

Mr. Trevor Nobile, PG, CPG
Wisconsin Department of Natural Resources
2300 North Dr. Martin Luther King, Jr. Drive
Milwaukee, WI 53212

**CHANGE ORDER REQUEST – REMEDIAL ACTION SERVICES (RA2)
FORMER ONE-HOUR VALET DRY CLEANERS PROPERTY
1214 WEST WELLS STREET, MILWAUKEE, WISCONSIN
BRRTS NO. 02-41-152248 AND FID NO. 241086120**

Dear Mr. Nobile:

This change order request has been prepared on behalf of Marquette University (Marquette) to request the Wisconsin Department of Natural Resources' (WDNR) approval for an increase in the approved remedial action services budget for the former One-Hour Valet Dry Cleaners property located at 1214 West Wells Street in Milwaukee, Wisconsin (Site).

During preparation of the remedial design documents and subsequent remediation contractor negotiations, a few items were identified that were not included and/or anticipated at the time of our original cost proposal. These items include the following which are further described in the remainder of this change order request document:

- coordination and disposal of impacted concrete;
- performance of perimeter air monitoring during soil blending activities;
- permitting and closure of the sidewalk along Wells Street during the remedial activities; and
- increased remediation contractor costs generally associated with a slight increase in soil volume, vapor suppression during soil blending, and excavation benching requirements.

Impacted Concrete Disposal

Based on the results of the basement floor concrete sampling performed in November 2017 and subsequent discussions with you and Mike Ellenbecker (WDNR – Hazardous Waste Group), a determination was made that the basement concrete floor in the former tetrachloroethene (PCE) storage room (where the samples were collected) will require disposal as a listed hazardous waste. The demolition contractor will segregate the concrete from the storage room floor and place it in a roll-off box supplied by the disposal contractor (Veolia). Marquette will contract directly with Veolia for the transportation and disposal. Consultant services include general coordination and support. The associated subcontractor and consultant costs are summarized below:

Subcontractor Transportation and Disposal Costs	\$4,800
Consultant Labor Costs	<u>\$947</u>
Total Cost for Impacted Concrete Disposal	\$5,747

July 10, 2018

Ramboll
175 North Corporate Drive
Suite 160
Brookfield, WI 53045
USA

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www.ramboll.com

Ref. 1690005819

A copy of the disposal estimate is provided as Attachment A. Please note that actual disposal costs may vary slightly depending on the actual tonnage of impacted concrete that is disposed. Additional cost details are provided in Table 1.

Perimeter Air Monitoring

The need for additional perimeter air monitoring was identified during the remedial design process. Given the high concentrations, observations made during the treatability sample collection activities, and urban setting, it was determined that real time readings of the specific contaminants of concern (instead of a broad range of compounds) was needed so the appropriate corrective actions could be taken in a timely manner if conditions warrant. Refer to Section 6.3.7 of the *Remedial Design Report* (Ramboll, February 2018) for additional details regarding the proposed perimeter air monitoring activities.

Ramboll proposes to rent a Gasmeter DX4040 portable FTIR gas analyzer and associated interface tablet for the performance of perimeter air monitoring during implementation of the excavation benching and soil blending activities. This equipment will allow for the real-time measurement of vapor concentrations along the property perimeter and will be used to dictate the need for implementation of vapor suppression measures. Costs include the equipment rental charge, shipping, and Ramboll labor for setup and daily calibration of the equipment as summarized below:

Equipment Rental and Shipping	\$5,700
Consultant Labor Costs	<u>\$1,751</u>
Total Cost for Perimeter Air Monitoring	\$7,451

Please note that the perimeter air monitoring equipment will be operated by the on-site Ramboll representative to keep costs down. A copy of the equipment rental quote is provided as Attachment B. Additional cost details are provided in Table 1.

Temporary Sidewalk Closure

Due to the close proximity of the open basement void to the Wells Street public sidewalk, Ramboll proposes to temporarily close the section of sidewalk immediately adjacent to the southern property boundary during the remediation work. This will help to maintain a safe distance between the public and the active remediation area. Costs include consultant time for preparation and submittal of the City of Milwaukee permit along with rental of the required barricades and signage. Note that the related permit fee of \$250 is not included in this request as it is our understanding that this is considered a Dry Cleaner Environmental Response Fund (DERF) ineligible costs. Subcontractor and consultant costs are summarized below:

Barricade and Sign Rental	\$300
Consultant Labor Costs	<u>\$1,183</u>
Total Cost for Temporary Sidewalk Closure	\$1,483

Additional cost details are provided in Table 1.

