APPENDIX B

BORING LOGS, MONITORING WELL CONSTRUCTION, MONITORING WELL SAMPLING LOGS, AND VAPOR SAMPLING LOGS

61 Broadway, Suite 1601
New York, NY 10006
(212) 962-4301

Log of Soil Boring ID: SB-13/MW-01
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/10/2016

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Well Construction (all depths in feet bgs)
						(0-0.3') - Concrete		
			0					
								Depths
			0					Borehole Total Depth: 15'
								Borehole Diameter: 8.25"
Hand Cleared to 5 feet bgs			0					Casing: PVC
								Screen: 5-15' bgs
			0			**(0.3-7.0') - Fill:** Loose dark brown to brown fine to coarse sand, moist, few fill (brick, concrete, and slag), few large gravel		Sand Pack: 3-15'bgs
								Bentonite chips: 1-3' bgs
			0					Bentonite grout:
				--5				Concrete: Surface
			0					
			0				▽	
1	42"	70%				**(7.0-7.5') - Fill:** Medium dense grayish brown medium to fine sand, wet, non-plastic, noncohesive		**WELL MATERIALS**
Geoprobe	60"		0					Monument:
						(7.5-8.0') - Fill: Medium dense lack medium to coarse sand, wet, non-plastic, noncohesive		Cap:
			0					Concrete: Quickcrete
						(8.0-10.0') - Fill: Soft greenish gray sandy clay, wet, low plasticity, cohesive, brick at 10' bgs		Bentonite:
			0					Casing: PVC 40
				--10				Well Screen:
			0					Monoflex, 10' with 0.020" slot
						(10.0-13.0'): Dark gray to brown silty medium to fine sand, wet, non-plastic, noncohesive, trace small gravel		PVC 40
			0					Sand Pack:
2	36"	60%						Morie Quartz #4 filter pack sand
Geoprobe	60"		0					End Cap:
			0					
			0			**(13.0-17.0'):** Gray medium to fine sand, wet, non-plastic, noncohesive, little small gravel		
				--15				
3	12"	50%	0					
Geoprobe	24"							
			0	--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-13 (5-7) @ 1115
SB-13 (15-17) @ 1140
VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

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Log of Soil Boring ID: SB-14
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/15/2016

SAMPLE INFORMATION						Depth to water: **Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol			
						(0-0.5') - Concrete		
			0			**(0.5-2.5') - Fill:** Loose brown medium to fine sand, dry, little brick, little small angular gravel		One-inch temporary well sampling point installed to 13 feet bgs. Screened 3 to 13 feet. Filter pack sand to 3 feet bgs.
			0					
1	30"	50%						
Geoprobe	60"		0			**(2.5-5.0') - Fill:** Medium dense brown medium to fine sand, moist, little large gravel		Eight gallons of water removed from well prior to sampling.
			0					
			0	--5				
						(5.0-5.3') - Fill: Medium dense reddish brown medium to fine sand, moist, little small gravel		
			0					
						(5.3-7.5') - Fill: Medium gray silty sand, moist to wet, non-plastic, noncohesive	▽	
			0					
2	24"	40%						
Geoprobe	60"		0			**(7.5-8.5') - Fill:** Dense reddish brown medium sand, wet, little coarse and fine sand		
			0			**(8.5-10.0')- Fill:** Medium dense gray clay, wet, few silt, few sand, trace brick at 10' bgs		
			0	--10				
						(10.0-17.0'): Medium dense grey to brown medium to fine sand, wet, trace rock		
			0					
3	30"	50%						
Geoprobe	60"		0					
			0					
			0	--15				
4	12"	50%	0					
Geoprobe	24"							
			0	--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-14 (3-5) @ 930 MS/MSD
SB-14 (15-17) @ 1005
GW-14 @ 1155
VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

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New York, NY 10006
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Log of Soil Boring ID: SB-15
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/21/2016

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
						(0-0.5') - Concrete		
			0			**(0.5-1.0') - Fill:** Loose light brown medium to fine sand, dry		
1	18"	50%						
Geoprobe	36"		0			**(1.0-3.0') - Fill:** Crushed concrete		
			0					
			0					
2	12"	33%				**(3.0-6.0') - Fill:** Dark brown to black medium to coarse sand, dry, few slag, few brick		
Geoprobe	36"		0	--5				
			0					
			0					
3	24"	67%				**(6.0-9.0') - Fill:** Medium dense brown to gray medium to fine sand, moist, few crushed rock	▽	
Geoprobe	36"		0.7					
			0					
			0	--10				
4	34"	94%						
Geoprobe	36"		0					
			0					
			0			**(9.0-17.0'):** Gray medium to fine sand, wet, non-plastic, noncohesive		
5	30"	83%						
Geoprobe	36"		0					
			0	--15				
6	12"	50%	0					
Geoprobe	24"							
			0	--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor:	AARCO	Samples Collected:	Location Sketch
Drilling Method/Equipment:	420 DT	SB-15 (7-9) @ 925	
Sampling Equipment:	2" Macrocore	SB-15 (15-17) @ 930	
Start/End Time:		VOCs, SVOCs, TAL Metals, PCBs, Pesticides	
Latitude:			
Longitude:			

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Log of Soil Boring ID: SB-16
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/15/2016

SAMPLE INFORMATION					Symbol	Depth to water: **Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)				
						(0-0.5') - Concrete		
			0			**(0.5-5.0') - Fill:** Brown medium to fine sand, moist, some fill (crushed brick, slag, crushed rock)		
			0					
1	24"	40%						
Geoprobe	60"		10					
			12					
			9					
			11	--5				
			420.0			**(5.0-10.0') - Fill:** Medium dense gray fine sand, moist to we, little silt, odor (odor not as strong below water table) -Crushed red rock at 9.5 feet bgs.	▽	
			1031					
2	22"	37%	385					
Geoprobe	60"							
			9					
			10	--10				
						(10.0-15.0'): Medium dense gray to brown medium to fine sand, wet, trace rock		
			9					
			3					
3	28"	47%						
Geoprobe	60"							
			5.2					
			0					
				--15				
			0			**(15.0-17.0'):** Medium dense gray fine to medium sand, wet, non-plastic, noncohesive		
4	12"	50%						
Geoprobe	24"		0					
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-16 (6-8) @ 1050
SB-16 (15-17) @ 1055
VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

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Log of Soil Boring ID: SB-17
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/15/2016

SAMPLE INFORMATION					Symbol	Depth to water: **Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)				
						(0-0.5') - Concrete		
			0					
			0					
1	34"	57%						
Geoprobe	60"		0			**(0.5-5.0') - Fill:** Dense brown to black coarse sand and small gravel, few fill (brick, slag, crushed rock), little medium to fine sand		
			0					
			3	--5				
			13			**(5.0-7.0') - Fill:** Medium dense gray fine to medium sand, moist, odor		
			620				▽	
2	34"	57%						
Geoprobe	60"		42					
			5					
			2	--10		**(7.0-13.0') - Fill:** Medium dense gray fine sand, wet, medium sand, little silt -Brick located at 13 fbgs		
			0					
			0					
3	36"	60%	0					
Geoprobe	60"							
			0					
			0					
				--15		**(13.0-17.0'):** Medium dense gray fine sand, wet, little silt, little medium sand		
			0					
4	12"	50%						
Geoprobe	24"		0					
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-17 (5-7) @ 1520 - DUP01
SB-17 (15-17) @ 1530
VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

61 Broadway, Suite 1601
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Log of Soil Boring ID: SB-18
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/15/2016

SAMPLE INFORMATION					Symbol	Depth to water: **Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)				
						(0-0.5') - Concrete		
			0					One-inch temporary well sampling point
								installed to 15 feet bgs. Screened
			0					5 to 15 feet. Filter pack sand to 3 feet
1	24"	40%				**(0.5-4.5') - Fill:** Medium dense brown medium to fine sand,		bgs.
Geoprobe	60"		0			moist, few fill (slag, crushed rock), little small gravel		
								Eight gallons of water removed from
			0					well prior to sampling.
			7	--5				
						(4.5-7.0') - Fill: Medium dense gray fine sand, moist, little		
			148			medium sand, little silt, odor		
			1073					
			120				▽	
2	44"	73%						
Geoprobe	60"		8					
			0					
			0	--10				
						(7.0-15.0') - Fill: Medium dense gray medium to fine sand, wet,		
			0			little silt, little fill (brick, crushed rock)		
			0					
3	24"	40%						
Geoprobe	60"							
			0					
			0					
				--15				
			0					
4	12"	50%				**(15.0-17.0):** Medium dense dark grayishs brown medium sand,		
Geoprobe	24"		0			wet, non-plastic, noncohesive		
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-18 (5-7) @ 1150
SB-18 (15-17) @ 1215
GW-18 @ 1445
VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

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Log of Soil Boring ID: SB-19/MW-02
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/11/2016

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Well Construction (all depths in feet bgs)
						(0-0.5') - Asphalt		
			0					
								Depths
			0					Borehole Total Depth: 15'
								Borehole Diameter: 8.25"
Hand Cleared to 5 feet bgs			0			**(0.5-5.0') - Fill:** Loose brown medium to fine sand, moist, some fill (brick, large rocks)		Casing: PVC
								Screen: 5-15' bgs
			0					Sand Pack: 3-15'bgs
								Bentonite chips: 1-3' bgs
			0	--5				Bentonite grout:
								Concrete: Surface
			0			**(5.0-7.0') - Fill:** Medium brown medium to fine sand, moist, little brick, little rock		
			0				▽	
1	30"	50%				**(7.0-7.5') - Fill:** Crushed concrete		**WELL MATERIALS**
Geoprobe	60"		0			**(7.5-9.0') - Fill:** Dense brown to gray fine sand, wet, few medium sand, few silt, little rock		Monument:
								Cap:
			0					Concrete: Quickcrete
						(9.0-10.0') - Fill: Dense grayish black medium to fine sand, wet, little silt, little clay		Bentonite:
			0	--10				Casing: PVC 40
			0					Well Screen:
						(10.0-12.5'): Soft dark gray medium sand, wet, little small gravel, little clay (clay layer at 11' bgs)		Monoflex, 10' with 0.020" slot
			0					PVC 40
								Sand Pack:
2	38"	63%	0					Morie Quartz #4 filter pack sand
Geoprobe	60"					**(12.5-16.5):** Dense grayish black medium sand, wet, little fine sand, little silt		End Cap:
			0					
			0					
				--15				
			0					
3	10	42%						
Geoprobe	24"		0			**(16.5-17.0'):** Soft black lean clay, wet, high plasticity, cohesive, little fine sand, little silt		
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-19 (5-7) @ 900
SB-19 (15-17) @ 915 - MS/MSD
VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

61 Broadway, Suite 1601
New York, NY 10006
(212) 962-4301

Log of Soil Boring ID: SB-18
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/15/2016

SAMPLE INFORMATION					Symbol	Depth to water: **Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)				
						(0-0.5') - Asphalt		
			0			**(0.5-1.5') - Fill:** Crushed brick, white rock, little black slag, dry, little glass		
			0					
1	42"	70%						
Geoprobe	60"		0			**(1.5-5.0') - Fill:** Medium dense brown fine to medium sand, moist, little crushed rock, trace slag		
			0					
			0	--5				
			1.3			**(5.0-5.3') - Fill:** Dense black coarse sand and small gravel, moist, few slag		
			0			**(5.3-5.6') - Fill:** Dense reddish brown medium to fine sand, moist, little rock		
							▽	
2	36"	60%	0			**(5.6-6.0') - Fill:** Dense brown medium to fine sand, wet, little coarse sand		
Geoprobe	60"							
			0			**(6.0-9.0'):** Gray medium dense fine to medium sand, wet, little rounded large gravel, little brick		
			0					
				--10				
			0					
			0					
3	43"	72%				**(9.0-15.0'):** Gray medium dense fine to medium sand, wet, little rounded large gravel, thin layers of black organics		
Geoprobe	60"							
			0					
			0					
				--15				
			0					
4	18"	75%				**(15.0-17.0):** Soft black clay, wet, high plasticity, cohesive		
Geoprobe	24"		0					
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-20 (4-6) @ 1320
SB-20 (15-17) @ 1330

VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

61 Broadway, Suite 1601
New York, NY 10006
(212) 962-4301

Log of Soil Boring ID: SB-21
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/11/2016

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
						(0-0.5') - Asphalt		
			0			**(0.5-1.5') - Fill:** White and red crushed rock and brick with coarse sand, moist		
			0					
1	36"	60%				**(1.5-5.0') - Fill:** Medium dense brownish tan medium to fine sand, moist, large rock at 3 feet bgs		
Geoprobe	60"		0					
			0					
			0	--5			▽	
			1.3			**(5.0-6.0') - Fill:** Medium brown fine to medium sand, wet, little silt		
			0			**(6.0-9.5') - Fill:** Medium dense gray medium to fine sand, wet, little fill -Crushed brick at 8 feet bgs -Crushed white rock at 9 feet bgs		
2	41"	68%	0					
Geoprobe	60"							
			0					
			0					
				--10		**(9.5-11.0'):** Dense gray medium to coarse sand, wet, little clay		
			0					
						(11.0-14.5'): Medium dense gray fine sand, wet, little medium sand, little silt, little clay		
			0					
3	44"	73%						
Geoprobe	60"							
			0					
			0					
				--15				
			0			**(14.5-17.0):** Soft black clay, moist, high plasticity, cohesive		
4	18"	75%						
Geoprobe	24"		0					
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-21 (3-5) @ 1200
SB-21 (15-17) @ 1215

VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

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Log of Soil Boring ID: SB-22
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/11/2016

