Table 3 - Estimated AMOR Application Scope
Mountain View Brownfield
Ellensburg, Washington

			Chemical Oxidation			Biological Oxidation			
Location Name	**Solution Name**	**On-Center Distance (feet)**	**Estimated Points**	**NovIOX™ Solution (gal)**	**NovIOX Concentrate (gal)**	**Estimated Points**	**AnoxEA-aq® (pounds)**	**ReleaSE-Dx™ (liters)**	**AM3™ (grams)**
Former Scale House Tank Area	A	8	180	2,880	19.2	80	4,000	40	2,000
North Mechanic Shop	A	8	47	752	5.0	30	1,500	15	1,500
East Mechanic Shop	B	10	48	768	5.1	20	500	5	500
		Totals	**275**	**4,400**	**29.3**	**130**	**6,000**	**60**	**4,000**

Notes:
Solution Composition:
Solution A = 50 pounds AnoxEA-aq, 0.5 L ReleaSE-Dx, 25 grams AM3 in 50 gallons of tap water.
Solution B = 25 pounds AnoxEA-aq, 0.25 L ReleaSE-Dx, 25 grams AM3 in 50 gallons of tap water.
NovIOX, AnoxEA-aq, ReleaSE-Dx, and AM3 provided by Bioremediation Specialists, L.L.C.

Table 1 - Bioremediation Amendment Product Evaluation
Mountain View Brownfield
Ellensburg, Washington

Evaluation Criteria	ORC Adv.	EHC-O	E-Ox	AnoxEA-aq	EAS
Cost per Pound of Product	$ 9.25	$ 5.25	$ 5.00	$ 4.00	$ 4.00
Nutrients	None	Trace N	None	N,P,K,micro	None
Mole Hydrogen Consumed Per Pound Product	4.83	4.12	4.74	11.01	15.10
Pounds of Product to Degrade One Pound of Petroleum	20.71	24.28	21.08	9.08	6.62
Cost Per Pound Of Petroleum Degraded	$ 188.75	$ 125.60	$ 103.87	$ 35.79	$ 26.10

Notes:
ORC Adv. = Oxygen Releasing Compound™ Advanced provided by Regenesis.
EHC-O™ provided by FMC Environmental Solutions.
E-Ox™ provided by EOS Remediation.
AnoxEA-aq® provided by Bioremediation Specialists, L.L.C.
EAS™ provided by EOS Remediation.
Trace N = trace nitrogen nutrient sources.
N,P,K,micro = nitrogen, phosphorous, postassium and micro-nutrients, respectively.

Table 2 - Electron Acceptor/Demand Calculations
Mountain View Brownfield
Ellensburg, Washington

Treatment Target Area Specifications	
Vertical Treatment (ft)	4
Treatment Width (ft)	200
Treatment Length (ft) (parallel w/ GW flow)	100
Effective Porosity	0.25
Foc	0.001
Estimated Seepage Velocity (ft/year)	100
Bulk Soil Density (lbs/ft^3)	120

Total Remediation Project Duration (days): **180**

Treatment Area Pore Volume: 566,000 L = 149,340 Gallons

Hydrogen/Electron Donor Availability

Constituent	Groundwater Concentration (mg/L)	Molecular Weight (g/mol)	Moles of H_2 to Oxidize / Mole Analyte	Moles of H_2 Donor In Treatment Area
Native Electron Donors				
Average Groundwater TPH-Gx	5.0	100	22	*623*
Approximate % Aromatic	5%			
Estimated Total Soil and GW TPH-Gx				14,591
Average Groundwater TPH-Dx	0.1	226	49	*12*
Estimated Total Soil and GW TPH-Dx				354,799
			Estimated Oxidative Efficiency	**20%** **73,878**

Hydrogen/Electron Acceptors

Constituent	Groundwater Concentration (mg/L)	Molecular Weight (g/mol)	Moles of H_2 to Reduce Mole Analyte	Moles of H_2 Acceptor In Treatment Area
Native Electron Acceptor Flux				
Dissolved Oxygen	2.0	32	2	71
Nitrate (as Nitrogen)	5.0	62	3	607
Sulfate	20.0	96.1	4	471
Fe^{+2} Formation from Fe^{+3}	0.0	55.8	0.5	0
As^{+3} Formation from As^{+5}	0.0	74.9	1	0
Mn^{+2} Formation from Mn^{+4}	0.0	54.9	1	0
Methane Formation	0.0	16	4	0
			Initial Treatment Area Hydrogen Acceptors	1,149
			Additional Hydrogen Acceptor Flux of Remediation Duration	566
			Total Native Hydrogen Acceptor Subtotal	1,715

Added Electron Acceptor	Added Pounds	Moles of H_2 to Reduce Mole Analyte	Moles H_2/Lb.	Moles H_2 Acceptor Added
AnoxEA-aq™	6,000	NA	10.5	62,700
			Added Hydrogen Acceptor Subtotal	62,700
			Estimated Moles of Hydrogen Acceptor:	**64,415**

Table 2 - Electron Acceptor/Demand Calculations
Mountain View Brownfield
Ellensburg, Washington

Estimated Oxidative Treatment Progress Based on Design Assumptions:	**87%**

Table 2 - Electron Acceptor/Demand Calculations
Mountain View Brownfield
Ellensburg, Washington

NOTES:

L = liters; gal = gallons; Fe^{+2} = dissolved iron; MN^{+2} = dissolved manganese;

$1ft^3$ = 7.48 gals = 28.3L; 3.79L = 1 gal.

Physical equalibrium constants per Oregon DEQ Risk-Based Decision Making Guidance.

Electron and hydrogen equivalents per Principles and Practices of Enhanced Anaerobic Bioremediation of Chlorinated Solvents, Air Force Center for Environmental Excellence, August 2004.

ft = feet; L = liters; mg/L = milligrams per liter; gal = gallons; gpm = gallons per minute; H_2 = hydrogen.