Remediation Contractor Cost Increases

Final remediation contractor costs increases were identified during final design and contracting activities due to a slight increase in soil treatment volume and associated chemical cost increases, addition of vapor suppression during soil blending, and additional soil management related costs associated with excavation benching and incorporation of benching soils with treated soils. These increases include the following:

- Increase in remediation contractor (Redox Tech) costs due to the slight increase in treatment volume (1,940 cubic yards [cy] vs. 1,820 cy) and resulting increase in chemical costs.
- Rental and operation of vapor suppression equipment. Redox Tech will also pickup two drums of Rusmar foam remaining from another Ramboll project. Note that there is no cost associated with these two drums foaming product other than transportation. Having the vapor suppression foam and delivery equipment on site will allow for timely implementation of active measures in the event of an exceedance of air action levels. Ramboll anticipates that two drums of foam will be sufficient. If additional foam product is needed based on site specific conditions, additional costs will be incurred (\$750/drum) which are not incorporated into this change order request.
- Costs associated with slope construction following building demolition. Please note that Redox Tech's original cost proposal assumed that the demolition contractor would leave stable slopes that would meet Occupational Safety and Health Administration (OSHA) requirements. Because the building demolition work will be completed from the ground surface, the demolition contractor will leave the basement walls generally vertical. As a result, additional soil management is required by the remediation contractor to properly bench and stage the soil to allow for the safe performance of the soil blending activities.
- Following soil treatment, the benching soils will be incorporated into the soil treatment area. Rough compaction is proposed after incorporation of 5 feet of benching soil and then after any subsequent 2-foot thick lifts of benching soil. Please note that only costs associated with the replacement of benching soils within the area of contamination are included in this change order request. Marquette's redevelopment contractor will handle the remainder of the backfill and site restoration activities which are considered ineligible under the DERF fund.

Subcontractor costs for the above related increases and minimal consultant costs associated with the management of these modifications are summarized below:

Remediation Contractor Cost Increase	\$22,705
Consultant Labor Costs	<u>\$1,366</u>
Total Cost for Remediation Contractor Cost Increases	\$24,071

A copy of the Redox Tech's cost proposal is provided as Attachment C. Additional cost details are provided in Table 1.

Summary

Based on the above information, the total change order request amount is \$38,752, with a split of \$5,247 in consultant labor costs and \$33,505 in subcontractor and rental costs. A breakdown of the previously approved remedial action costs along with the change order costs is attached.

We appreciate your consideration of this request. If you have any questions or comments, please contact us at your convenience.

Yours sincerely,



Susan Petrofske
Senior Managing Consultant

D 262 901 3501
spetrofske@ramboll.com



Jeanne M. Tarvin, PG, CPG
Principal

D 262 901 0085
jtarvin@ramboll.com



Attachments

Table 1 – Approved Remedial Action Costs plus Change Order Request RA2

Attachment A – Concrete Disposal Estimate

Attachment B – Perimeter Air Monitoring Equipment Rental Quote

Attachment C – Redox Tech Updated Proposal (June 5, 2018)

cc: Joel Smullen, Marquette University

TABLE 1
APPROVED REMEDIAL ACTION COSTS
PLUS CHANGE ORDER REQUEST RA2

Table 1. Approved Remedial Action Costs plus Change Order Request
RA2
Former One-Hour Valet Cleaners, Milwaukee, Wisconsin
Ramboll Environ Proposal No. P21-12208