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
						(0-0.5') - Asphalt		
			0			**(0.5-2.0') - Fill:** Crushed brick, slag, crushed rock, little brown sand		
			0					
1	30"	50%				**(2.0-3.5') - Fill:** Dense brown medium to fine sand, moist, few crushed rock, trace slag		
Geoprobe	60"		0					
			0			**(3.5-4.0') - Fill:** Medium gray medium to fine sand, moist		
						(4.0-4.5') - Fill: Hard black slag, moist, little medium to coarse sand		
			0	--5				
			0.0			**(4.5-5.5') - Fill:** Medium gray medium to fine sand, moist, little slag	▽	
			0			**(5.5-7.5') - Fill:** Brown medium to fine sand, wet, becomes reddish brown at 7.3 feet bgs		
2	32"	53%	0					
Geoprobe	60"							
			0					
			0					
				--10		**(7.5-13.5') - Fill:** Medium dense gray medium to fine sand, wet, little crushed rock, brick at 13 feet bgs		
			0					
			0					
3	30"	50%						
Geoprobe	60"							
			0					
			0			**(13.5-15.0'):** Medium dense gray medium to fine sand, wet, non-plastic, noncohesive		
				--15				
			0					
4	12"	50%				**(15.0-17.0'):** Soft black clay, wet, high plasticity, cohesive		
Geoprobe	24"		0					
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-22 (4-6) @ 1415
SB-22 (15-17) @ 1425

VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

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Log of Soil Boring ID: SB-23
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/15/2016

SAMPLE INFORMATION					Symbol	Depth to water: **Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)				
						(0-0.5') - Concrete		
			0			**(0.5-5.0') - Fill:** Medium dense brown medium to fine sand, moist, few fill (brick, slag, crushed rock)		
			0					
1	30"	50%						
Geoprobe	60"		0					
			0					
			3	--5				
			10.1			**(5.0-7.0') - Fill:** Medium gray fine to medium sand, moist, odor, little small gravel	▽	
			405					
			222					
			7					
2	36"	60%	9					
Geoprobe	60"							
			0					
			0					
				--10		**(7.0-13.0') - Fill:** Loose gray to brown fine sand with silt, wet, little crushed rock -Crushed brick at 13 feet bgs		
			0					
			0					
3	25"	42%						
Geoprobe	60"							
			0					
			0					
				--15		**(13.0-17.0'):** Dense dark gray medium to fine sand, wet, little silt, non-plastic, noncohesive		
			0					
4	12"	50%						
Geoprobe	24"		0					
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-23 (5-7) @ 1345
SB-23 (15-17) @ 1410

VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

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Log of Soil Boring ID: SB-24
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/14/2016

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
						(0-0.5') - Concrete		
			0			**(0.5-2.5') - Fill:** Dark brown to black medium to fine sand, moist, few small gravel, little slag		
			0					
1	42"	70%						
Geoprobe	60"		0			**(2.5-5.0') - Fill:** Brown to reddish brown medium to coarse sand, mosit, few small to large angular gravel		
			0					
			0	--5			▽	
						(5.0-10.0') - Fill: Medium dense gray fine to medium sand, wet little brick		
			0					
			0					
2	38"	63%						
Geoprobe	60"		0					
			0					
			0	--10				
						(10.0-15.0): Medium gray fine sand, wet, little silt		
			0					
3	48"	80%						
Geoprobe	60"							
			0					
			0					
				--15				
			0			**(15.0-17.0):** Soft gray sandy clay, wet, little silt, non-plastic, noncohesive		
4	12"	50%						
Geoprobe	24"		0					
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-24 (3-5) @ 1125
SB-24 (15-17) @ 1130

VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

61 Broadway, Suite 1601
New York, NY 10006
(212) 962-4301

Log of Soil Boring ID: SB-25/MW-3
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/14/2016

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Well Construction (all depths in feet bgs)
						(0-0.3') - Concrete		
			0					
								Depths
			14					Borehole Total Depth: 15'
								Borehole Diameter: 8.25"
Hand Cleared to 5 feet bgs			18					Casing: PVC
								Screen: 5-15' bgs
								Sand Pack: 3-15'bgs
			73			**(0.3-8.0') - Fill:** Dark brown to black medium to fine sand, moist, few small gravel, little slag		Bentonite chips: 1-3' bgs
				--5			▽	Bentonite grout:
								Concrete: Surface
			720					
1	36"	60%	1042					**WELL MATERIALS**
Geoprobe	60"							Monument:
			1076					Cap:
						(8.0-10.0') - Fill: Loose grayish brown medium to fine sand, wet, few small gravel, little brick, odor		Concrete: Quickcrete
								Bentonite:
			600					Casing: PVC 40
				--10				Well Screen:
			3					Monoflex, 10' with 0.020" slot
								PVC 40
			0					Sand Pack:
2	6"	10%				**(10.0-15.0):** Medium dense gray medium to fine sand, large rock in drilling shoe		Morie Quartz #4 filter pack sand
Geoprobe	60"							End Cap:
			0					
			0					
				--15				
			0					
3	20"	83%				**(15.0-17.0):** Brownish gray medium to fine sand, wet -In slough, medium to coarse grayish brown sand		
Geoprobe	24"		0					
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-25 (6-8) @ 1430
SB-25 (15-17) @ 1445

VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

integral consulting inc.
61 Broadway, Suite 1601
New York, NY 10006
(212) 962-4301

Log of Soil Boring ID: SB-26/GW-26
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/14/2016

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
						(0-0.5') - Concrete		
			0					One-inch temporary well sampling point
								installed to 15 feet bgs. Screened
			0					5 to 15 feet. Filter pack sand to 5 feet
1	40"	67%				**(0.5-4.0') - Fill:** Medium dense dark brown to black medium to fine sand, few fill (slag, crushted rock), few angular gravel		bgs.
Geoprobe	60"		0					
								Eight gallons of water removed from
			0					well prior to sampling.
						(4.0-5.0') - Fill: Medium dense brown fine to medium sand, moist, little silt, little clay		
			0	--5				
						(5.0-10.0') - Fill: Dark gray medium to fine sand, moist to wet, little gravel, large rock in bottom of liner	▽	
			0					
2	16"	27%						
Geoprobe	60"		0					
			0					
			0	--10				
						(10.0-17.0'): Loose gray medium to fine sand, wet, little silt		
			0					
3	40"	67%						
Geoprobe	60"		0					
			0					
			0	--15				
4	0"	0%	0					
Geoprobe	24"							
			0	--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor:	AARCO	Samples Collected:	Location Sketch
Drilling Method/Equipment:	7822 DT	SB-26 (3-5) @ 1410	
Sampling Equipment:	2" Macrocore	SB-26 (13-15) @ 1415	
Start/End Time:		GW-26 @ 1515	
Latitude:		VOCs, SVOCs, TAL Metals, PCBs, Pesticides	
Longitude:			

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Log of Soil Boring ID: SB-27
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/14/2016

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
						(0-0.5') - Concrete		
			0			**(0.5-3.0') - Fill:** Dark brown to black medium to fine sand, moist, few small gravel, little slag		
			0					
1	28"	47%						
Geoprobe	60"		0					
						(3.0-5.0') - Fill: Brown to reddish brown medium to coarse sand, moist, few small gravel		
			0					
				--5				
						(5.0-9.5') - Fill: Dark gray medium to fine sand, moist to wet, little large crushed rock	▽	
			0					
2	34"	57%	0					
Geoprobe	60"							
			0					
			0	--10				
						(9.5-12.5) - Fill: Black medium to fine sand, wet, non-plastic, noncohesive		
			0					
3	36"	60%						
Geoprobe	60"					**(12.5-15.0'):** Medium dense gray fine sand, little medium sand, non-plastic, noncohesive		
			0					
			0					
				--15				
			0			**(15.0-17.0):** Soft gray clay, wet, low plasticticity, cohesive, little silt		
4	18"	75%						
Geoprobe	24"		0					
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-27 (2-5) @ 1215 - Duplicate collected
SB-27 (15-17) @ 1225

VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

integral consulting inc.
61 Broadway, Suite 1601
New York, NY 10006
(212) 962-4301

Log of Soil Boring ID: SB-28/GW-28
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/14/2016

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
						(0-0.5') - Concrete		
			0					One-inch temporary well sampling point
								installed to 15 feet bgs. Screened
			0					5 to 15 feet. Filter pack sand to 5 feet
1	12"	20%						bgs.
Geoprobe	60"		0			**(0.5-5.0') - Fill:** Loose brown medium to fine sand, some brick		
								Eight gallons of water removed from
			0					well prior to sampling.
			0	--5				
			0					
			0					
2	33"	55%				**(5.0-10.0') - Fill:** Brown to dark gray medium to fine sand, moist to wet, few crushed rock, little wood	▽	
Geoprobe	60"		0					
			0					
			0	--10				
			0					
						(10.0-12.5'): Medium dense brown medium to fine sand, wet, little coarse sand		
			0					
3	32"	53%						
Geoprobe	60"		0					
						(12.5-15.0'): Medium dense black medium to coarse sand, wet, little clay		
			0					
			0	--15				
4	12"	50%	0			**(15.0-17.0'):** Medium dense brown medium to coarse sand, wet, few small gravel		
Geoprobe	24"							
			0	--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-28 (5-7) @ 925
SB-28 (15-17) @ 935
GW-28 @ 1245
VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

integral consulting inc.
61 Broadway, Suite 1601
New York, NY 10006
(212) 962-4301

Log of Soil Boring ID: SB-29/GW-29
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/14/2016

SAMPLE INFORMATION								
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	Depth to water: **Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
						(0-0.5') - Concrete		
			0			**(0.5-2.5') - Fill:** Medium dense dark brown to black crushed gravel, moist, little coarse sand, odor at 2.5 feet		One-inch temporary well sampling point installed to 15 feet bgs. Screened 5 to 15 feet. Filter pack sand to 5 feet bgs.
			36					
1	32"	53%						
Geoprobe	60"		73			**(2.5-5.0') - Fill:** Dark gray to brown medium to fine sand, moist, little small gravel, odor		Eight gallons of water removed from well prior to sampling.
			90					
				--5				
						(5.0-6.0') - Fill: Dark gray to black medium sand with small gravel, moist, little clay, odor		
			35					
						(6.0-7.0') - Fill: Medium dense reddish brown medium to coarse sand, wet, little small gravel		
			15					
2	46"	77%					▽	
Geoprobe	60"		7			**(7.0-10.0'):** Dark gray to black medium to fine sand, wet, little silt		
			0					
			0	--10				
			0					
3	15"	25%						
Geoprobe	60"		0			**(10.0-15.0'):** Dark gray to black clay, wet, high plasticity, cohesive		
			0					
			0	--15				
4	12"	50%	0			**(15.0-17.0'):** Loose black medium to fine sand, wet, little shells		
Geoprobe	24"							
			0	--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-29 (5-7) @ 1500
SB-29 (15-17) @ 1510
GW-29 @ 1615
VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

integral consulting inc.
61 Broadway, Suite 1601
New York, NY 10006
(212) 962-4301

Log of Soil Boring ID: SB-30
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 11/14/2016

SAMPLE INFORMATION					Symbol	Depth to water: **Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)				
						(0-0.5') - Concrete		
			0			**(0.5-8.0') - Fill:** Brown medium to fine sand, moist, some brick and crushed rock		
			0					
1	24"	40%						
Geoprobe	60"		0					
			0					
				--5				
							▽	
			0					
2	36"	60%	0					
Geoprobe	60"							
			0					
			0	--10				
						(8.0-13.0'): Medium dense black to brown medium to fine sand, wet, little gravel		
			0					
			0					
3	40"	67%						
Geoprobe	60"							
			0					
			0					
				--15		**(13.0-17.0):** Soft black clay, wet, medium plasticity, cohesive		
			0					
4	24"	100%						
Geoprobe	24"		0					
				--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-30 (8-10) @ 1010
SB-30 (15-17) @ 1030

VOCs, SVOCs, TAL Metals, PCBs, Pesticides

Location Sketch

integral consulting inc.
61 Broadway, Suite 1601
New York, NY 10006
(212) 962-4301

Log of Soil Boring ID: SB-31/GW-31
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 6/21/2017

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
						(0-0.6') - Concrete		
			0			**(0.6-1.5') - Fill:** Loose light brown medium to fine sand, wet (from concrete core), poorly graded		
			0			**(1.5-3.0') - Fill:** Dark brown to black medium to fine sand, dry, non-plastic, noncohesive, few large gravel, few fill (brick, slag)		
Hand Cleared to 5 feet bgs								Installed a temporary 1-inch monitoring
			0					well, screened 5-15 feet bgs, filter
						(3.0-5.0') - Fill: Loose reddish brown medium to fine sand and gravel, dry, non-plastic, noncohesive, few large gravel, fill (shells, brick)		pack to 3' bgs, bentonite to surface.
			0					
			0	--5				
			0					
			0			**(5.0-8.5') - Fill:** medium dense dark gray to black fine sand, moist to wet (becomes wet at 8' bgs), little silt	▽	
1	48"							
Geoprobe	60"		0					
			0			**(8.5-10') -** Black to dark brown medium to fine sand, wet, non-plastic, noncohesive, little crushed rock		
			0	--10				
			0					
			0					
2	12"							
Geoprobe	60"		0			**(10-16') -** Loose dark brown fine silty sand, wet, non-plastic, noncohesive, little small gravel		
			0					
			0	--15				
3	24"		0					
Geoprobe	24"					**(16.0-17.0'):** Medium dense reddish brown medium to fine sand, wet, non-plastic, noncohesive, little silt		
			0	--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-31 (5-7) @ 1000 - DUP01 collected
VOCs, SVOCs

Location Sketch

integral consulting inc.

