>	<b>EA</b>	<b>4,640</b>	<b>4,640</b>	
				927.97	927.97	
<b>Quarterly Partnering Sessions</b>		<b>1.25</b>	<b>EA</b>	<b>1,160</b>	<b>1,160</b>	
<b>32 05 02 02 0003 - Safety, Health, and Emergency Response</b>		<b>1.00</b>	<b>LS</b>	<b>110,950</b>	<b>110,950</b>	
				22,189.95	22,189.95	
<b>32 05 02 02 01 Safety, Traffic Control, First Aid, Fire</b>		<b>5.00</b>	<b>MO</b>	<b>110,950</b>	<b>110,950</b>	
				10,247.89	10,247.89	
<b>32 05 02 02 01 01 Safety Management</b>		<b>5.00</b>	<b>MO</b>	<b>51,239</b>	<b>51,239</b>	
				85.48	85.48	
<b>32 05 02 02 01 02 Field First Aid</b>		<b>1.00</b>	<b>EA</b>	<b>85</b>	<b>85</b>	
				1,424.70	1,424.70	
<b>32 05 02 02 01 03 Safety Training</b>		<b>5.00</b>	<b>MO</b>	<b>7,123</b>	<b>7,123</b>	
				10,500.27	10,500.27	



Description	Quantity	UOM	ContractCost	ProjectCost	C/O
32 05 02 02 01 05 Traffic Control	5.00	MO	52,501	52,501	
32 05 02 03 0004 - Security	1.00	LS	122,603	122,603	
32 05 02 04 0005 - Decontamination	1.00	LS	2,298	2,298	
32 05 02 04 01 Temporary Equipment Decontamination Pad	1.00	LS	2,298	2,298	
32 05 03 Work Element 03 - Mobilization/Demobilization	1.00	LS	87,163	87,163	
32 05 03 01 0006 - Perform Mobilization	1.00	LS	55,050	55,050	
32 05 03 02 0007 - Perform Demobilization	1.00	LS	32,113	32,113	
32 05 04 Work Element 04 - Bench-Scale Microcosm Study	1.00	LS	27,030	27,030	
32 05 04 01 0008 - Bench-Scale Microcosm Study	1.00	LS	27,030	27,030	
32 05 05 Work Element 05 - Installation of ISCR Barrier Across Plume Axis	1.00	LS	196,867	196,867	
			2,468.97	2,468.97	
32 05 05 01 0009 - ISCR Barrier Installation	45.00	EA	111,103	111,103	
			1,891.17	1,891.17	
32 05 00 06 02 Install 2-inch Diameter PRB Points Using DPT	45.00	EA	85,103	85,103	
			96.30	96.30	
32 05 00 06 03 Oversight Labor	270.00	HR	26,001	26,001	
			3.41	3.41	
32 05 05 02 0010 - EHC	25,150.00	LB	85,764	85,764	
32 05 06 Work Element 06 - Well Installation	1.00	LS	257,809	257,809	
			582.52	582.52	
32 05 06 01 0011 - Extraction/Injection Well Installation	375.00	LF	218,445	218,445	
			87.08	87.08	
32 05 06 01 01 8.25" Well Drilling	375.00	LF	32,657	32,657	
			432.60	432.60	
32 05 00 04 05 6-inch Threaded Stainless Steel Well Installation	375.00	LF	162,226	162,226	
			425.14	425.14	
32 05 00 04 07 Well Completion Flush Mounts	5.00	EA	2,126	2,126	
			1,057.03	1,057.03	
32 05 00 04 08 Well Development	12.00	HR	12,684	12,684	
			729.35	729.35	
32 05 00 04 16 Traffic Control	12.00	DAY	8,752	8,752	
			197.38	197.38	