Description	Principal	Sr. Manager	Associate 6	Associate 4	Drafting	Clerical	Contractor/ Expenses ⁽¹⁾	TOTAL	Comments
Health and Safety Plan ⁽²⁾		5		7		2		\$1,521	
Baseline Groundwater Monitoring Event ⁽²⁾	1	5		32		4	\$1,548	\$5,584	
NR 718/UIC Permit Requests ⁽²⁾	2	18	46		6	8		\$9,846	
NR 724 Design Report and Plans/Specifications ⁽²⁾	4	32		38	8	12		\$10,440	
NR 724 Groundwater Monitoring Plan ⁽²⁾	1	4	8		2	4		\$2,211	
Vapor Testing of Utilities ⁽²⁾	1	4	10		2	4	\$1,800	\$4,259	Hydraulic Probe and Laboratory Contractor
Monitoring Well Installation/Sampling (if needed) ⁽²⁾	2	3	3	12	2	4	\$2,200	\$4,877	MW Installation and Laboratory Contractor
ZVI Bench Test ⁽²⁾	3	10	15				\$4,400	\$8,365	Bench Testing Contractor
Full-Scale ZVI Soil Blending ⁽³⁾	14	44	8	130	4	12	\$188,300	\$211,230	ZVI Blending Contractor
Replacement of Two Piezometers ⁽³⁾	1	3	3	26		2	\$6,270	\$9,710	
Verification Soil Sampling ⁽³⁾	3	7		42	2	4	\$4,630	\$10,380	Hydraulic Probe and Laboratory Contractor
Eight Groundwater Monitoring Events ⁽³⁾	7	36		244	4	28	\$10,990	\$41,465	Laboratory Contractor
Construction Documentation Report ⁽³⁾	8	24	40		12	12		\$11,864	
Completion of Case Closure Report ⁽³⁾	2	16	40		12	12	\$8,240	\$17,754	Well Abandonment Contractor
TOTAL HOURS	49	211	173	531	54	108			
RATE	\$185	\$155	\$124	\$88	\$77	\$65			
TOTAL ORIGINAL APPROVED PROJECT COST	\$9,065	\$32,705	\$21,452	\$46,728	\$4,158	\$7,020	\$228,378	\$349,506	
RA Change Order 1 (Approved 10/31/2017)									
Concrete Slab Sampling ⁽²⁾	\$185	\$465	\$620	\$880	\$0	\$130	\$980	\$3,260	
TOTAL APPROVED RA COSTS	\$9,250	\$33,170	\$22,072	\$47,608	\$4,158	\$7,150	\$229,358	\$352,766	

RA Change Order Request 2

Description	Principal	Sr. Manager	Associate 6	Associate 4	Drafting	Clerical	Contractor/ Expenses ⁽¹⁾	TOTAL	Comments
Impacted Concrete Disposal	1	4			1	1	\$ 4,800	\$ 5,747.00	Disposal coordination; Veolia Costs - Transportation and Disposal of Haz Concrete; To Be Paid Directly By Marquette
Perimeter Air Monitoring During Soil Blending		2	4	10		1	\$ 5,700	\$ 7,451.00	Rental equipment; setup; daily calibration
Temporary Sidewalk Closure		1	6		2	2	\$ 300	\$ 1,483.00	Temporary closure needed for safety; Permit application preparation; Walkthrough; Barricade Rental (note City of Milwaukee permit fee is not included)
Soil Blending Subcontractor	1	4	4			1	\$ 22,705	\$ 24,071.00	Redox Tech Costs - Volume increase; vapor suppression; soil management (benching soil);
TOTAL HOURS	2	11	14	10	3	5			
RATE	\$185	\$155	\$124	\$88	\$77	\$65			
RA Change Order Request 2	\$370	\$1,705	\$1,736	\$880	\$231	\$325	\$33,505.00	\$38,752	
TOTAL PROJECT COST - REVISED	\$9,620	\$34,875	\$23,808	\$48,488	\$4,389	\$7,475	\$262,863	\$391,518	

Notes:

- Laboratory costs are as follows: VOCs = \$65, sulfate = \$12, total organic carbon = \$35, ferrous iron = \$15, ethene/ethane/methane = \$55, nitrate/nitrite = \$15, TO-15 = \$217, TCLP-VOCs = \$120, and concrete sample processing = \$50.
- Task would be conducted pre-demolition.
- Task would be conducted post-demolition.



ATTACHMENT A

CONCRETE DISPOSAL ESTIMATE

December 28, 2017

Mr. Bob Juran
RCRA Advantage
9705 Stones Pocket Road
North Freedom, WI 53951

888/644-1083

Re: Waste Disposal PCE Contaminated Concrete

Dear Mr. Bob Juran:

Veolia ES Technical Solutions, LLC (Veolia) is pleased to submit an itemized estimate for the proper transportation and disposal of the hazardous materials from your project location.

Based upon our understanding of the scope of work as presented by RCRA Advantage the following is a summary of the proposed Veolia products and services:

Scope of Work

This quotation includes the following activities:

- Profiling (approval) of the Waste Material.
- All necessary Waste Material manifesting, permitting and any other paperwork as required by law.
- Transportation of the Waste Materials to the transfer/disposal facility
- Ultimate disposal at a Veolia approved Chemical Treatment Facility, Incinerator, or Recycling Facility.