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New York, NY 10006
(212) 962-4301

Log of Soil Boring ID: SB-32/GW-32
Project Name: 555 West 22nd Street
Project Number: E107-501
Logged by: Jordan Junion
Date: 6/21/2017

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table	Comments
						(0-0.6') - Concrete		
			0					
			0			**(0.6-3.9') - Fill:** Loose gray to reddisgh brown and black medium to fine sand, dry to moist, non-plastic, noncohesive, few large cobbles		
Hand Cleared to 5 feet bgs								Installed a temporary 1-inch monitoring
			0					well, screened 5-15 feet bgs, filter
								pack to 3' bgs, bentonite to surface.
			0					
			872	--5				
						(3.9-7.5') - Fill: Loose dark brown to reddish brown medium to fine sand, moist, strong odor, non-plastic, noncohesive, little fill		
			313					
			150					
1	28"							
Geoprobe	60"		210					
						(7.5-10.0') - Medium dense grayish brown fine sand, wet, non-plastic, noncohesive, trace silt, poorly graded		
			23					
			2			**(8.0-10.0') - Fill:** Soft greenish gray sandy clay, wet, low plasticity, cohesive, brick at 10' bgs		
			3	--10				
						(10.0-15.0'): Reddish gray brown sandy lean clay, wet, low plasticity, cohesive		
			0					
			0					
2	8"							
Geoprobe	60"		0					
			0					
			0	--15				
						(15.0-17.0'): Dark grayish black lean clay, moist, medium plasticity, cohesive		
3	24"		0					
Geoprobe	24"							
			0	--17				
						End of Boring at 17' feet below grade		
				--20				

Drilling Contractor: AARCO
Drilling Method/Equipment: 7822 DT
Sampling Equipment: 2" Macrocore
Start/End Time:
Latitude:
Longitude:

Samples Collected:
SB-32 (4-5) @ 1105
SB-32 (6-8) @ 1125
VOCs, SVOCs

Location Sketch

integral engineering pc
61 Broadway, Suite 1601
New York, NY 10006
(212) 962-4301

Log of Soil Boring ID: SB-34/GW-33
Project Name: 555 West 22nd Street - Lot 2
Project Number: E107
Logged by: A. Platt
Date: 11/14/2017

SAMPLE INFORMATION						Depth to water:		
Sample Number and Type	Recovery/ Attempted	% Recov.	PID	Depth (Feet)	Symbol	**Soil Description** (USCS group name, minor components, color, moisture, additional descriptions)	Noted Water Table ~~Elevation~~	Well Construction
						0-4"- Concrete		
			0			4"-22"- Loose, brown to gray med. sand w/ gravel - fill		Well Depth - 17'
1 Geoprobe	16" / 34"		0			22"-26"- Loose black med. sand-fill		Diameter - 1"
			0			26"-34"- Loose brown SP-SM, med. to coarse, moist		Screen - 7-17'
				2.8'				Casing - 0-7'
			0			34"-50"- Loose, brown, med. to coarse SP-SM w/ gravel, moist		Sand - 5-17'
2 Geoprobe	24" / 34"		0					Bentonite - 0.5-5'
			0			50"-68"- Med. dense, brown, SC, fine, wet,	4.8'	Concrete - 0-0.5'
				5.6'				
			0			68"-89" - Med. dense, brown, SC, fine, wet, tr. gravel bottom 6"		
3 Geoprobe	34" / 34"		0			89"-102"- Med. dense, gray, fine to very fine SM, wet		
			0					
				8.5'				
			0			102"- 136"- Gray, soft sandy CL, fatty, med. plasticity, cohesive		
4 Geoprobe	24" / 34"		0					
			0					
				11.3'				
			0			136"-170"- Gray, med. dense SM w/ clay, fine, tr. gravel, wet		
5 Geoprobe	20" / 34"		0					
			0					
				14.1'				
			0			170"-204"- Brown, med. dense, fine to medium SM, wet.		
6 Geoprobe	8" / 34"		0					
			0			End of Boring		
			0	17'				

Drilling Contractor: AARCO
Drilling Method/Equipment: 420 M
Sampling Equipment: 34" MacroCore
Start/End Time: 0910/1020
Latitude:
Longitude:

Sample Collected:
SB-34_14-17 @ 1010
SB-34_3-5 @ 1030
DUP01-11142017@1030

Location Sketch

North

integral

61 Broadway, Suite 1601
New York, NY 10006
(212) 962-4301

Log of Borehole: SB-36
Project Name: 555 West 22nd Street - Lot 2
Project Number: E107
Logged by: A. Platt
Date: 11/14/2017

SAMPLE INFORMATION

Depth to water: 4.8' bsg

Sample ID	% Recov.	PID (PPM)	Sheen (Y/N)	Depth (Feet)	Material to Excavate	Soil Description (size, color, major component, description, moisture, odor; followed by minor components)
		0				0"-4" - Concrete
Geoprobe 1	24"					4"-12" - Loose brown to gray, medium sand w/ gravel - fill
	34"	0				12"-34" - Brown, med. dense SM, fine to medium, tr. gravel top 6"
		0		2.8		
		0				34"-45" - Brown, med. dense SM, fine to med.
Geoprobe 2	26"					45"-53" - Black, med. dense fine to med. SM
	34"	0				53"-68" - Brown, med. dense, fine SM w/ clay, wet
		0		5.6		
		0				68"-92" - Brown, med. dense fine SM w/ clay, wet, trace gravel bottom 6"
Geoprobe 3	34"					92"-102" - Brown to gray, wet, stiff, lean CL w/ sand, turns to SC bottom 3" cohesive, med. plasticity
	34"	0				
		0		8.5		
		0				102"-136" - Brown to gray, wet, loose SC, fine, sporadic pockets of sandy clay
Geoprobe 4	30"					
	34"	0				
		0		11.3		
		0				136"-170" - Brown, wet, med. dense SP-SC w/ gravel, med. to coarse
Geoprobe 5	18"					
	34"	0				
		0		14.1		
		0				170"-192" - Brown, wet, med. dense SP-SM w/ gravel, med. to coarse
Geoprobe 6	28"					192"-204" - Gray to black, med. stiff, med. plasticity CL, cohesive, wet
	34"	0				
		0		17		

Drilling Contractor: AARCO Environmental Services LLC
Drilling Method: Geoprobe 420 M
Sampling Equipment: 34" Macro Core
Start/End Time: 1035/1110

Latitude:
Longitude:
Sample Analysis: SB-36_14-17 @ 1140
SB-36_3-5 @ 1150

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New York, NY 10006
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Log of Borehole: SB-38
Project Name: 555 West 22nd Street - Lot 2
Project Number: E107
Logged by: A. Platt
Date: 11/14/2017

SAMPLE INFORMATION

Depth to water: 6.6' bsg

Sample ID	% Recov.	PID (PPM)	Sheen (Y/N)	Depth (Feet)	Material to Excavate	Soil Description (size, color, major component, description, moisture, odor; followed by minor components)
	16"	0				0"-4"- Concrete
Geoprobe 1	~~Recv~~					4"-22"- Loose, brown to gray, med. sand w/ gravel - fill
	34"	0				22"-34"- Black loose, med. sand w/ gravel - fill
		0		2.8		
	34"	0				34"-46"- Black, loose, med. to fine SP-SM w/ gravel
	~~Recv~~					46"-68"- Brown to gray, dense, fine SM w/ trace gravel top 3"
Geoprobe 2	34"	0				
		0		5.6		
	28"	0				68"-88"- Brown, med. dense, fine SM, wet at bottom
Geoprobe 3	~~Recv~~					88"-102"- Gy, med. dense, fine SC w/ silt, wet
	34"	0				
		0		8.5		
	34"	0				102"-136"- Brown, med. dense, fine SC w/ silt, wet
Geoprobe 4	~~Recv~~					
	34"	0				
		0		11.3		
		0				136"-156"-Brown, med. dense fine SC w/ silt, wet
Geoprobe 5	34"					156"-170"- Brown to black, med. dense, med. to coarse SP-SM w/ gravel, wet
	34"	0				
		0		14.1		
		0				170"-184"- Brown, med. dense, med. SM w/ gravel, wet
Geoprobe 6	34"					184"-204"- Gray to black, med. stiff, med. plasticity CL, cohesive, fatty
	34"	0				
		0		17		

Drilling Contractor: AARCO Environmental Services LLC
Drilling Method: Georprobe ~~6620~~ 420M
Sampling Equipment: 34" Macro Core
Start/End Time: 1130/1205

Latitude:
Longitude:
Sample Analysis: SB-38_14-17@1230
SB-38_5.5-7.5@1245

MONITORING WELL ID: MW-1

PUMP INTAKE DEPTH: 12'

WELL PERMIT #:

DTW (PRIOR TO PUMP PLACEMENT): 7.9'

WELL DEPTH: 14.35'

DTW (AFTER PUMP PLACEMENT): 7.9'

WELL DIAMETER: 2"

SCREENED INTERVAL: 10'

DATE: 11/21/16 -05 W. 22nd

WEATHER: Cold 30s Windy 20mph

PID / FID READINGS (ppm): BACKGROUND: 0.2 AT WELL HEAD: 0.4

TIME	PURGING	SAMPLING	Color/Odor	pH	SPECIFIC CONDUCTIVITY (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)	DISSOLVED OXYGEN (percent)	TEMPERATURE (DEGREES C)	O. REDOX POTENTIAL (MV)	PUMPING RATE (discharge/fill)	DEPTH TO WATER (FT BTOC)
1237	X		Clear/none	6.84	7.97	295	4.02	Nm	16.90	-100	260 ml/min	8.2'
1245	X		Clear/none	6.70	7.94	144	3.19	Nm	17.70	-113	260 ml/min	8.2'
1250	X		Clear/none	6.75	8.01	102	2.93	Nm	17.82	-116	260 ml/min	8.2'
1255	X		Clear/none	6.77	8.03	104	2.64	Nm	17.96	-117	260 ml/min	8.2'
1300	X		Clear/none	6.77	8.05	106	2.13	Nm	17.94	-118	260 ml/min	8.2'
1305	X		Clear/none	6.78	8.09	82.7	1.33	Nm	19.11	-119	260 ml/min	8.2'
1310	X		Clear/none	6.78	8.06	78.2	0.66	Nm	18.16	-119	260 ml/min	8.2'
1315	X		Clear/none	6.79	8.15	79.2	0.56	Nm	18.01	-120	260 ml/min	8.2'
1320	X		Clear/none	6.79	8.16	58.2	0.54	Nm	18.11	-119	260 ml/min	8.2'
1325		X	Clear/none	6.79	8.16	58.2	0.54	Nm	18.11	-119		

COMMENTS: purge water is

ANALYSIS:

(GW-19)

MONITORING WELL ID: MW - 02

SITE: SSS W 22nd St
DATE: 11/21/16
WEATHER: Cold 20 mph wind light snow

WELL PERMIT #:
WELL DEPTH: 14.49
WELL DIAMETER: 2'
SCREENED INTERVAL: 10'

PUMP INTAKE DEPTH: 12' 6.10'
DTW (PRIOR TO PUMP PLACEMENT): ~~5.72~~
DTW (AFTER PUMP PLACEMENT): ~~5.72~~ 6.10

PID / FID READINGS (ppm): BACKGROUND: 0 AT WELL HEAD: 0

TIME	PURGING	SAMPLING	Color/Odor	pH	SPECIFIC CONDUCTIVITY (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)	DISSOLVED OXYGEN (percent)	TEMPERATURE (DEGREES C)	O. REDOX POTENTIAL (MV)	PUMPING RATE (discharge/fill)	DEPTH TO WATER (FT BTOC)
0903	X		clear/none	7.19	3.03	697	2.98	Nm	15.85	-123	400 ml/min	7.54'
0909	X		clear/none	7.01	2.98	332	2.84	Nm	15.42	-115	200 ml/min	7.54'
0914	X		clear/none	7.02	2.90	175	5.84	Nm	14.62	-115	200 ml/min	7.54'
0919	X		clear/none	7.07	2.92	108	6.56	Nm	14.11	-114	200 ml/min	7.54'
0923	X		clear/none	7.13	2.85	90.0	6.92	Nm	13.74	-112	200 ml/min	7.54'
0928	X		clear/none	7.15	2.86	71.2	6.99	Nm	13.53	-110	200 ml/min	7.54'
0932	X		clear/none	7.11	2.92	92.4	6.44	Nm	14.00	-109	200 ml/min	7.54'
0936	X		clear/none	7.13	2.89	68.3	6.82	Nm	13.82	-112	200 ml/min	7.54'
0940	X		clear/none	7.17	2.88	65.2	6.99	Nm	13.69	-112	200 ml/min	7.54'
0944	X		clear/none	7.22	2.84	[illegible]3	7.25	Nm	13.48	-111	200 ml/min	7.54'
0948	X		clear/none	7.21	2.85	60.1	7.21	Nm	13.45	-110	200 ml/min	7.54'
0950		X	clear/none	7.21	2.85	60.1	7.21	NM	13.45	-110	200 ml/min	7.54'

COMMENTS:

SAMPLE TIME: ANALYSIS:

MONITORING WELL ID: MW-3

SITE: 555 W. 22nd

DATE: 11/25/16

WEATHER: Cold, 30s, light snow (occasional) windy, 20 mph NNW

WELL PERMIT #:

WELL DEPTH: 15.39'

WELL DIAMETER: 2"

SCREENED INTERVAL: 10'

PUMP INTAKE DEPTH: 12'

DTW (PRIOR TO PUMP PLACEMENT): 7.52'

DTW (AFTER PUMP PLACEMENT): 7.52'

PID / FID READINGS (ppm): BACKGROUND: 0-0 AT WELL HEAD: 910 ppm

TIME	PURGING	SAMPLING	Color/Odor	pH	SPECIFIC CONDUCTIVITY (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)	DISSOLVED OXYGEN (percent)	TEMPERATURE (DEGREES C)	O. REDOX POTENTIAL (MV)	PUMPING RATE (discharge/fill)	DEPTH TO WATER (FT BTOC)
1120	X		clear/none	6.20	14.0	466	3.79	NM	15.39	-87	220 ml/min	7.72
1125	X		clear/none	6.46	13.9	390	3.56	NM	15.75	-112	220 ml/min	7.72
1130	X		clear/none	6.51	13.8	156	3.49	NM	15.80	-117	220 ml/min	7.72
1137	X		~~Light~~ clear/none	6.52	13.9	104	3.41	NM	15.95	-119	220 ml/min	7.72
1141	X		clear/none	6.61	13.9	67.4	3.43	NM	16.22	-122	220 ml/min	7.72
1145	X		clear/none	6.55	13.9	57.8	3.12	NM	16.34	-123	220 ml/min	7.72
1150	X		clear/none	6.55	13.8	46.5	3.13	NM	16.40	-126	220 ml/min	7.72
1150		X	clear/none	6.55	13.8	46.5	3.13	NM	16.40	-126	220 ml/min	7.72

COMMENTS:

purge water is light grey

Removed 3.5 gal.