Description	Quantity	UOM	ContractCost	ProjectCost	C/O
32 05 06 02 0012 - Temporary Monitoring Well Installation	150.00	LF	29,608	29,608	
			63.99	63.99	
32 05 06 02 01 Temporary Well Drilling	150.00	LF	9,599	9,599	
			26.72	26.72	
32 05 06 02 02 2-inch Temporary PVC Well Installation	210.00	LF	5,611	5,611	
			21.38	21.38	
32 05 00 04 07 Well Completion Flush Mounts	5.00	EA	107	107	
			1,057.03	1,057.03	
32 05 00 04 08 Well Development	8.00	HR	8,456	8,456	
			729.35	729.35	
32 05 00 04 16 Traffic Control	8.00	DAY	5,835	5,835	
32 05 06 03 0013 Survey Well Locations	1.00	LS	9,756	9,756	
32 05 07 Work Element 07 - Baseline Sampling and Analysis	1.00	LS	42,029	42,029	
32 05 07 01 0014 - Baseline Sampling and Analysis	1.00	LS	29,864	29,864	
			96.30	96.30	
32 05 07 01 01 Field Labor	120.00	HR	11,556	11,556	
			465.19	465.19	
32 05 07 01 02 Field Equipment	5.00	DAY	2,326	2,326	
			54.73	54.73	
32 05 07 01 03 2-inch Split Spoon Sampling	292.00	LF	15,982	15,982	
32 05 07 02 0015 - Lab Analysis	1.00	LS	12,164	12,164	
			280.76	280.76	
32 05 12 07 01 Target Compound List (TCL) VOCs	24.00	EA	6,738	6,738	
			64.69	64.69	
32 05 12 07 02 Total Organic Carbon	10.00	EA	647	647	
			142.54	142.54	
32 05 12 07 03 Dissolved Gases	10.00	EA	1,425	1,425	
			229.67	229.67	
32 05 12 07 04 Volatile Fatty Acids	10.00	EA	2,297	2,297	
			264.25	264.25	
32 05 12 07 05 qPCR Census	4.00	EA	1,057	1,057	
32 05 08 Work Element 08 - Management of Solid Waste	1.00	LS	14,482	14,482	



Description	Quantity	UOM	ContractCost	ProjectCost	C/O
			965.45	965.45	
32 05 08 01 0016 - Management of Solid Waste	15.00	TON	14,482	14,482	
32 05 09 Work Element 09 - Management of Liquid Waste	1.00	LS	51,905	51,905	
			5.19	5.19	
32 05 09 01 0017 - Management of Liquid Waste	10,000.00	GAL	51,905	51,905	
32 05 10 Work Element 10 - Enhanced In-Situ Bioremediation System Equipment	1.00	LS	103,471	103,471	
32 05 10 01 0018 - Enhanced In-Situ Bioremediation System	1.00	LS	86,772	86,772	
			1,703.31	1,703.31	
32 05 10 01 01 Submersible Pumps	2.00	EA	3,407	3,407	
			946.64	946.64	
32 05 10 01 02 Submersible Pump Controls	2.00	EA	1,893	1,893	
			3,089.41	3,089.41	
32 05 10 01 03 Data Logger, Software, Power Supply, Cables	1.00	EA	3,089	3,089	
			2,995.86	2,995.86	
32 05 10 01 04 Extraction Well Vault and Instrumentation	2.00	EA	5,992	5,992	
			2,995.86	2,995.86	
32 05 10 01 05 Injection Well Vault and Instrumentation	4.00	EA	11,983	11,983	
			5,455.36	5,455.36	
32 05 10 01 06 Oversight and Installation of Remediation System	4.00	WK	21,821	21,821	
			5,215.45	5,215.45	
32 05 10 01 07 Well Vaults Utility Entrance	6.00	EA	31,293	31,293	
			729.35	729.35	
32 05 10 01 08 Traffic Control	10.00	DAY	7,293	7,293	
32 05 10 02 0019 - Initial Startup Testing	1.00	LS	16,699	16,699	
32 05 10 02 01 Remediation System Start-Up	1.00	LS	16,699	16,699	
			96.30	96.30	
32 05 10 02 01 01 Equipment and Controls Shakedown and De-Bugging	100.00	HR	9,630	9,630	
32 05 10 02 01 02 Equipment and Expenses	1.00	LS	6,414	6,414	
			655.79	655.79	
32 05 10 02 01 03 Cellular Modem IP Address and Service Set-Up	1.00	EA	656	656	
			33,026.57	33,026.57	
32 05 11 Work Element 11 - Installation of Enhanced In-Situ Bioremediation System	6.00	EA	198,159	198,159	