Miscellaneous Conditions

All work performed will be in strict compliance with all federal, state and local regulations and laws.

One Hour Cleaners must also comply with all applicable laws and regulations pertaining to generators of hazardous waste. Veolia will not accept improperly identified or unidentified materials.

A fuel surcharge will be applied to transportation fees. The fuel surcharge is a variable rate that is indexed weekly to the DOE National Average Fuel Price. Dependent upon the method of disposal and the location of the facility, applicable hazardous waste taxes and/or surcharges imposed by the state will be charged.

Materials which do not conform to generator certified waste profile sheets may incur additional processing fees depending on the required treatment technology for the non-conforming waste, or will be rejected back to the generator site at the expense of the generator.

Any generator supplied bulk shipping container offered for shipment that does not comply with UN/DOT specifications will not be accepted for off-site transport. Veolia will also refuse bulk containers which are overfilled or overweight.

If Veolia provides bulk shipping containers (roll-off boxes, vacuum boxes, bulk portable tanks, etc) a monthly rental fee will be charged per unit supplied. Any damages to bulk containers, including but not limited to damaged tarps, support bows, hinges, valves, fittings or other mechanical closure devices, will be charged to the Customer.

Transportation of containers may require up to 10 business days between pick up request and actual pick up date, depending on geographic location. Veolia can provide expedited pick up services upon request, which may result in additional service fees.



All waste material pick ups will be done during standard Veolia business weekdays and hours (Monday through Friday, 7am to 5pm). Veolia can accommodate non-standard service days or times if mutually agreed to and incorporated into the previously defined Scope of Work.

Veolia includes one (1) free hour of on-site container loading time. Additional on-site loading time will be charged as "Transporter Demurrage" per the Quotation Worksheet.

Any additional services performed at the request of the customer, not listed contractually, will be invoiced based on the services provided.

Compensation

Veolia's Payment Terms: Net thirty (30) days.

The foregoing is an estimate only. Actual costs are contingent upon total material removed, freight and manpower hours. This estimate is valid for thirty (30) days. If you require additional time for evaluation or have any questions regarding the above, please feel free to call.

If a Purchase Order Number must be referenced for invoice payment, please include this information with your acceptance signature. Delay of payment due to missing or incomplete purchase order information will result in finance charges as defined in our Environmental Services Agreement. Veolia Payment Terms of Net thirty (30) days supersedes all payment terms as listed on customer's issued purchase order.

Specific Quote Terms

The afore mentioned items, including the Quotation Worksheet, will be incorporated by reference into the Environmental Services Agreement, which must be executed prior to service.

In all correspondence regarding this quotation, please refer to Veolia Reference Number: Q152004568.

If you have questions regarding this quote or any other Veolia services, please call me at (262) 255-0863.

To schedule a service date, please sign and return a copy of this letter via facsimile to (262) 255-5794, Attention Allan Kountz or via e-mail to: allan.kountz@veolia.com or the following address:

Veolia ES Technical Solutions
W124 N9311 Boundary Road
Menomonee Falls, Wisconsin 53051
Attention: Allan Kountz