(15.39 − 7.52) × .163

7.87 × .163

= 1.3 gal/well

SAMPLE TIME:

ANALYSIS: TCL VOC/SVOCs, Pest, PCBs, TAL (dis/unfis)

MONITORING WELL ID: MW-3

SITE: 555 W. 22 Street
DATE: 6/23/17
WEATHER: Cloudy 83

WELL PERMIT #:
WELL DEPTH: 15.39'
WELL DIAMETER: 2"
SCREENED INTERVAL:

PUMP INTAKE DEPTH: 10.5'
DTW (PRIOR TO PUMP PLACEMENT): 7.35
DTW (AFTER PUMP PLACEMENT): 7.35

PID / FID READINGS (ppm): BACKGROUND: 0.0 AT WELL HEAD: 414.7

TIME	PURGING	SAMPLING	Color/Odor	pH	SPECIFIC CONDUCTIVITY (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)	DISSOLVED OXYGEN (percent)	TEMPERATURE (DEGREES C)	O. REDOX POTENTIAL (MV)	PUMPING RATE (discharge/fill)	DEPTH TO WATER (FT BTOC)
1032	<		clear/strong	6.06	16.5	33.5	0.0	0.0	18.78	-85	125	7.58
1037	x		clear/strong	6.08	16.3	32.3	0.0	0.0	18.85	-99	125	7.58
1040	x		clear/strong	6.08	16.2	31.3	0.0	0.0	18.87	-104	125	7.58
1043	x		clear/strong	6.09	16.1	31.4	0.0	0.0	18.87	-110	125	7.58
1047	x		clear/strong	6.09	~~16.0~~ 15.9	30.0	0.0	0.0	18.86	-114	125	7.58
1050	x		clear/strong	6.10	15.9	28.3	0.0	0.0	18.81	-117	125	7.58
1053	x		clear/strong	6.10	15.8	27.4	0.0	0.0	18.69	-119	125	7.58
1056	x		clear/strong	6.11	15.8	26.2	0.0	0.0	18.73	-121	125	7.58
1100	x	x	clear/strong	6.10	15.7	25.3	0.0	0.0	18.85	-122	125	7.58

COMMENTS: 1018 - Begin purging (Removed) 3.5 gallons

SAMPLE TIME:

ANALYSIS: TCL VOCs, TCL SVOCs

DUP01

MONITORING WELL ID: GW-31

SITE: West 22nd St.
DATE: 6/23/17
WEATHER: Cloudy 80s

WELL PERMIT #:
WELL DEPTH: 15.1
WELL DIAMETER: 1"
SCREENED INTERVAL: 5-15

PUMP INTAKE DEPTH:
DTW (PRIOR TO PUMP PLACEMENT): 7.70
DTW (AFTER PUMP PLACEMENT): 7.80

PID / FID READINGS (ppm): BACKGROUND: 0.0 AT WELL HEAD: 0.0

TIME	PURGING	SAMPLING	Color/Odor	pH	SPECIFIC CONDUCTIVITY (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)	DISSOLVED OXYGEN (percent)	TEMPERATURE (DEGREES C)	O. REDOX POTENTIAL (MV)	PUMPING RATE ~~(discharge/fill)~~ mL/min	DEPTH TO WATER (FT BTOC)
935	x		clear / none	6.29	8.10	70.3	0.28	3.3	23.12	-8	125	NM
938	x		clear / none	6.34	8.39	50.2	0.02	0.3	21.28	-65	125	"
941	x		clear / none	6.35	8.50	37.3	0.0	0.0	20.27	-84	125	Well
943	x		clear / none	6.36	8.48	15.2	0.0	0.0	20.10	-96	125	"
946	x		clear / none	6.36	8.46	14.3	0.0	0.0	20.00	-100	125	"
949	x		clear / none	6.36	8.42	15.7	0.0	0.0	19.88	-105	125	"
950		x										

COMMENTS: Begin purging @ 900 Develop for 30 mins, removed 3 gallons w/ peristaltic pump
Removed 4.5 gallons

SAMPLE TIME: 0950

ANALYSIS: TCL VOCs TCL SVOC

MONITORING WELL ID: GW-32

SITE: 555 W. 22nd Street
DATE: 6/23/17
WEATHER: Overcast 83

WELL PERMIT #:
WELL DEPTH: 14.4
WELL DIAMETER: 1"
SCREENED INTERVAL: 5-15

PUMP INTAKE DEPTH: 11
DTW (PRIOR TO PUMP PLACEMENT): 6.69
DTW (AFTER PUMP PLACEMENT): ~~11.0~~ 6.69

PID / FID READINGS (ppm): BACKGROUND: 0.0 AT WELL HEAD: 63.7

TIME	PURGING	SAMPLING	Color/Odor	pH	SPECIFIC CONDUCTIVITY (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)	DISSOLVED OXYGEN (percent)	TEMPERATURE (DEGREES C)	O. REDOX POTENTIAL (MV)	PUMPING RATE (discharge/fill)	DEPTH TO WATER (FT BTOC)
1144	x		clear/slight	6.35	6.25	571	0.0	0.0	18.28	21	125	NM
1148	x		clear/slight	6.34	6.12	451	0.0	0.0	17.76	-52	125	11"
1153	x		clear/slight	6.35	6.08	522	0.0	0.0	17.42	-73	125	well
1156	x		clear/slight	6.35	6.03	372	0.0	0.0	17.42	-82	125	"
1159	x		clear/slight	6.35	6.03	137	0.0	0.0	17.51	-89	125	"
1202	x		clear/slight	6.35	6.04	42.3	0.0	0.0	17.54	-94	125	"
1205	x		clear/slight	6.35	6.00	47.5	0.0	0.0	17.57	-99	125	"
1208	x		clear/slight	6.36	5.97	45.3	0.0	0.0	17.81	-102	125	"
1210		x										

COMMENTS: Begin Purging/development @ 1128 Purged 2 gallons during development 5 gallons removed

SAMPLE TIME: 1210 ANALYSIS: TCL VOCs, TCL SVOCs

MONITORING WELL ID: GW-33

SITE: 555 W 22nd St. - Lot 2
DATE: 11/14/17
WEATHER: Sunny, 47°F

WELL PERMIT #:
WELL DEPTH: 17'
WELL DIAMETER: 1"
SCREENED INTERVAL: 10'

PUMP INTAKE DEPTH:
DTW (PRIOR TO PUMP PLACEMENT): 4.45'
DTW (AFTER PUMP PLACEMENT): 4.45'

PID / FID READINGS (ppm): BACKGROUND: 0.0 AT WELL HEAD: 0.0

TIME	PURGING	SAMPLING	Color/Odor	pH	SPECIFIC CONDUCTIVITY (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)	DISSOLVED OXYGEN (percent)	TEMPERATURE (DEGREES C)	O. REDOX POTENTIAL (MV)	PUMPING RATE (discharge/fill)	DEPTH TO WATER (FT BTOC)
			Water quality meter from US Envl broken, needs new									
			internal battery, collecting samples without water quality readings									

COMMENTS: Begin purging @ 1350 WV = (DTB - DTW) · .092 gal/ft
WV = (17 - 4.45) · .092 WV = 1.15
Removed 3.5 gallons
3 WV = 3.45 gallons

SAMPLE TIME: 15:20

ANALYSIS: VOCs, SVOCs, TAL metals, PCBs, + pesticides

VI Sample Collection Sheet

Site Name: 555 West 22nd Street	**Site Location:** 555 West 22nd Street		**Viridian Project #:**
Date(s): 11/9/2016	**On Site Date / Time / Weather:**	50 °	**Bar** 29.85" Hg
Sampler(s): Matt Krippahne	**Off Site Date / Time / Weather:**	50 °	**Bar** 29.85" Hg

	Sample ID	Depth/ Height	He % Tracer	OK	Start Time/Date	Finish Time/Date	Start Pressure (" Hg)	Final Pressure (" Hg)	Lab Outgoing Pressure	Flow Controller ID	Canister ID	Flow Readout	Comments
1	SV-03	2"	29.5	✓	Date: 11/9/16 Time: 11:56	Date: 11/9/16 Time: 1356	-29.81	-5.74	-30.0	0797	1730	17.8	CO-0 OXY-17.6 H_2S-0 LEL-0
2	SV-06	2"	31.0	✓	Date: 11/9/16 Time: 1204	Date: 11/9/16 Time: 1409	-29.96	-5.64	-30.0	0934	422	17.7	CO-0 OXY-0 H_2S-0 LEL-17.8
3	SV-04	10"	27.7	✓	Date: 11/9/16 Time: 1208	Date: 11/9/16 Time: 1408	-29.82	-7.18	-30.0	0937	323	17.4	CO-0 OXY-20.9 H_2S-0 LEL-0
4	SV-05	2"	27.1	✓	Date: 11/9/16 Time: 1216	Date: 11/9/16 Time: 1216	-29.60	-4.77	-29.9	0798	328	17.9	CO: 0 OXY: 0 H_2S: 0 LEL: 20.9
5	SV-02	1'	22.1	✓	Date: 11/9/16 Time: 1220	Date: 11/9/16 Time: 1420	-30.35	-29.82	-30.0	0231	1741	17.5	CO: 0 OXY: 0 H_2S: 0 LEL: 20.9
6	SV-01	1'	26.8	✓	Date: 11/9/16 Time: 1223	Date: 11/9/16 Time: 1423	-30.10	-17.82	-30.0	0721	519	18.0	CO: 0 OXY: H_2S 0 LEL: 20.9
7	SV-05 DUP		—	✓	Date: 11/9/16 Time: 1216	Date: 11/9/16 Time: 1216	-29.84	-4.71	-30.0	0250	1733	17.7	—
8					Date: / / Time:	Date: / / Time:							
9					Date: / / Time:	Date: / / Time:							
10					Date: / / Time:	Date: / / Time:							

Notes:

Shut-In Conducted?

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VI Sample Collection Sheet

Site Name: Integral – 555 W. 22nd St.	Site Location: 555 W. 22nd St. New York, NY			Viridian Project #: 0401-17
Date(s): 6/22/2017	On Site Date / Time / Weather: 6/22/2017	78°	Bar	29.99 ”
Sampler(s): CM	Off Site Date / Time / Weather: 6/22/2017	81°	Bar	29.97 ”

	Sample ID	Depth/ Height	He % Tracer	OK	Start Time/Date	Finish Time/Date	Start Pressure (“ Hg)	Final Pressure (“ Hg)	Lab Outgoing Pressure	Flow Controller ID	Canister ID	Flow Readout	Comments
1	Sv-07	-(6+3)”	23.7%	OK	Date: 6/22/17 Time: 12:16	Date: 6/22/17 Time: 14:16	-30.2	-0.2	-29.5	0971	225	17.6	Front of building
2	SV-08	-(7+3)”	26.3%	OK	Date: 6/2/17 Time: 12:20	Date: 6/22/17 Time: 14:20	-30.0	-2.6	-29.7	0332	2242	18.0	Back of building
3	DUP-6/22/17	-	-	-	Date: 6/22/17 Time: 12:16	Date: 6/6/17 Time: 14:16	-30.8	-	-29.5	0303	2203	17.7	Collected from SV-07 location (DUP)
4					Date: Time:	Date: Time:							
5					Date: Time:	Date: Time:							
6					Date: Time:	Date: Time:							
7					Date: Time:	Date: Time:							
8					Date: Time:	Date: Time:							
9					Date: Time:	Date: Time:							
10					Date: Time:	Date: Time:							

Notes: SV-07 installed @ 11:28; SV-08 installed at 11:35. SV-07: 19.4% O2; SV-08: 19.1% O2.
Battery died on flow controller for DUP-6/22/17, no final pressure could be read.
AA-01 scratched/not sampled; canister was stolen from porch where being sampled

Shut-In Conducted? Yes, on site

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VI Sample Collection Sheet

Site Name: Integral	**Site Location:** 555 W. 22nd St, NY		**Viridian Project #:** 1103-D
Date(s): 11/10/17	**On Site Date / Time / Weather:** 11/10/17, 07:30, Sunny/Windy, 39°F	**Bar**	"
Sampler(s): MKirkham	**Off Site Date / Time / Weather:** 11/10/17, 15:45, Windy, 34°F °	**Bar**	"

	Sample ID	Depth/ Height	He % Tracer	OK	Start Time/Date	Finish Time/Date	Start Pressure (" Hg)	Final Pressure (" Hg)	Lab Outgoing Pressure	Flow Controller ID	Canister ID	Flow Readout	Comments
1	AA-1				Date: 11/10/17 Time: 0754	Date: 11/10/17 Time: 13:15	-29.75	0.16	-29.7	0439	2296	4.5	O Readings on multi-gas meter = Oxygen Levels Normal
2	SV-11	- 1'			Date: 11/10/17 Time: 1013	Date: 11/10/17 Time: 1239	-30.11	-5.71	-30.0	0386	156	18.0	
3	SV-12	- 1'			Date: 11/10/17 Time: 1015	Date: 11/10/17 Time: 1238	-29.98	-1.12	-28.8	0473	2248	18.0	
4	SV-13	- 1'			Date: 11/10/17 Time: 1016	Date: 11/10/17 Time: 1237	-29.95	0.83	-29.4	0471	1728	17.6	
5					Date: / / Time:	Date: / / Time:							
6					Date: / / Time:	Date: / / Time:							
7					Date: / / Time:	Date: / / Time:							
8					Date: / / Time:	Date: / / Time:							
9					Date: / / Time:	Date: / / Time:							
10					Date: / / Time:	Date: / / Time:							

Notes:

Shut-In Conducted?

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Environmental Field Services

APPENDIX C

FIELD SAMPLING PLAN

APPENDIX C

FIELD SAMPLING PLAN

U-Haul Site
555 West 22nd Street
New York, New York 10011
NYSDEC BCP No. C231101

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau B
625 Broadway, 12th Floor
Albany, NY 12233-7020

Prepared for
23rd and 11th Associates LLC
c/o The Related Companies
60 Columbus Circle
New York, NY 10023

Prepared by

integral engineering p.c.
61 Broadway
Suite 1601
New York, NY 10006

Final
January 2018

CONTENTS

1 INTRODUCTION

The following Field Sampling Plan (FSP) describes in detail the sampling and data gathering methods and procedures to be used during the Remedial Investigation activities at the property located at 555 West 22nd Street (Block 694, Lots 2, 5, 60, 61 and 65), New York, NY (Site), outlined in the Remedial Investigation (RI) Work Plan.