Description	Quantity	UOM	ContractCost	ProjectCost	C/O
			33,026.57	33,026.57	
<b>32 05 11 01 0020 - Installation of Enhanced In-Situ Bioremediation System</b>	<b>6.00</b>	<b>EA</b>	<b>198,159</b>	<b>198,159</b>	
			10,564.07	10,564.07	
<b>32 05 11 01 00 Equipment Trailer Mob/Demob</b>	<b>6.00</b>	<b>EA</b>	<b>63,384</b>	<b>63,384</b>	
			90,701.59	90,701.59	
<b>32 05 11 01 01 Equipment Trailer</b>	<b>1.00</b>	<b>EA</b>	<b>90,702</b>	<b>90,702</b>	
			36,060.07	36,060.07	
<b>32 05 00 05 01 01 Trailer Purchase</b>	<b>1.00</b>	<b>EA</b>	<b>36,060</b>	<b>36,060</b>	
			25,926.74	25,926.74	
<b>32 05 00 05 01 02 Control Panel</b>	<b>1.00</b>	<b>EA</b>	<b>25,927</b>	<b>25,927</b>	
			5,614.93	5,614.93	
<b>32 05 00 05 01 03 Sodium Bicarbonate Storage Tank</b>	<b>1.00</b>	<b>EA</b>	<b>5,615</b>	<b>5,615</b>	
			3,477.90	3,477.90	
<b>32 05 00 05 01 04 Substrate Tote Tank</b>	<b>1.00</b>	<b>EA</b>	<b>3,478</b>	<b>3,478</b>	
			8,154.46	8,154.46	
<b>32 05 00 05 01 05 Inlet Manifold</b>	<b>1.00</b>	<b>EA</b>	<b>8,154</b>	<b>8,154</b>	
			11,467.48	11,467.48	
<b>32 05 00 05 01 06 Injection Manifold</b>	<b>1.00</b>	<b>EA</b>	<b>11,467</b>	<b>11,467</b>	
			16,484.71	16,484.71	
<b>32 05 11 01 02 Electrical Connection</b>	<b>2.00</b>	<b>EA</b>	<b>32,969</b>	<b>32,969</b>	
			9,711.87	9,711.87	
<b>32 05 00 05 02 01 Temporary Service Pole</b>	<b>2.00</b>	<b>EA</b>	<b>19,424</b>	<b>19,424</b>	
			6,772.84	6,772.84	
<b>32 05 00 05 02 02 Equipment</b>	<b>2.00</b>	<b>EA</b>	<b>13,546</b>	<b>13,546</b>	
			15.24	15.24	
<b>32 05 11 01 04 Aboveground Piping</b>	<b>250.00</b>	<b>LF</b>	<b>3,811</b>	<b>3,811</b>	
			729.35	729.35	
<b>32 05 11 01 05 Traffic Control</b>	<b>10.00</b>	<b>DAY</b>	<b>7,293</b>	<b>7,293</b>	
<b>32 05 12 Work Element 12 - Year One O&amp;M</b>	<b>1.00</b>	<b>LS</b>	<b>614,064</b>	<b>614,064</b>	
			60,889.57	60,889.57	
<b>32 05 12 01 0021 - Biostimulation Event</b>	<b>2.00</b>	<b>EA</b>	<b>121,779</b>	<b>121,779</b>	
			0.23	0.23	



Description	Quantity	UOM	ContractCost	ProjectCost	C/O
32 05 12 01 01 Energy - Electric	21,600.00	KWH	4,924	4,924	
			96.30	96.30	
32 05 12 01 02 Site Visits	250.00	HR	24,075	24,075	
			320.68	320.68	
32 05 12 01 03 Field Equipment Rental	24.00	DAY	7,696	7,696	
			96.51	96.51	
32 05 12 01 04 Vehicle Rental	24.00	DAY	2,316	2,316	
			6,945.57	6,945.57	
32 05 12 01 05 Maintenance	2.00	EA	13,891	13,891	
32 05 12 01 06 Cellular Data Plan	1.00	LS	656	656	
			1,696.08	1,696.08	
32 05 12 01 08 Electrical Connect/Disconnect	2.00	EA	3,392	3,392	
			1,454.60	1,454.60	
32 05 12 01 09 Heavy-Duty Hose Ramp (Steel) Rental	26.00	EA	37,820	37,820	
			216.58	216.58	
32 05 12 01 10 Heavy-Duty Hose Ramp Relocation	26.00	EA	5,631	5,631	
			1,572.39	1,572.39	
32 05 12 01 11 Heavy-Duty Hose Ramp (Steel) Shipping	2.00	EA	3,145	3,145	
			729.35	729.35	
32 05 12 01 12 Traffic Control	25.00	DAY	18,234	18,234	
			3.01	3.01	
32 05 12 02 0022 - Biostimulation Amendments	45,000.00	LB	135,275	135,275	
			3.01	3.01	
32 05 12 02 01 Substrate Purchase	45,000.00	LB	135,275	135,275	
			18,113.52	18,113.52	
32 05 12 03 0023 - Bioaugmentation Event	1.00	EA	18,114	18,114	
			96.30	96.30	
32 05 01 02 01 Site Visits/Process Monitoring	125.00	HR	12,037	12,037	
			320.68	320.68	
32 05 01 02 02 Field Equipment Rental	12.50	DAY	4,009	4,009	
32 05 01 02 03 Miscellaneous Supplies	1.00	LS	861	861	
			96.51	96.51	