Sincerely,
Veolia ES Technical Solutions


Account Manager

ACCEPTED:
RCRA Advantage

By: _____

Title: _____

Date: _____

Purchase Order No. _____



MANIFEST FROM:
One Hour Cleaners

Milwaukee, WI

RETURN MANIFEST TO:
*** Same Address ***

CERTIFICATE TO:
*** Same Address ***

CONTACT: Mr. Bob Juran	QUOTE DATE: 12/28/2017	TERRITORY: W38
PHONE:	FAX:	SALES REP: ALLAN G. KOUNTZ

Line	Service	Description	Quantity	Price	Unit	Extension
	Waste Stream:	PCE Contaminated Concrete	8.00	225.00	EA	\$1800.00
	Technology:	Chemical Treatment				
	Facility:	MICH. DISPOSAL WASTE TREATMENT				
	UOM/Container:	TONS				
	Disp. Fee:	MICHIGAN HAZ WASTE DISPOSAL FE	8.00	10.00	TON	\$80.00
	Freight:		1.00	1850.00	Trip	\$1850.00
	Miscellaneous:	DEMURRAGE	1.00	45.00	EACH	\$45.00
		<i>After the first free hour of demurrage.</i>	1.00	100.00	EACH	\$100.00
		DAILY RENTAL FOR A ROLLOFF	1.00	10.00	EACH	\$10.00
		FUEL SURCHARGE	2150.00	0.18	EACH	\$387.00
		<i>Fuel Surcharge will be assessed to the transportation portion of the invoice according to the DOE's weekly average diesel fuel price at the time of the pickup. It is currently 18%.</i>				
		Line Total				\$4272.00
		DISPOSAL FEE	8.00	1.70	TON	\$13.60
		<i>Wayne Host Community Fee</i>				
		Line Total				\$13.60
		CONTAINER DROP OFF FEE	1.00	300.00	EACH	\$300.00
		Line Total				\$300.00
		ENERGY & SECURITY SURCHARGE	1800.00	0.10	PERCNT	\$180.00
		Line Total				\$180.00
		Quote Total				\$4765.60

All terms and conditions described in the previous pages will apply.



ATTACHMENT B

PERIMETER AIR MONITORING EQUIPMENT RENTAL QUOTE



DATE	06/18/2018	TOTAL PAGES	2	INCLUDING COVER
TO	BBY WEDIG RAMBOLL ENVIRON			
EMAIL	AWEDIG@ramboll.com			
FROM	MIKE LYUBLIN PREMIER SAFETY - GL 46400 CONTINENTAL DR CHESTERFIELD MI 48047-5206	PHONE NUMBER	586-840-3200	FAX NUMBER 586-840-3201
SUBJECT	RENTAL QUOTE 04036374			

PLEASE REVIEW RENTAL QUOTE. THANK YOU.



46400 CONTINENTAL DR
 CHESTERFIELD, MI 48047-5206
 PH 586-840-3200 FX 586-840-3201

BILL TO

1006255
 RAMBOLL ENVIRON
 333 W WACKER DR STE 2700
 CHICAGO, IL 60606-2872

SHIP TO

RAMBOLL ENVIRON
 175 N CORPORATE DR STE 160
 BROOKFIELD, WI 53045-5898

Rental Quotation

QUOTE #	04036374
LOCATION	04
DATE	06/18/18
PAGE	1 OF 1

QUOTE DATE 06/05/18	EXPIRE DATE 07/05/18	REQUIRED DATE	REFERENCE NUMBER 1690005819	PAYMENT TERMS NET 30 DAYS
PREPARED BY MIKE LYUBLIN PH 586-840-3223		CONTACT ABBY WEDIG		SHIP VIA OTHER
FREIGHT TERMS PREPAY & ADD		FOB		SALES PERSON GREAT LAKES HOUSE

PRODUCT/DESCRIPTION	QUANTITY	PRICE	U/M	EXTENSION
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444-0005	1			
GASMET DX4040 PORTABLE				
FTIR GAS ANALYZER				
DAY: 861.00 WK: 2583.00 MO: 7749.00		DAY: 861.00 WK: 2583.00 MO: 7749.00		

120-1010	1			
LAPTOP COMPUTER				
SEE MODEL FOR TYPE				
DAY: 26.24 WK: 78.72 MO: 236.16		DAY: 26.24 WK: 78.72 MO: 236.16		

You might be interested in one of our newest services "LiveTech" where you can communicate on-line and observe our technical staff provide direction and assistance.

MERCHANDISE TOTAL	TOTAL RATES
0.00	DAY: 887.24 WK: 2661.72 MO: 7985.16

Accepted:

By: _____

Date:



ATTACHMENT C
REDOX TECH UPDATED PROPOSAL (JUNE 5, 2018)

REDOX TECH, LLC



"Providing Innovative In Situ Soil and Groundwater Treatment"

June 5, 2018

Via Email

Ms. Susan Petrofske

Ramboll Environ US Corp.