This FSP should be used in conjunction with the Quality Assurance Project Plan (QAPP) (Appendix C to the RIWP) and Health and Safety Plan (HASP) (Appendix D to the RIWP), both developed by Integral Engineering P.C. for the RI activities at the Site.

1.1 SITE LOCATION

The Site is located in a mixed use area of the West Chelsea section of the Borough of Manhattan. The Site is comprised of four tax lots (approximately 33,671 SF) identified on New York City tax maps as Block 694 Lots 2, 5, 60, 61, and 65. The Site is bounded to the north by West 23rd Street, to the east by 10th Avenue, to the south by West 22nd Street, and to the west by 11th Avenue.

1.2 SAMPLING OBJECTIVE

The objective of the sampling is to define the nature and extent of historical fill material present onsite; delineate the horizontal and vertical extent of contaminants (if present) in soil, groundwater, and soil vapor beneath the Site; evaluate potential offsite impacts to groundwater from contamination, if present; evaluate the potential for soil vapor to migrate offsite via preferred pathways, if present; evaluate the potential presence of unidentified underground storage tanks; to determine whether remedial action is needed to protect human health and the environment; and to produce data of sufficient quantity and quality to support remediation of the Site.

1.3 FIELD ACTIVITIES

The Remedial Investigation (RI) will include the following scope of work:

- Ground penetrating radar (GPR) will be utilized to evaluate the potential presence of unidentified and/or unconfirmed USTs and will aid in the identification of potential utilities, piping, and other subsurface infrastructure in the vicinity of proposed boring areas;

- Twenty three (23) soil borings will be installed around the Site to evaluate subsurface soil conditions to the depth of approximately 17 ftbg (one foot below the anticipated

excavation depth). Borings will be continuously screened and evaluated for their physical characteristics and appropriate intervals will be identified for sample collection;

- Install three (3) permanent groundwater monitoring wells, screened across the groundwater interface, and eight (8) temporary wells. Following well installation and development, groundwater samples will be collected in accordance with EPA's *Low Flow Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells* (Low Flow Procedures, January 2010);

- Install eleven (11) soil vapor points, collect soil vapor from eleven (11) points, collect four (4) indoor air samples, and collect two (2) ambient air samples while conducting the vapor/indoor air portion of the RI.

All sampling will be conducted in accordance with the FSP, QAPP, and HASP.

1.3.1 Onsite Personnel, Roles, and Responsibilities

Personnel:

- Integral Project Manager: Alana Carroll (Office: 212-440-6706; Cell: 646-895-1403)
- Integral Field Staff: Jordan Junion (Office: 212-440-6705; Cell: 414-315-8977)

Roles and Responsibilities:

Integral Project Manager: Oversees the performance of field activities and directs deviations from the RI Work Plan (if necessary).

Integral Field Staff:

- Manages the implementation of the RI
- Oversees and directs subcontractors
- Collects samples for data analysis
- Controls sample handling, packaging and shipment

1.3.2 Field Logbook

All field activities will be carefully documented in field logbooks. Entries will be of sufficient detail that a complete daily record of significant events, observations, and measurements is obtained. The field books will provide a legal record of the activities conducted at the site. Accordingly:

- Field books will be bound with consecutively numbered pages;
- Field books will be controlled by the field staff while field work is in progress;

- Logbooks will be waterproof;
- Entries will be signed and dated at the conclusion of each day of field work;
- Erroneous entries made while fieldwork is in progress will be corrected by the person that made the entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing the correction;
- Corrections made after departing the field will be made by the person who made the original entries. The correction will be made by drawing a line through the error, entering the correct information, and initialing and dating the time of the correction; and
- The Integral Project Manager will control field books when fieldwork is not in progress.

At a minimum, daily field book entries will include the following information:

- Date and page number on each page or set of pages;
- Location of field activity;
- Date and time of entry;
- Names and titles of field team members;
- Names and titles of any site visitors and site contacts;
- Weather information: temperature, cloud coverage, wind speed and direction;
- Purpose of field activity;
- A detailed description of the fieldwork conducted observations and any measurements or readings. Where appropriate, a hand-drawn sketch map will also be included that identifies significant landmarks, features, sample locations, and utilities; and
- When appropriate, boring numbers, well numbers, sample point ID or key activities should be identified on the top of each page to facilitate retrieval of data at a later date.

1.3.3 Ground Penetrating Radar

A ground penetrating radar (GPR) survey is proposed to be conducted over the entire Site (where accessible) prior to the advancement of soil borings. The GPR survey will evaluate the potential presence of unidentified and/or unconfirmed USTs and will aid in the identification of potential utilities, piping, and other subsurface infrastructure. The GPR survey will involve traversing the Site with a portable digital pulse GPR system in order to obtain detailed horizontal profiles. Spacing of the traverse lines will be dependent upon the interference and resolution. Typical depth range for GPR equipment is primarily governed by Site-specific lithology. The majority of buried utilities and structures are expected to be positioned above the groundwater table (less than 9 ftbg).

1.3.4 Sample Collection and Analysis

1.3.4.1 Soil Sampling

In order to characterize the soil at the Site, the following scope of work will be implemented:

- Advance an estimated twenty three (23) soil borings at and around the Site to evaluate the subsurface soil conditions to the depth of approximately 17 ftbg (one foot below the anticipated excavation depth). The borings are intended to evaluate the horizontal and vertical extent of impacts (if present); assess the condition of soils to be left onsite; assess the soil conditions around and downgradient of the AOCs; evaluate potential sources (on and offsite); evaluate potential offsite migration of onsite impacts (if present); and assist in the presentation of Alternative Analysis and remedy recommendations;
- Evaluate physical characteristics of the entire soil/fill column in each boring and identify appropriate intervals from which samples will be collected;
- Collect soil samples via EPA Method 5035/5035A; and
- Analyze soil samples for:
    - TCL VOCs via EPA Method 8260C.
    - TCL SVOCs via EPA Method 8270D;
    - Target Analyte List (TAL) Metals via EPA Method 6010C/7471B;
    - Polychlorinated Biphenyls (PCBs) via EPA Method 8082A; and
    - Pesticides via EPA Method 8081B.
    - Note selected samples will be analyzed for VOCs and SCOVs only.

Based on field measurements and observations, boring locations may be moved or added. Prior to modifications being made with regard to the above-described placement, coordination with NYSDEC will take place. Proposed soil boring locations are shown on Figure 10 of the RIWP.

Prior to the advancement of soil borings, all locations will be cleared for utilities and subsurface infrastructure using GPR. Continuous soil sampling will be conducted for all borings. It is anticipated that two (2) soil samples will be analyzed per boring. As a default, one (1) soil sample will be collected from the interval exhibiting the highest PID reading or visual/olfactory impact and one (1) sample will be collected from the interval directly below the anticipated development excavation depth (~17 ftbg). If no obvious signs of impacts are observed within the soil column, a soil sample will be collected from the interval directly above the groundwater interface (~9 ftbg). If additional impacted or questionable zones are identified, samples will be collected from those areas for analysis. All samples are expected to be collected from two (2) foot intervals, but the intervals may be expanded or contracted based upon material recovery and identification of impacts.

Delineation borings may be advanced in areas where impacts were observed from visual or olfactory cues, or via a photoionization detector (PID). Delineation borings will be advanced radiating out from any proposed onsite soil boring (i.e., within the Site building based on the most reasonable access) that show signs of impact. Delineation borings will be advanced until no obvious signs of impacts are observed or access limitations prevent any further investigation. Samples analyzed from delineation borings showing no impacts will be collected consistent with the previous sample interval selected from the proposed boring that exhibited impacts. Samples collected from delineation borings terminated due to access limitations will be selected from the area of highest suspected impact.

This delineation process focuses the subsurface soil investigation on probable source areas, while obtaining a more complete data set and eliminating multiple mobilizations. The analysis of impacted soil and potential source area delineation will assist in evaluation of the remedy. This delineation process focuses the subsurface soil investigation on probable source areas, while obtaining a more complete data set and eliminating multiple mobilizations. The analysis of impacted soil and potential source area delineation will assist in evaluation of the remedy.

Impact will be determined in the field by a Qualified Environmental Professional (QEP) via screening for VOCs using a PID and visual/olfactory indication.

Soil borings will be installed using a track mounted or Bobcat Geoprobe® utilizing direct push technology to the groundwater interface depth, approximately 17 ftbg. Continuous soil samples will be collected using four (4) or five (5) foot macrocore samplers fitted with dedicated acetate liners. The soil/fill retrieved from each sampler will be field screened with a PID for VOCs and described by Integral field personnel on boring logs. Evidence of contamination (e.g., Non Aqueous Phase Liquid [NAPL], sheens, odors, staining, elevated PID readings) will be documented by Integral field personnel. Product samples, if encountered, will be submitted for gas chromatography-mass spectrometer fingerprint analysis.

Soil samples selected for laboratory analysis will be placed in laboratory supplied containers, sealed and labeled, and placed in a cooler and chilled to 4oC for transport under chain-of-custody procedures. Soil samples will be submitted to a NYSDOH ELAP-certified laboratory via courier service under standard chain-of-custody protocol and analyzed for all of the compounds included in 6 NYCRR Part 375 SCOs and Final CP-51 SCLs.

1.3.4.2 Groundwater Sampling

The following scope of work is proposed to further characterize the groundwater at the Site:

- Install (8) temporary groundwater wells;
- Install three (3) permanent groundwater monitoring wells, screened across the groundwater interface;
- Survey all newly-installed wells;

- Collect one (1) round of depth-to-groundwater measurements from newly-installed wells;
- Evaluate groundwater elevations and present groundwater contours;
- Purge all wells in accordance with DER-10 requirements and collect samples for laboratory analysis. All purging and sampling will be performed in accordance with proper program protocols. Samples will be collected from each of the proposed wells; and
- Analyze groundwater samples for:
    - TCL VOCs via USEPA Method 8260C.
    - TCL SVOCs via USEPA Method 8270D;
    - TAL Metals via USEPA Method 6010C/7471B (filtered and unfiltered);
    - PCBs via USEPA Method 8082A; and
    - Pesticides via USEPA Method 8081B.
    - Note selected samples will be analyzed for VOCs and SCOVs only.

Samples selected for full scan analysis will be collected from locations that indicate potential impact through visual, olfactory or field meter readings. If no impact areas or locations are identified, samples for full scan sample analysis will be selected randomly.

All well locations will be installed concurrent with a soil boring location. Proposed well locations are shown on Figure 10 of the RIWP. Monitoring well construction will follow the protocol described below. Monitoring wells installed within the sidewalk will be installed using a track mounted Geoprobe outfitted with 4¼" hollow-stem auger attachments. Monitoring wells installed within the Site building will be installed using a track mounted or Bobcat Geoprobe, depending on access limitations. Interior wells installed utilizing a Bobcat Geoprobe will be constructed of 1" PVC riser and screen in order to achieve the proper annular space around each well, and will follow the same general construction as the 2" sidewalk wells described below. If any significant impacts are identified, well materials may be altered to prevent detriment to PVC screen material.

Sidewalk wells will be installed approximately 5-6' below the groundwater table (expected to be at approximately 9 ftbg) in order to collect samples in the shallow saturated zone. The wells will be constructed of 2" diameter PVC riser with 10' of .020" slotted PVC screen. The screen interval will straddle the groundwater interface. The annular space around the well will be filled with No. 2 Morie quartz sand to a depth of 2' above the top of the well screen, followed by 2' of bentonite, then backfilled with screened (unimpacted) soil cuttings to 1' below grade. The wells will be finished with 6" of bentonite pellets placed below a locking flush-mounted road box, set in a cement apron. Development will be performed by purging the water column in

order to remove sediment disturbed by the drilling process. Purge water will be collected and containerized for proper management and disposal.

Sampling of the monitoring wells is anticipated to take place approximately one week following their installation. Following purging, one (1) representative groundwater sample will be collected from each well, using dedicated polyethylene tubing attached to a peristaltic pump capable of low flow control. During purging, water quality indicators (pH, temperature, specific conductivity, and turbidity) will be monitored using a flow through cell while purging. Purging is considered complete when field parameters have stabilized (e.g., turbidity reading of 5 NTU). Groundwater samples will be collected according to *EPA's Low Flow Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells* (Low Flow Procedures, January 2010).

The groundwater samples will be pumped directly into laboratory-supplied sample bottles. Samples will be collected, cooled, properly packaged to prevent breakage, and submitted to a NYSDOH ELAP-certified laboratory via courier service under standard chain-of-custody protocol.

1.3.4.3 Soil Vapor and Air Sampling

The scope of work proposed for the characterization of soil vapor onsite focuses on the potential for offsite migration of onsite contaminants (if present), as well as the potential for onsite migration of contaminants from offsite sources. The results of soil vapor and air sampling will assist in evaluating future onsite engineering controls.

The following scope of work is proposed to characterize the soil vapor at the Site:

- Install six (11) soil vapor points;
- Purge and collect soil vapor samples from eleven (11) points;
- Collect one (4) indoor air samples from Building A (Lot 65);
- Collect one (2) ambient air samples; and
- Analyze all soil vapor, indoor air and ambient air samples for TO-15 VOCs.

Proposed soil vapor sampling locations are shown on Figure 10 of the RIWP.

Each soil vapor probe will be installed approximately 2" below the building or parking area slab using dedicated 1/8" Teflon tubing. The tubing will be implanted into the hole and the annular space sealed with bentonite to prevent ambient air from entering the area around the probe. Once the seal is secure, a "T" fitting and valve will be connected on the above-surface end of the tubing. A syringe will be used to purge the vapors in the probe and tubing of three volumes. As required by the NYSDOH, a helium (He) tracer will be used as part of the sampling process and all testing will follow the NYSDOH Soil Vapor Guidance. Prior to sample collection, the He vapor will be screened using a field meter and the measurement recorded at

each soil vapor sampling location. Prior to sample collection, a multi-gas meter will be used to measure the concentration of O2, CO2, and CH4 in each probe, to assess the subsurface chemistry (e.g. redox state). Following this procedure, the soil vapor samples will be collected in clean, batch certified, two (2) liter SummaTM canisters at flow rates no greater than 200 ml/min.

Soil vapor samples will be collected over a period of two (2) hours. Soil vapor samples will be analyzed for VOCs via USEPA Method TO-15 at a NYSDOH ELAP-certified analytical laboratory.