Description	Quantity	UOM	ContractCost	ProjectCost	C/O
32 05 01 02 04 Vehicle Rental	12.50	DAY	1,206	1,206	
			393.47	393.47	
32 05 12 04 0024 - Dehalococcoides Cultures	512.00	LIT	201,458	201,458	
			14,234.42	14,234.42	
32 05 12 05 0025 - Performance Monitoring	4.00	EA	56,938	56,938	
			96.30	96.30	
32 05 01 03 04 Field Labor	400.00	HR	38,520	38,520	
			421.00	421.00	
32 05 01 03 05 Field Equipment	20.00	DAY	8,420	8,420	
			96.51	96.51	
32 05 01 03 06 Vehicle Rental	20.00	DAY	1,930	1,930	
32 05 01 03 07 Materials and Supplies	4.00	LS	8,068	8,068	
			6,903.97	6,903.97	
32 05 12 06 0026 - Process Monitoring	4.00	EA	27,616	27,616	
			96.30	96.30	
32 05 01 03 04 Field Labor	160.00	HR	15,408	15,408	
			421.00	421.00	
32 05 01 03 05 Field Equipment	8.00	DAY	3,368	3,368	
			96.51	96.51	
32 05 01 03 06 Vehicle Rental	8.00	DAY	772	772	
32 05 01 03 07 Materials and Supplies	4.00	LS	8,068	8,068	
32 05 12 07 0027 - Lab Analysis	1.00	LS	52,885	52,885	
			280.76	280.76	
32 05 12 07 01 Target Compound List (TCL) VOCs	96.00	EA	26,953	26,953	
			64.69	64.69	
32 05 12 07 02 Total Organic Carbon	40.00	EA	2,588	2,588	
			142.54	142.54	
32 05 12 07 03 Dissolved Gases	40.00	EA	5,702	5,702	
			229.67	229.67	
32 05 12 07 04 Volatile Fatty Acids	40.00	EA	9,187	9,187	
			264.25	264.25	
32 05 12 07 05 qPCR Census	32.00	EA	8,456	8,456	