175 North Corporate Drive, Suite 160

Brookfield, WI 53045

Email: spetrofske@ramboll.com

RE: In Situ Blending at Former Valet Cleaners, Milwaukee, WI

Dear Ms. Petrofske;

Redox Tech is pleased to present the following revised cost estimate to perform in situ blending at the Former Valet Cleaners Site located at 1214 W. Wells Street in Milwaukee, WI. As per our previous proposal dated May 26, 2017 we feel that in situ blending is a viable and effective approach at this site. This is compounded by the fact that the soils are clayey and delivery of an amendment via an injection strategy would be difficult. Based on recent correspondence, Redox Tech has made the following changes/assumptions in preparing this estimate:

- 1) Marquette University has contracted a general contractor, Mortensen, to remove the existing buildings and foundations. The southern foundation wall will remain in place to provide support for the southern wall. Upon arrival to the site, Redox Tech will slope the sidewalls of the work area at 1:1 slopes (or as warranted based on conditions encountered to maintain a safe excavation) and build an access ramp on the east side of the open excavation at a 2:1 slope. Due to space limitations on the eastern side of the work area, soils will need to be moved and stockpiled to the north and northeastern portions of the site. Redox Tech has not provided any costs for erosion control with respect to these soil piles. Following completion of the soil blending, the stockpiled soil will be returned to the open excavation and incorporated into the treated soil utilizing a backhoe. A geotextile fabric will then be placed to provide a added stability and separation between the treated material and subsequent backfilling and site restoration activities performed by others. Redox Tech will not be responsible for sidewall stability when not on site (pre and post work).
- 2) A water source is available in the existing parking garage with a flow rate of approximately 15gpm. Redox Tech will bring a pillow tank to the site to store water for use during the soil blending activities.
- 3) A security fence will be constructed and managed by others surrounding the site.
- 4) The total volume of soil to be treated is approximately 1,940 cubic yards
- 5) The maximum depth of treatment shall not exceed 35 feet from grade

- 6) Redox Tech will arrange delivery of a Rusmar NTC/8 portable pneumatic foam unit and an air compressor that will be used for vapor control if required. Ramboll currently has 2 drums of foam that Redox Tech personnel will pick up from a Ramboll storage facility in WI. We have assumed that the storage facility has the capability of loading the drums (each approximately 450 pounds) onto our truck or trailer.

Redox Tech proposes to use an enhanced reductive dechlorination (ERD) approach using Zero Valent Iron (ZVI) and our ABC[®] product to treat the contaminants of concern. We are recommending applying ZVI at a loading rate of approximately 2.5 percent of the weight of soil. Assuming a soil density of 120 lbs/ft³, this would be equivalent to approximately 79 tons.

Treatment of chlorinated volatile organic compounds by Zero Valent Iron (ZVI) has been proven and widely accepted as an effective in situ remediation technology of chlorinated solvents such as PCE and TCE as found at this site. The degradation process is an abiotic reductive dehalogenation process occurring on the surface of the granular iron, with the iron acting as an electron source. During the dehalogenation process, the halides on the compound (chloride, fluoride and bromide) are replaced by hydrogen resulting in the transformation of halogenated VOCs to ethane, ethane, methane, and halide ions (Cl⁻, F⁻, and Br⁻). Dehalogenation proceeds by three processes commonly referred to as β -elimination, hydrogenolysis and hydrogenation. For chlorinated ethenes such as PCE and TCE, β -elimination involves the removal of two chlorides on adjacent carbons resulting in the formation of a lesser chlorinated acetylene intermediate and is considered to be the dominant dechlorination process for most chlorinated ethenes.

Degradation rates using the ZVI process are several orders of magnitude greater than under natural conditions. As a consequence of multiple degradation processes, only a small fraction (<10%) of the original PCE and TCE will be degraded to cis-1,2-dichloroethene (cDCE) and VC within the treatment zone. When these compounds come in contact with ZVI, they will rapidly degrade to ethane and ethane. Thus, for all but a few chlorinated ethenes, ethanes and methanes the process does not result in the formation of unwanted, potentially persistent toxic compounds.

The addition of ABC[®] will provide short-term and long-term nutrients to support anaerobic bacteria growth, which also assists in creating a reducing environment. ABC[®] contains soluble carbon and a phosphate buffer that maintains the pH in a range that is best suited for microbial growth and provides an important micronutrient for bioremediation. In addition, the corrosion of iron metal yields ferrous iron and hydrogen, both of which are possible reducing agents. The hydrogen gas produced is also an excellent energy source for a wide variety of anaerobic bacteria.

We recommend applying 17,300 lbs of ABC[®], which when diluted with water to a 15 weight percent solution, will be equivalent to approximately 10 percent of the available pore space assuming a porosity of 30 percent. Based on treatability testing conducted earlier this year (results provided in a prior correspondence), Redox Tech will increase the ethyl lactate content in the ABC[®] formula to assist in solubilizing the PCE.