Indoor and Ambient Air Samples

In accordance with the NYSDOH Guidance for Evaluating Soil Vapor Intrusion, one (1) indoor air sample and one (1) ambient air sample (per sampling day) will be collected prior to the collection of sub-slab soil vapor samples . One (1) indoor air sample will be collected from Building A (Lot 65). The indoor air sample will be collected in the breathing zone (approximately four (4) to six (6) feet above the floor). One background ambient air sample will also be collected per day along West 23rd Street. Indoor and background air samples will be collected in six (6) liter, batch-certified clean SUMMATM canisters attached to 8-hour flow controllers. Samples will be collected at flow rates no greater than 200 ml/min.

For each sub-slab soil vapor, soil vapor, indoor, and background sample, the start time, end time, maximum and minimum temperature, and beginning and final ambient temperature will be recorded. Indoor and ambient air samples will be collected over a period of eight (8) hours and will be analyzed for VOCs via USEPA Method TO-15 at a NYSDOH ELAP-certified analytical laboratory.

1.3.5 Equipment Decontamination

Where possible, samples will be collected using new, dedicated sampling equipment so that decontamination is not required. All non-dedicated drilling tools, equipment and sampling equipment will be decontaminated between boring locations using potable tap water and a phosphate-free detergent (e.g., Alconox) and/or a steam cleaner. All non-dedicated sampling equipment will be decontaminated after each sampler is recovered. Decontamination water will be collected and disposed as investigation-derived waste (IDW).

1.3.6 Investigation Derived Waste

It is anticipated that soil cuttings and groundwater will be generated during Site characterization activities. The cutting from drilling operations will be placed on protective sheeting, screened with a PID, and either used to backfill the bore hole (if screening indicates no/minimal VOCs) or placed into 55-gallon steel drums. Cutting determined to be inadequate for backfill, along with redevelopment and purge water, will be drummed, characterized and disposed of off-site in accordance with federal, state and local regulations.

Used personal protective equipment (PPE) and other non-hazardous materials that come into contact with chlorinated solvents will be drummed and disposed of off-site in accordance with federal, state and local regulations.

1.3.7 Field Instrument Calibration

All field screening and sampling instruments (e.g., temperature-conductivity-pH probes) that require calibration prior to operation will be calibrated daily in accordance with the manufacturer's instructions. All instrument calibrations will be documented in the project field book and in instrument calibration logs for the various pieces of equipment. Instrument operating manuals will be maintained onsite by the field team.

APPENDIX D

QUALITY ASSURANCE PROJECT PLAN

APPENDIX D

QUALITY ASSURANCE PROJECT PLAN

U-Haul Site
555 West 22nd Street
New York, New York 10011
NYSDEC BCP No. C231101

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau B
625 Broadway, 12th Floor
Albany, NY 12233-7020

Prepared for
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c/o The Related Companies
60 Columbus Circle
New York, NY 10023

Prepared by:

61 Broadway
Suite 1601
New York, NY 10006

Final
January 2018

CONTENTS

1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been developed for the Remedial Investigation (RI) Work Plan prepared for the property located at 555 West 22nd Street (Block 694, Lots 2, 5, 60, 61 and 65), New York, NY (Site).

The Site is located in a mixed use area of the West Chelsea section of the Borough of Manhattan. The Site is comprised of four tax lots (approximately 33,671 SF) identified on New York City tax maps as Block 694 Lots 2, 5, 60, 61, and 65. The Site is bounded to the north by West 23rd Street, to the east by 10th Avenue, to the south by West 22nd Street, and to the west by 11th Avenue.

1.1 PROJECT SCOPE AND QAPP OBJECTIVE

The proposed scope of work includes the following:

- Advancement of borings for soil, groundwater and/or soil vapor sampling at several locations around the site; and,
- Collection of soil, groundwater, soil vapor, and indoor and ambient air samples from soil borings, monitoring wells and temporary soil vapor points.

The objective of the QAPP is to detail the policies, organization, objectives, functional activities and specific quality assurance/quality control (QA/QC) activities designed to achieve the data quality goals or objectives of the Remedial Investigation Work Plan (Work Plan). This QAPP addresses how the acquisition and handling of samples and the review and reporting of data will be documented for quality control (QC) purposes. Specifically, this QAPP address the following:

- The procedures to be used to collect, preserve, package, and transport samples;
- Field data collection and record keeping;
- Data management;
- Chain-of-custody procedures; and,
- Determination of precision, accuracy, completeness, representativeness, decision rules, comparability and level of QC effort.

2 PROJECT ORGANIZATION

The personnel detailed are responsible for the implementation of the QAPP. Integral Engineering PC (Integral) will implement the Work Plan on behalf of 23rd and 11th Associates LLC (Participant) once approved by the New York State Department of Environmental Conservation (NYSDEC).

The Qualified Environmental Professional will be Kevin McCarty, P.G., Principal at Integral. Mr. McCarty is a professional geologist with nearly 20 years of experience in the New York City metropolitan area. He has designed and implemented subsurface investigations and is proficient in groundwater modeling, design of groundwater treatment systems, and soil remediation. He has managed numerous projects focused on compliance with the requirements of the New York State Brownfield Cleanup and spills programs and the New York City "e" designation program. Mr. McCarty also has extensive experience coordinating with New York State and New York City regulatory agencies. Mr. McCarty received his BA in Geology from Western Connecticut State University.

The Quality Assurance Officer will be Mr. Keith Brodock, P.E., Senior Managing Engineer at Integral. Mr. Brodock is an is a professional engineer with over 10 years of experience in environmental risk analysis, real estate portfolio liability estimation, transactional risk evaluation, remediation design, and decision management science. One of his primary responsibilities is managing and quantifying transactional risks for brownfield properties. Mr. Brodock routinely consults purchasers and sellers on the regulatory climate, technical interpretations, and risk mitigation measures. He frequently supports fate and transport modeling of vapor intrusion cases and engineering designs for remediation systems. Mr. Brodock received his BS in Chemical Engineering from Clarkson University. Mr. Brodock has experience with analytical methods, data interpretation and validation, the development of sampling plans, quality control procedures and auditing requirements and techniques. Mr. Brodock will review sampling procedures and certify that the data was collected and analyzed using the appropriate procedures and will not be directly involved in the collection and analysis of samples from the Site. Mr. Brodock has, in conjunction with the Project Manager, developed the sampling and analytical portion of this QAPP.

The Project Manager will be Mrs. Alana Carroll, Senior Managing Geologist at Integral. Mrs. Carroll is an environmental geologist with over 10 years of experience in all aspects of site assessment, investigation, remediation and development and implementation of remedial strategies. Her experience involves managing a variety of environmental consulting and engineering projects in the New York metropolitan area, specializing in remedial investigations, conceptual site modeling, and remedial design and implementation. Ms. Carroll provides analytical, technical, and regulatory guidance to clients, including developers and environmental attorneys, on a variety of projects in various stages of investigation, remediation,

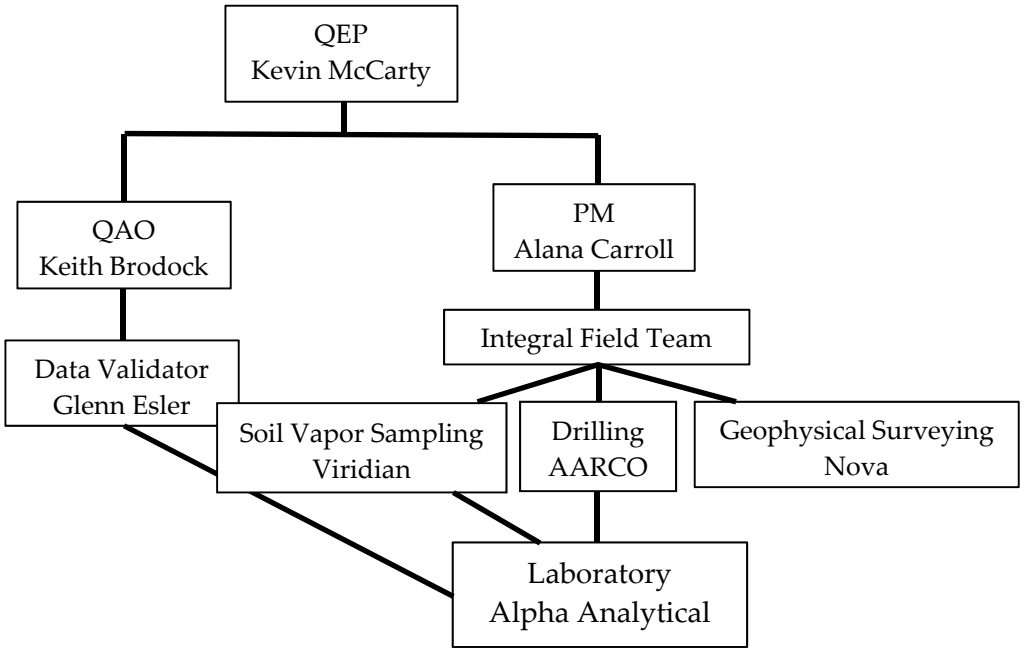
and redevelopment and has managed projects in the New York State Brownfield Cleanup Program, the New York State Department of Environmental Conservation (NYSDEC) Spills and Voluntary Cleanup Programs, and New York City "e" Designation Program. Mrs. Carroll received her BS in Geology from Hofstra University and will receive her MA in Geology from Brooklyn College in the fall of 2016.

Data validation will be performed by Mr. Glenn Esler, a Scientist at Integral and a certified laboratory auditor. Mr. Esler has more than 30 years of experience in the field of environmental chemistry, including 15 years in quality assurance and data quality management and 5 years as a GC/MS analyst. His technical specialties include design and implementation of laboratory quality management programs, laboratory and field audits, and data interpretation and assessment of compliance with regulatory requirements and project objectives. He has an in-depth working knowledge of EPA environmental analytical methods and EPA Contract Laboratory Program (CLP) national functional guidelines for data review. Mr. Esler received his BS in Geography from Portland State University and AS in Chemistry from Millersville University.

Project personnel resumes are included in Attachment C1.

In addition, Integral will utilize subcontractors for drilling (AARCO Environmental of Lindenhurst, NY) soil vapor sampling (Viridian Inc. of Upper Montclair, NJ), geophysical survey (Nova Geophysical Services of Douglaston, NY), surveying (Donald Stedge, P.L.S, of Goshen, NY) and laboratory services (Alpha Analytical of Mahwah, NJ).

An organization chart for the implementation of the Remedial Investigation Work Plan and QAPP is below.



3 SAMPLING AND DECONTAMINATION PROCEDURES

A detailed description of the procedures to be used during this program for collection of the soil, groundwater, soil vapor, and ambient air samples is provided below. Proposed sample locations are shown on Figure 10 of the RI Work Plan. An Analytical Methods/Quality Assurance Summary is provided in Table 1, included below in Section 3.11.

3.1 LEVEL OF EFFORT FOR QC SAMPLES

Field blank, trip blank, field duplicate samples and matrix spike (MS) / matrix spike duplicate (MSD) will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs. Each type of QC sample is discussed below.

- Field and trip blanks consisting of distilled water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field-sampling program. Field (equipment) blank samples are analyzed to check for procedural chemical constituents at the facility that may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage.

- Duplicate samples are analyzed to check for sampling and analytical reproducibility.

- MS/MSD samples provide information about the effect of the sample matrix on the digestion and measurement methodology

The general level of QC effort will be one (1) field duplicate and one (1) field blank (when non-dedicated equipment is used) for every 20 or fewer investigative samples of a given matrix. Additional sample volume will also be provided to the laboratory to allow one (1) site-specific MS/MSD for every 20 or fewer investigative samples of a given matrix. One (1) trip blank will be included along with each sample delivery group of VOC samples.

The analytical laboratory will be certified under the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) in the appropriate categories. NYSDEC Analytical Services Protocol (ASP) Category B deliverables will be prepared by the laboratory.

3.2 SAMPLE HANDLING

Samples will be picked up by the laboratory or delivered to the laboratory in person by the sampler, or transported to the laboratory by overnight courier. All samples will be shipped to

the laboratory to arrive within 48 hours after collection, and the laboratory will adhere to the analytical holding times for these analyses, as listed in the July 2005 NYSDEC ASP.

3.3 CUSTODY PROCEDURES

Sample custody will be controlled and maintained through the chain-of-custody procedures. The chain of custody is the means by which the possession and handling of samples is tracked from the site to the laboratory. Sample containers will be cleaned and preserved at the laboratory before shipment to the Site. The following sections (Sections 3.4 and 3.5) describe procedures for maintaining sample custody from the time samples are collected to the time they are received by the analytical laboratory.

3.4 SAMPLE STORAGE

Samples will be stored in secure limited-access areas. Iced coolers or refrigerators will be maintained at 4°C, 2°C, or as required by the applicable regulatory program. The temperatures of all refrigerated storage areas are monitored and recorded a minimum of once per day. Deviations of temperature from the applicable range require corrective action, including moving samples to another storage location, if necessary.

3.5 SAMPLE CUSTODY

Sample custody is defined by this document as the following:

- The sample is in someone's actual possession;
- The sample is in someone's view after being in his or her physical possession;
- The sample was in someone's possession and then locked, sealed, or secured in a manner that prevents unsuspected tampering; or,
- The sample is placed in a designated and secured area.
- Samples will be removed from storage areas by the sample custodian or laboratory personnel and transported to secure laboratory areas for analysis. Access to the laboratory and sample storage areas is restricted to laboratory personnel and escorted visitors only; all areas of the laboratory are therefore considered secure.

Laboratory documentation used to establish chain of custody and sample identification may include the following:

- Field chains of custody or other paperwork that arrives with the sample;
- Laboratory chain of custody;

- Sample labels or tags attached to each sample container;
- Sample custody seals;
- Sample preparation logs (i.e., extraction and digestion information) recorded in hardbound laboratory books, filled out in legible handwriting, and signed and dated by the chemist;
- Sample analysis logs (e.g., metals, GC/MS, etc.) information recorded in hardbound laboratory books that are filled out in legible handwriting, and signed and dated by the chemist;
- Sample storage log (same as the laboratory chain of custody); and,
- Sample disposition log, which documents sample disposal by a contracted waste disposal company.