Description	Quantity	UOM	ContractCost	ProjectCost	C/O
<b>32 05 13 Work Element 13 - Years Two and Three O&amp;M</b>	<b>1.00</b>	<b>LS</b>	<b>504,814</b>	<b>504,814</b>	
			56,504.75	56,504.75	
<b>32 05 12 01 0028 - Biostimulation Event</b>	<b>4.00</b>	<b>EA</b>	<b>226,019</b>	<b>226,019</b>	
			0.23	0.23	
<b>32 05 12 01 01 Energy - Electric</b>	<b>43,200.00</b>	<b>KWH</b>	<b>9,848</b>	<b>9,848</b>	
			96.30	96.30	
<b>32 05 12 01 02 Site Visits</b>	<b>640.00</b>	<b>HR</b>	<b>61,631</b>	<b>61,631</b>	
			320.68	320.68	
<b>32 05 12 01 03 Field Equipment Rental</b>	<b>64.00</b>	<b>DAY</b>	<b>20,524</b>	<b>20,524</b>	
			96.51	96.51	
<b>32 05 12 01 04 Vehicle Rental</b>	<b>64.00</b>	<b>DAY</b>	<b>6,176</b>	<b>6,176</b>	
			6,945.57	6,945.57	
<b>32 05 12 01 05 Maintenance</b>	<b>4.00</b>	<b>EA</b>	<b>27,782</b>	<b>27,782</b>	
			1,696.08	1,696.08	
<b>32 05 12 01 08 Electrical Connect/Disconnect</b>	<b>4.00</b>	<b>EA</b>	<b>6,784</b>	<b>6,784</b>	
			1,454.60	1,454.60	
<b>32 05 12 01 09 Heavy-Duty Hose Ramp (Steel) Rental</b>	<b>26.00</b>	<b>EA</b>	<b>37,820</b>	<b>37,820</b>	
			216.58	216.58	
<b>32 05 12 01 10 Heavy-Duty Hose Ramp Relocation</b>	<b>26.00</b>	<b>EA</b>	<b>5,631</b>	<b>5,631</b>	
			1,572.39	1,572.39	
<b>32 05 12 01 11 Heavy-Duty Hose Ramp (Steel) Shipping</b>	<b>2.00</b>	<b>EA</b>	<b>3,145</b>	<b>3,145</b>	
			729.35	729.35	
<b>32 05 12 01 12 Traffic Control</b>	<b>64.00</b>	<b>DAY</b>	<b>46,678</b>	<b>46,678</b>	
			3.01	3.01	
<b>32 05 12 02 0029 - Biostimulation Amendments</b>	<b>9,000.00</b>	<b>LB</b>	<b>27,055</b>	<b>27,055</b>	
			3.01	3.01	
<b>32 05 12 02 01 Substrate Purchase</b>	<b>9,000.00</b>	<b>LB</b>	<b>27,055</b>	<b>27,055</b>	
			11,931.16	11,931.16	
<b>32 05 12 03 0030 - Bioaugmentation Event</b>	<b>4.00</b>	<b>EA</b>	<b>47,725</b>	<b>47,725</b>	
			96.30	96.30	
<b>32 05 01 02 01 Site Visits/Process Monitoring</b>	<b>400.00</b>	<b>HR</b>	<b>38,520</b>	<b>38,520</b>	
			320.68	320.68	



Description	Quantity	UOM	ContractCost	ProjectCost	C/O
32 05 01 02 02 Field Equipment Rental	20.00	DAY	6,414	6,414	
32 05 01 02 03 Miscellaneous Supplies	1.00	LS	861	861	
			96.51	96.51	
32 05 01 02 04 Vehicle Rental	20.00	DAY	1,930	1,930	
			393.47	393.47	
32 05 12 04 0031 - Dehalococcoides Cultures	102.00	LIT	40,134	40,134	
			6,231.63	6,231.63	
32 05 12 05 0032 - Performance Monitoring	6.00	EA	37,390	37,390	
			96.30	96.30	
32 05 01 03 04 Field Labor	240.00	HR	23,112	23,112	
			421.00	421.00	
32 05 01 03 05 Field Equipment	12.00	DAY	5,052	5,052	
			96.51	96.51	
32 05 01 03 06 Vehicle Rental	12.00	DAY	1,158	1,158	
32 05 01 03 07 Materials and Supplies	4.00	LS	8,068	8,068	
			5,895.47	5,895.47	
32 05 12 06 0033 - Process Monitoring	8.00	EA	47,164	47,164	
			96.30	96.30	
32 05 01 03 04 Field Labor	320.00	HR	30,816	30,816	
			421.00	421.00	
32 05 01 03 05 Field Equipment	16.00	DAY	6,736	6,736	
			96.51	96.51	
32 05 01 03 06 Vehicle Rental	16.00	DAY	1,544	1,544	
32 05 01 03 07 Materials and Supplies	4.00	LS	8,068	8,068	
32 05 12 07 0034 - Lab Analysis	1.00	LS	79,328	79,328	
			280.76	280.76	
32 05 12 07 01 Target Compound List (TCL) VOCs	144.00	EA	40,430	40,430	
			64.69	64.69	
32 05 12 07 02 Total Organic Carbon	60.00	EA	3,882	3,882	
			142.54	142.54	
32 05 12 07 03 Dissolved Gases	60.00	EA	8,552	8,552	
			229.67	229.67	



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	Description	Quantity	UOM	ContractCost	ProjectCost	C/O
32 05 12 07 04	Volatile Fatty Acids	60.00	EA	13,780	13,780	
				264.25	264.25	
32 05 12 07 05	qPCR Census	48.00	EA	12,684	12,684	