In Situ Soil Blending

In situ soil blending involves using an in situ blender to effectively distribute chemical amendments throughout the soil medium to treat contaminants of concern. The chemical amendments can range from oxidants, reductants, biostimulants, or soil stabilizers. The in situ blender is mounted on a large excavator with a modified diesel engine and hydraulic power system. The mixer is capable of mixing dry soil as well as sludge material to depths of 20 feet below ground surface. Utilizing hydraulic pressures of 5,000 psi, a 28-inch diameter mixing drum with specially designed “teeth” is rotated at speeds up to 100 rpm with torque of 20,300 lbs per foot. This rugged durability allows the mixing drum to penetrate all soil types, even with the presence of backfill materials such as bricks, boulders, and rebar.

Since many chemical remediation alternatives require direct contact with the target contaminants, the effectiveness of the remediation strategy is often limited by the ability to distribute the chemical amendments throughout the soil medium. The blending process breaks soil loose, allowing for the rotary teeth to blend the reagent(s) and the soil into a relatively homogeneous mixture. The operator controls the depth of blending by advancing the arm of the rig downwards to the target depth. Based on experience, the operator knows how deep he is by how far the arm of the blender has been extended (i.e. certain points on the arm equate to specific depths). The in situ blender is an effective and efficient method to achieve mixing at shallow depths (less than 20 feet). In its current configuration, the maximum depth that the blender can reach is approximately 22 feet. However, deeper depths can be achieved by benching. The maximum depth is therefore only limited by how deep the equipment can bench. In addition, the production rate of this equipment is comparable to excavating, and is a much cheaper alternative to dig and haul.

The blending equipment will work in tandem with a conventional excavator. The excavator serves three purposes; 1) to initially loosen the soils and verify that no buried objects are present that could potentially damage the blending equipment such as footings, boulders, utilities, etc, 2) it allows access to the target lift, and 3) it is used to move and place the chemicals into the open excavation.

Within each cell, blending will be conducted in 10 foot thick lifts where possible. This will ensure proper vertical distribution of the chemical amendment is achieved. In areas where sidewall stability may be a concern, larger vertical lifts may be addressed. Predetermined quantities of amendment will be added to the cell and blended with the soil using the in situ blender. The amount of amendment used in each cell/lift will be based on the predetermined loading rate.

The ZVI will be delivered to the site in either 1,000lb or 2,000lb supersacks. As needed, the sacks will be brought from the staging area to the treatment cell using a forklift. Each sack is equipped with 4 looped lifting straps (one on each corner) that when pulled upwards, allows for the entire sack to drain under gravity. These loops will be connected to the lifting ring, located on the bottom of the excavator’s bucket, by a field technician using nylon braided lifting straps. The operator of the excavator will then tilt the sack on

its side to allow access to the release ropes located on the underside of the sacks. Once the operator signals the field technician to proceed, the technician will release the ropes on the underside of the sack to allow for the chemicals to pour from the sack once lifted. The technician will then leave the exclusion zone (approximately 50 to 100 feet away from the equipment) and signal the operator to proceed. The operator will lift the sack over the treatment cell, emptying the contents of the sack. The blender will then be used to blend the material throughout the entire cell.

The ABC[®] solution will be mixed in portable mixing tanks and sprayed/pumped into the soils as the soil is being blended. Additional water may also be added to the cell if required, to help assist in the blending process. Once the cell has been blended, the equipment will move to the next lift or cell and the procedure repeated.

The in situ blending process will be performed systematically by subdividing the treatment area(s) into smaller cells. The cell dimensions and chemical loading requirements are determined during the planning stages, but typically do not exceed 20 feet by 20 feet. Each cell will also be subdivided into 5-ft to 10-ft lifts which are addressed separately working from depth upwards. This will ensure vertical distribution of the chemical amendment. Larger lifts may be addressed in areas where sidewall stability may be a concern. A detailed implementation plan would be developed prior to mobilization to properly coordinate the mixing process.

Please note that the soil blending process inherently loosens the structural strength of the soils. In addition, the addition of ZVI, ABC[®], and water, combined with the blending process, will significantly increase the volume of soil present, resulting in a mounding effect. However, this should not be an issue since most of the work will be conducted below grade. The soil will not likely be suitable for building a structure on for some time after the blending has been complete, however, a parking area can be constructed fairly soon afterwards by properly designing the subgrade accordingly.