3.6 SAMPLE TRACKING

All samples will be maintained in the appropriate coolers prior to and after analysis. Laboratory analysts will remove and return their samples, as needed. Samples that require internal chain of custody procedures will be relinquished to the analysts by the sample custodians. The analyst and sample custodian will sign the original chain of custody relinquishing custody of the samples from the sample custodian to the analyst. When the samples are returned, the analyst will sign the original chain of custody returning sample custody to the sample custodian. Sample extracts will be relinquished to the instrumentation analysts by the preparatory analysts. Each preparation department will track internal chain of custody through their logbooks/spreadsheets.

Any change in the sample during the time of custody will be noted on the chain of custody (e.g., sample breakage or depletion).

3.7 SOIL BORING ADVANCEMENT

Depending on access, soil borings will be installed using a track mounted or limited access Bobcat Geoprobe® utilizing direct push technology to the groundwater interface depth, approximately 17 ftbg. Continuous soil samples will be collected using four (4) or five (5) foot macrocore samplers fitted with dedicated acetate liners. Proper decontamination procedures will be followed after each sampler is recovered.

New, dedicated disposable acetate sleeves will be used for all soil samples collected using the Geoprobe. The sleeve for each sample interval will be opened and the soil within scanned for volatile organic compounds (VOCs) using a photoionization detector (PID) and geologically described using the Unified Soil Classification System, including documentation of observations

regarding potential contamination such as odors, staining, etc. All descriptions and observations will be documented in a field notebook.

3.7.1 Soil Sampling

It is anticipated that two (2) soil samples will be analyzed per boring. As a default, one (1) soil sample will be collected from the interval exhibiting the highest PID reading or visual/olfactory impact and one (1) sample will be collected from the interval directly below the anticipated development excavation depth (~17 ftbg). If no obvious signs of impacts are observed within the soil column, a soil sample will be collected from the interval directly above the groundwater interface (~9 ftbg). If additional impacted or questionable zones are identified, samples will be collected from those areas for analysis. All samples are expected to be collected from two (2) foot intervals, but the intervals may be expanded or contracted based upon material recovery and identification of impacts.

VOC soil samples will be placed in laboratory provided En Core samplers (En Novative Technologies, Inc.). All other soil samples will be placed in laboratory supplied glass containers. All samples will be sealed, labeled, cooled to 4°C in the field, and transported under chain-of-custody command to the designated laboratory for analysis. Product samples, if encountered, will be submitted for gas chromatography-mass spectrometer fingerprint analysis.

Soil samples will be analyzed for VOCs via EPA Method 8260C; semi-volatile organic compounds (SVOCs) via EPA Method 8270D; Target Analyte List (TAL) Metals via EPA Method 6010C/7471B; Polychlorinated Biphenyls (PCBs) via USEPA Method 8082A; and Pesticides via USEPA 8081B. A select set of soil samples will be analyzed for VOCs and SVOCs only. The samples will be submitted for laboratory analysis with a NYSDEC ASP Category B data package.

3.8 MONITORING WELL INSTALLATION AND DEVELOPMENT

Monitoring wells installed within the sidewalk will be installed using a track mounted Geoprobe outfitted with 4¼" hollow-stem auger attachments. Monitoring wells installed within the Site building will be installed using a track mounted or Bobcat Geoprobe, depending on access limitations. Interior wells installed utilizing a Bobcat Geoprobe will be constructed of 1" PVC riser and screen in order to achieve the proper annular space around each well, and will follow the same general construction as the 2" sidewalk wells described below. If any significant impacts are identified, well materials may be altered to prevent detriment to PVC screen material.

Sidewalk wells will be installed approximately 5-6' below the groundwater table (expected to be approximately at 9 ftbg) in order to collect samples in the shallow saturated zone. The wells will be constructed of 2" diameter PVC riser with 10' of .020" slotted PVC screen. The screen interval will straddle the groundwater interface. The annular space around the well will be

filled with No. 2 Morie quartz sand to a depth of 2' above the top of the well screen, followed by 2' of bentonite, then backfilled with screened (unimpacted) soil cuttings to 1' below grade. The wells will be finished with 6" of bentonite pellets placed below a locking flush-mounted road box, set in a cement apron. Development will be performed by purging the water column in order to remove sediment disturbed by the drilling process. Purge water will be collected and containerized for proper management and disposal. Monitoring wells will be developed after a competent bentonite seal has been established.

All wells will be surveyed to a common Site datum.

3.8.1 Groundwater Sampling

Prior to sample collection, static water levels will be measured and recorded from all monitoring wells. Following water level measurement, Integral will purge and sample monitoring wells using low-flow/minimal drawdown purge and sample collection procedures. Prior to sample collection, groundwater will be evacuated from each well at a low-flow rate (typically less than 0.1 L/min). Field measurements for pH, temperature, turbidity, dissolved oxygen, specific conductance, oxidation-reduction potential and water level, as well as visual and olfactory field observations, will be periodically recorded and monitored for stabilization in overburden wells. Purging will be considered complete when pH, specific conductivity, dissolved oxygen and temperature stabilize and when turbidity measurements fall below 50 Nephelometric Turbidity Units (NTU), or become stable above 50 NTU. If stabilization does not occur or the well has been purged and recovery cannot maintain the pace of low flow purging, a sample will be collected and a notation will be made in the field book.

Stability is defined as variation between field measurements of 10 percent or less and no overall upward or downward trend in the measurements. Upon stabilization of field parameters, groundwater samples will be collected and analyzed as discussed below.

Wells will be purged and sampled using dedicated pump tubing following low-flow/minimal drawdown purge and sample collection procedures, as described above. The pump will be decontaminated between samples and the tubing will be replaced.

Groundwater samples will be collected for laboratory analysis through dedicated tubing. Prior to, and immediately following collection of groundwater samples, field measurements for pH, specific conductance, temperature, dissolved oxygen, turbidity and depth-to-water, as well as visual and olfactory field observations will be recorded. All collected groundwater samples will be placed in pre-cleaned, pre-preserved laboratory provided sample bottles, cooled to 4°C in the field, and transported under chain-of-custody command to the designated laboratory for analysis.

Groundwater samples will be analyzed for VOCs via EPA Method 8260C; SVOCs via EPA Method 8270D; TAL Metals via EPA Method 6010C/7472B (filtered and unfiltered); PCBs via EPA Method 8082A; and Pesticides via EPA 8081B. Select samples will be analyzed for VOCs

and SVOCs only. The samples will be submitted for laboratory analysis with a NYSDEC ASP Category B data package.

3.9 TEMPORARY SOIL VAPOR POINT INSTALLATION

Temporary soil vapor points will be installed using a hand held hammer drill. Each soil vapor probe will be installed approximately 2" below the slab using dedicated 1/8" Teflon tubing. The tubing will be implanted into the hole and the annular space sealed with bentonite to prevent ambient air from entering the area around the probe. The bentonite seal will be left to set overnight. Once the seal is secure, a "T" fitting and valve will be connected on the above-surface end of the tubing. A syringe will be used to purge the vapors in the probe and tubing of three volumes.

3.9.1 Soil Vapor, Indoor, and Ambient Air Sampling

Soil Vapor Samples

As required by NYSDOH, a helium (He) tracer will be used as part of the sampling process and all testing will follow the NYSDOH Soil Vapor Guidance[1]. Prior to sample collection, the He vapor will be screened using a field meter and the measurement recorded at each soil vapor sampling location. Prior to sample collection, a multi-gas meter will be used to measure the concentration of O_2, CO_2, and CH_4 in each probe, to assess the subsurface chemistry (e.g. redox state). Following this procedure, the soil vapor samples will be collected in clean, batch certified, two (2) liter Summa™ canisters at flow rates no greater than 200 ml/min.

A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone and chain of custody.

Soil vapor samples will be collected over a period of two (2) hours. Soil vapor samples will be analyzed for VOCs via USEPA Method TO-15 at a NYSDOH ELAP-certified analytical laboratory.

Indoor and Ambient Air Samples

In accordance with the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion*, one (1) indoor air samples and one (1) ambient air sample (per sampling day) will be collected prior to the collection of sub-slab soil vapor samples[2]. One (1) indoor air sample will be collected from Building A (Lot 65). Indoor air samples will be collected in the breathing zone (approximately four (4) to six (6) feet above the floor). One background ambient air sample will also be collected

[1] *Guidance for Evaluating Soil Vapor Intrusion in the State of New York, Final*. October 2006.
[2] This limits interference from the soil vapor matrix.

per day along West 23rd Street. Indoor and background air samples will be collected in six (6) liter, batch-certified clean SUMMA™ canisters attached to 8-hour flow controllers. Samples will be collected at flow rates no greater than 200 ml/min.

For each sub-slab soil vapor, soil vapor, indoor, and background sample, the start time, end time, maximum and minimum temperature, and beginning and final ambient temperature will be recorded. Indoor and ambient air samples will be collected over a period of eight (8) hours and will be analyzed for VOCs via USEPA Method TO-15 at a NYSDOH ELAP-certified analytical laboratory.

3.10 ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

A summary of the analytical methods and quality assurance methods are included in Table 1, below.

Table 1
Analytical Methods/Quality Assurance Summary

Matrix	Proposed Samples	QA/QC Samples				Total # Samples	Analytical Parameter	Method	Preservative	Holding Time	Container
		TB	FB	DUP	MS/MSD						
Soil *	Unknown	0	0	0	0	--	Fingerprint	8100M	Cool to 4°C	14 days to perform analysis on all except VOCs from EnCores (48 hour HT)	(1) 250 mL glass bottle
	45	5	1	4	2/2	59	All VOCs; SVOCs; Metals; PCBs: Pests	8260C; 8270D; 6010C/7471B; 8082A; 8081B			(3) 5-gram En Core; All other parameters: (1) 100ml amber glass jar.
Groundwater *	12	6	1	2	1/1	23	All VOCs; SVOCs; Metals; PCBs: Pests	8260C; 8270D; 6010C/7472B; 8082A; 8081B	Cool to 4°C, VOCs: pH<2 with HCl; with HNO3		(3) 40 mL glass vials; (2) 1L amber glass; (1) 500ml plastic bottle preserved; (1) 500ml plastic bottle non preserved; (2) 1L amber glass
Soil Vapor	11	0	0	1	0	12	VOCs	TO-15	None		2 L Summa
Indoor/ Ambient Air	6	0	0	0	0	6					6 L Summa

*Selected samples to be analyzed for VOCs and SVOCs only

3.11 DECONTAMINATION

Where possible, samples will be collected using new, dedicated sampling equipment so that decontamination is not required. All non-dedicated drilling tools, equipment and sampling equipment will be decontaminated between boring locations using potable tap water and a phosphate-free detergent (e.g., Alconox) and/or a steam cleaner. All non-dedicated sampling equipment will also have a final rinse with deionized water. Decontamination water will be collected and disposed as investigation-derived waste (IDW).

3.12 DATA REVIEW AND REPORTING

The NYSDEC ASP Category B data package will be validated by an independent data validation subconsultant (resume provided in Attachment C1) and a DUSR summarizing the results of the data validation process will be prepared. All reported analytical results will be qualified as necessary by the data validation and will be reviewed and compared against background concentrations and/or applicable New York State criteria:

Soil – Restricted Residential Use Soil Cleanup Objectives (SCOs), Site-specific SCOs and Supplemental Soil Cleanup Levels (SCLs) as listed in 6NYCRR Part 375 and NYSDEC Commissioner's Policy CP-51;
Groundwater – NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) (1.1.1) Ambient Water Quality Standards (AWQSs) and Guidance Values and Groundwater Effluent Limitations; and,
Soil Vapor – Guidance for Evaluating Soil Vapor Intrusion in the State of New York Matrices.

A report documenting the Remedial Investigation will be prepared, and will describe Site conditions and document applicable observations made during the sample collection. In addition, the report will include a description of the sampling procedures, tabulated sample results and an assessment of the data and conclusions. The laboratory data packages, DUSR, soil vapor point construction diagrams, and field notes will be included in the report as appendices. All data will also be submitted electronically to NYSDEC via the Environmental Information Management System (EIMS) in EqUIS format.

Attachment C1
Resumes

Integral Consulting Inc.
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New York, NY 10006

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facsimile: 212.962.4302
kbrodock@integral-corp.com

Keith P. Brodock, P.E., LEED AP

Senior Managing Engineer

PROFESSIONAL PROFILE

Mr. Keith Brodock is a professional engineer with more than 10 years of experience in environmental risk analysis, real estate portfolio liability estimation, transactional risk evaluation, remediation and stormwater design, and construction management. One of his primary responsibilities is managing and quantifying transactional risks for brownfield properties. Mr. Brodock routinely consults purchasers and sellers on the regulatory climate, technical interpretations, and risk mitigation measures, including engineering designs and implementation. He frequently supports fate and transport modeling of vapor intrusion cases and engineering designs for mitigation systems. Mr. Brodock utilizes data management software, including GIS and EQuIS, to conceptualize and simply explain the spatial distribution and meaning of environmental data. He also serves as resident engineer on multiple construction projects in the New York City area.

CREDENTIALS AND PROFESSIONAL HONORS

B.S., Chemical Engineering, Clarkson University, Potsdam, New York, 2003

Professional Engineer, Delaware (License No. 18630), New York (License No. 089004), Maryland (License No. 44309)
Leadership in Energy and Environmental Design Accredited Professional (2009)

CONTINUING EDUCATION AND TRAINING

Hazardous Waste Operations and Emergency Response 40-Hour Certification (2003 to present)
Hazardous Waste Operations Management and Supervisor 8-Hour Certification (2004)
OSHA 10-Hour Construction Safety Training (2012)
New York State (NYS) Asbestos Project Designer Training
Transportation Worker Identification Credential (Expires 2020)

PROFESSIONAL AFFILIATIONS

Urban Land Institute, Redevelopment and Reuse Product Council (2012 to present)
Urban Land Institute, New York District Council, Mentoring Co-Chair (2013 to present)
Urban Land Institute, NY Mentor Program Chair (2011 to 2013)

National Society of Professional Engineers (2011 to present)
Montclair Environmental Commission, Alternate Commissioner (2013 to present)

RELEVANT EXPERIENCE

Real Estate Transactions

Private Acquisition of Excess Government Property, Washington, DC—Advised joint venture client on potential environmental liabilities associated with the acquisition of the steam-generating West Heating Plant in Washington, DC. Performed scenario analysis of potential contamination events (in soil, groundwater, and building materials) and developed expected costs therefor. Our evaluation allowed the joint venture client to move forward with and win the auction. During contracting, supported the procurement of environmental insurance for added risk protection. Continuing to support joint venture client with NPDES permit compliance.