We are guaranteeing that the PCE soil concentrations within the treatment area will be less than 33 ppm within 20 months after treatment. We are basing that guarantee upon the nature and extent data provided by Ramboll. If the measured maximum PCE contaminant level increases after soil blending, then the guarantee is void. Redox Tech reserves the right to collect samples during the soil blending process for analysis for PCE by Method 8260. If the PCE concentration detected is greater than twenty percent higher than the previously reported maximum concentration, the guarantee is void. In the event the PCE concentration in soil is still above 33 ppm after 20 months, Redox Tech shall have the choice of treating the additional soil with a method of our choice or disposing the soil. Redox Tech is not responsible for any additional sampling, analysis or reporting.

We estimate that the blending work can be completed in 8 to 10 days, depending on weather conditions. **Table 1** presents the cost summary for completing this work.

Table 1. Cost Summary for In Situ Soil Blending with ABC® and ZVI

Item	Quantity	Rate	Subtotal
Mobe/Demobe (for crew and equipment)	Lump Sum		\$17,500
Project Management (includes HASP and Work Plan prep., material procurement, etc.)	Lump Sum		\$7,500
Chemicals (includes shipping and handling)			
ZVI	79 tons	\$1,300 per ton	\$102,700
ABC®	17,300 lbs	\$1.25 per lb	\$21,625
In Situ Blending (includes support vehicles, rentals, fuel, labor, PM, Level D PPE, per diem, materials, rentals, decon, etc.)	1,940 cubic yards	\$22 per cubic yard	\$42,680
Rusmar portable pneumatic foam unit (including shipping and rental of 185 scfm air compressor)*	2 weeks	\$4,600	\$4,600
Slope construction, soil management, and geotextile	Lump Sum		\$11,000
TOTAL	\$207,605		
Potential Cost Adjustments			
H&S Upgrade to PPE Level C	\$75/employee/hr		
Additional Rusmar Foam*	\$750/drum		
Rough compaction during benching soil backfilling**	\$3,400		
Adjustment for reduction in slope construction/ soil management if the southern 60-foot sections of the eastern and western basement walls are retained.	\$ 1,500		

*Assumes Ramboll supplies 2 drums of foaming agent. Each additional drum with shipping will cost ~\$750. Unused foaming agent cannot be restocked.

** Rough compaction of benching soils includes use of plate compactor (backhoe attachment) after initial incorporation of 5 feet with treated soils and subsequent 2 foot lifts.

ASSUMPTIONS

The following assumptions were made in preparing the budgetary cost estimates for this site:

- Potable water is readily available on site. Redox Tech will monitor the amount of water that is used.
- The site is secure and a laydown area is available for equipment.
- Chemicals will be purchased by Redox Tech.
- Charges for chemicals are paid net 45 days from time of delivery.
- All other charges are invoiced monthly and paid net 60 days.
- All work will be completed in modified Level D PPE. Redox Tech will monitor the health and safety of its employees and have the necessary PPE available on site to upgrade to Level C PPE if conditions warrant. The additive cost for Level C PPE per employee, if used, is \$75 per hour.
- All decontamination activities will be conducted over the treatment zone. No cost for containerizing and/or disposing of decon fluids are included.
- All general refuse will be properly bagged and collected by Redox Tech. Redox Tech will arrange for the proper storage and removal of trash generated on-site during the soil blending activities.
- All permitting will be completed by others.
- Perimeter air monitoring will be the responsibility of Ramboll. Redox Tech will be responsible for conducting air monitoring for its workers using a PID or other appropriate air monitoring equipment.
- Work can be completed during normal daytime working hours, Monday through Sunday.
- Regulatory and client interface is predominantly the responsibility of Ramboll.
- Soil and groundwater sampling and analysis have not been included in this estimate.
- All regulatory reports will be prepared by Ramboll.
- Redox Tech will prepare daily production logs.
- Redox Tech will provide equipment, personnel, and project management to complete the project.
- Utility clearances will be completed by others, and Redox Tech is only responsible for damage to underground utilities when Redox Tech is solely negligent.
- All associated utility costs will be borne by others.
- Any grading or soil movement after benching soils have been returned to the excavation will be the responsibility of others.

Thank you for the opportunity to provide you with this estimate. We are looking forward to hearing back from you. If you have any questions or concerns, please do not hesitate to call me at 630-705-0390.

Regards,

Steve Markesic