Superfund Property Disposition and Liability Transfer, Wall, New Jersey—Advised on the sale of 650-acre encompassing a federal Superfund site and more than 600 historical tenants. Assisted with development of the selected remediation proposal for a $1.5 million shooting range cleanup. Provided review of liability transfer offer, including cost/benefit analysis, insurance funding, and remediation cost-overrun risk using Monte Carlo modeling. Supported negotiations with EPA and the U.S. Department of Justice (USDOJ) to allow private takeover of remediation activities. Performed New Jersey Industrial Site Recovery Act investigation of more than 600 historical tenants as a requirement of the transaction.

Real Estate Portfolio Acquisition Support, Staten Island, New York—As part of client's acquisition of real estate investment trust, advised on environmental risks of the Staten Island property. With a state Superfund manufactured gas plant (MGP) site adjacent to the property, communicated potential liabilities to client. Worked in conjunction with seller's environmental consultant to conduct a soil gas / indoor air evaluation. Performed critical review of seller's soil vapor report.

Brownfield Program Property Disposition, Manhattan, New York—Supported the transaction of two properties that completed the New York State Brownfields Cleanup Program. One property contained a school under construction and the other was a vacant lot. Helped to provide the buyer's team with a complete understanding of the environmental history, and prepared an engineering certification attesting to compliance with ongoing monitoring requirements.

Cypress Equities Land Acquisition, King of Prussia, Pennsylvania—Advised on pending land acquisition deal after conducting an in-depth environmental review and limited subsurface investigation. Developed a probabilistic cost estimate spanning the identifiable areas of concern for all of the multiple investigation/remediation scenarios applicable under the Act 2 regulations in Pennsylvania.

Not-for-Profit Land Acquisition and Development, New York, New York—Supported a not-for-profit organization in the acquisition and development of various tracts of land to build a

charter school. Assisted with the Phase I evaluations. Prepared scopes of work for Phase II investigations. Managed the development of the regulatory interaction strategy with the New York City School Construction Authority. Provided sound engineering support for the development of subsurface remediation/mitigation measures for the protection of schoolchildren's health.

Phase I Investigations, Various Properties, New Jersey, Arkansas, New York, Connecticut—Conducted Phase I and Phase I/II hybrid investigations according to ASTM standards, both pre- and post-EPA All Appropriate Inquiries. Integrated state requirements into the analyses. Included radon, drinking water, and indoor air analysis, as required.

Brownfields

Public Charter School Construction, Mott Haven, Bronx, New York—Managed the environmental remediation and construction for the KIPP Bronx New York City (NYC) school. As owners' representative, assisted with generating specifications for the work, leading to zero successful change orders. Worked with the design engineer to develop the remediation system using green design principles. Led the project team overseeing the implementation of the remediation and led the office team reviewing submittals from the contractors. The remediation included contaminated soil excavation and disposal, installation of a sub-slab depressurization system (SSDS) and vapor barrier, underground storage tank (UST) removal, and petroleum spill closeout. Collaborated with structural, geotechnical, and electrical engineers. Worked with New York State Department of Environmental Conservation (NYSDEC) spills (Region 2) and environmental remediation (Albany) groups, School Construction Authority (Industrial & Environmental Health, and NYC Office of Environmental Remediation (OER) to obtain full regulatory approval. Supported the construction manager in determining eligibility of contractor claims for additional funds based on compliance with the specifications.

Petroleum Remediation System Design and Implementation, Gravesend, Brooklyn, New York—Provided professional engineering services to repair and restart a pneumatic petroleum recovery system in accordance with a NYSDEC-approved remedial action plan for a major oil storage facility on the water. After that system was destroyed in Superstorm Sandy, evaluated and implemented a skimmer recovery system to remove the petroleum. Provided oversight for the preparation of engineering estimates and schedules for completion.

RCRA Storage Area Closure, Long Island City, New York—Managed the closure of a hazardous waste storage area under the NYS RCRA program. Developed and certified (as the engineer-of-record) the RCRA closure plan. Oversaw the investigation and subsequent disposition of the impoundment area. Sealed the closure report and worked with NYSDEC to conduct the final facility inspection as the final step to closure.

Slag and Sewage Site, Past Costs and River Sediment Evaluation, Fox Point Park, Wilmington, Delaware—Managed the past cost evaluation, including human health risk assessment, and the sediment investigation in the Delaware River. Evaluated past costs from Delaware

Department of Natural Resources and Environmental Control (DNREC) for investigation and remediation liability attributable to the client. Worked with the risk assessment group to evaluate whether site risk was a cause for remediation, and whether the unacceptable risk was related to the client's alleged site constituents. Led communications with DNREC, Delaware Department of Justice, and federal trustees regarding natural resource damages, cooperative assessment, and scope of work for the RI/FS of OU-2 (Delaware River).

Industrial Scrap Recycling Site, Bronx, New York—Engineer in responsible charge for petroleum storage and stormwater management compliance. Oversaw preparation of spill prevention, control, and countermeasures; stormwater pollution prevention plan; and multi-sector general permit documentation under NYSDEC. Determined feasibility of industrial stormwater discharge to either a surface water body or city storm sewer. Evaluated historical bulkhead construction utilizing photogrammetry techniques to determine wetland adjacent area status.

Petroleum Spill Closure and PCB Investigation for Redevelopment, Long Island City, Queens, New York—Managed a UST removal/closure, petroleum spill closure, and PCB investigation for the redevelopment of a former warehouse into a large distribution facility for a national shipping carrier. Worked with NYSDEC to develop the scope of investigation and remediation. Oversaw the soil materials management at the site.

Warehouse Expansion on Waterfront Superfund Site, Maspeth, Queens, New York—Provided professional engineering services developing the site remedial design of a NYSDEC engineered cap. Assisted in developing the construction phasing to minimize potential exposure to site workers and the community. Oversaw the site stormwater treatment design by the site civil engineer.

Risk Assessment and Building Engineering Control Evaluation, Former MGP Site, Manhattan, New York—Professional Engineer and project manager for annual engineering control (waterproofing and air exchange system) inspections and repairs, as needed. Led team of vapor intrusion experts and risk assessors to evaluate potential human health effects for construction workers in subsurface structure rebuilding damaged mechanical, electrical, and plumbing systems, including the air exchange system engineering control that were damaged during Superstorm Sandy.

State Superfund Remediation and Stormwater Design, Maspeth, Queens, New York—Acted as engineer in responsible charge of the design of a state superfund remedial cap. Remedial cap was designed for direct discharge of stormwater to Newtown Creek. Collaborated with NYSDOT and NYSDEC to develop a design consistent with the needs of both agencies. NYSDOT would be constructing the designed cap as part of their construction of a nearby bridge.

Residential Development, City Island, Bronx, New York—Supported the construction of a residential development on City Island by providing certainty on cost and schedule. Collaborated with NYC OER to develop a scope of work to define remediation areas.

Provided strategy for the remedial action, and assisted with the integration of remediation into construction.

Mixed-Use Development at Former Dry Cleaner Site, Manhattan, New York—Provided engineering oversight for vapor intrusion evaluation and mitigation design at a Brownfield Cleanup Program site. Engineer in responsible charge for Brownfield Cleanup Program activities. Worked with NYSDEC, client, and the current property owner to identify a mitigation strategy to prevent future infiltration of soil gas with elevated chlorinated solvent concentrations. Currently overseeing the preparation of investigation work plan to delineate known soil and groundwater concentrations of dry cleaning fluid.

Former Woodhaven Bowl Site, Forest Hills, Queens, New York—Managed the team to concurrently satisfy five regulatory agencies (including NYS and NYC agencies), a then current landowner inexperienced at brownfield redevelopment, and a demanding future tenant with an extremely tight construction schedule to facilitate redevelopment. Utilized careful, advanced planning to facilitate the evaluation of each stakeholder's objectives. Used direct-sensing equipment (membrane interface probe) to quickly evaluate the potential release areas. Designed and oversaw the construction of a SSDS serving 40,000 ft^2 of retail space. Achieved the project objectives by delivering a building ready for development by the tenant.

Residual Light Nonaqueous Phase Liquid (LNAPL) Investigation/Remediation, Long Island City, New York—Designed and managed the investigation and remedial actions at a former fueling depot. Identified data gaps in the previous consultant's work and designed a characterization plan to reduce the uncertainties in the conceptual site model. The characterization plan was integrated with the remedial action plan so only one field mobilization was necessary. Design included an *in situ* chemical oxidant injection as the remedial action. The remedial action is currently being implemented.

Subsurface Investigation and Tank Removal, Jersey City, New Jersey—Managed a subsurface investigation at a warehousing property that contained railroad sidings, improperly closed USTs and an aboveground fueling operation. Coordinated the removal/closure of the fueling operation and building demolition. Provided consultation on the investigation results to assist the client in securing financing for the property.

Former Oil Terminal Investigation and Remediation, Brooklyn, New York—Supported the property owner through negotiations with the NYSDEC, as part of a groundbreaking deal where NYSDEC agreed to clean up a state Superfund site that was owned by a private entity. Assisted the inter-governmental team with triad planning and design to achieve a rapid subsurface investigation/characterization. Developed a work plan that included demolition and disposal of PCB-containing equipment.

Dual-Phase Extraction and Discharge Compliance Engineering, Northern New Jersey—Led a team to deploy a packaged solution to lower the concentrations of non-compliant water being discharged to a river, in which 60 percent of the chemicals causing the exceedance could not be identified by conventional laboratory techniques. Implemented enhancements to a

high-vacuum, dual-phase extraction (DPE) remediation system, resulting in increased mass removal rates and system uptime. Achieved long-term cost savings in the form of decreased time onsite and automated task development. Developing a comprehensive systems management tool that uses engineering statistics to prescribe proactive solutions to maintenance and system exceedance issues. Created a U.S. Securities and Exchange Commission (SEC)-compliant cost estimate model that encompasses various remediation strategies through end-of-project lifecycle.

Surfactant Soil Remediation, Margate City, New Jersey—Project engineer and subcontractor manager for the remediation of a #2 fuel oil release beneath a residence. Applied an innovative surfactant flushing program to mobilize and extract adsorbed fuel oil from the soils. Careful planning and immediate reaction to changing site conditions were necessary to prevent further oil migration or the settling of a $3 million mansion. Successful management of multiple subcontractors led to a soils closure within the project deadline.

Subsurface MGP Investigation, Manhattan, New York—Evaluated and interpreted the results of more than 700 samples collected during a subsurface investigation at a former MGP site. Composed the data analysis portion of the site characterization report for submittal to NYSDEC. Also supported subsurface field activities while acting as client liaison to the public.

Dual-Phase Remediation System Improvements, Newark, New Jersey—Analyzed performance issues of a catalytic oxidizer, part of a DPE remediation system. Determined that the control system was failing and causing false alarms. Led the team to implement a redesigned alarm system to better diagnose system trouble conditions.

Heavy Metal Statistical Source Separation, Virginia—Supported team in separating heavy metal contamination sources through electron microscopy and elemental analysis. Based on the differing elemental properties of various sources of lead, employed the use of statistical analysis to parse the portion of contamination that was likely attributable to the client from the entire mass, thereby saving money in remediation costs.

Biennial Certification Reporting, Various Locations, New Jersey—Oversaw biannual monitoring activities and biennial certification filings as part of New Jersey Department of Environmental Protection (NJDEP) agreements. Coordinated scheduling with clients and tenants for biannual property inspections. Completed biennial certification reporting process to NJDEP and various local entities.

Vapor Intrusion

Pilot Test and SSDS Installation, Lakewood, Washington—Senior technical oversight for SSDS pilot test and installation for a national car rental location. Evaluated vapor intrusion conditions and prepared potential mitigation strategies. Supported staff in developing a scope of work for subcontractor, and advised on testing and installation coordination and execution.

Vapor Intrusion Investigation, Williamsburg, Brooklyn, New York—Professional engineer for vapor intrusion investigation at a former dry cleaning fluid distribution facility applying

for the Brownfield Cleanup Program. Reviewed offsite soil vapor data to develop a conceptual site model as the basis for a soil vapor intrusion investigation program. Supported the application of the facility to the Brownfield Cleanup Program.

Vapor Intrusion Evaluation, Woodside, Queens, New York—Developed strategy for vapor intrusion evaluation and potential mitigation to protect residents and move forward with refinancing. Reviewed strategy with NYSDEC and New York State Department of Health (NYSDOH). Worked with the lender to satisfy their requirements to continue with refinancing.

Farrand Controls State Superfund Site, Valhalla, New York—Identified source and fate and transport of vapor-phase chlorinated solvents within a commercial/industrial operation to support the construction of a mitigation action. Traced the airflows from four distinct heating/cooling zones throughout the building to understand mixing and transport of the chlorinated solvents, as the highest readings of vapors did not match the site conditions. Identified the entry point of the vapors from contaminated groundwater beneath the site. Performed a pilot test for and designed an active SSDS for the slab-on-grade portions of the building. Recommended a cost-effective solution to mitigate vapor intrusion in the building basement.

Vapor Intrusion Investigation, Cranford, New Jersey—Managed vapor intrusion investigation on properties adjoining a chlorinated solvent spill. Negotiated access agreements with abutting property owners and tenants. Organized subcontractors' work to minimize business interruption while still maintaining the integrity of the investigation. Educated the neighboring property owners on the significance of the results and communicated continuing action plans to them.

Mayflower Cleaners State Superfund Site, Great Neck, New York—Evaluated the fate and transport of multiple sources of tetrachloroethylene (PCE; dry cleaning fluid) to support the preparation of a remedial action. The fate and transport evaluation included a known source beneath the slab of the building and a potential source from the adjacent dry cleaning operation. Developed a conceptual airflow model. Created the communication strategy with the regulatory agencies. Designed and managed the implementation of an interim remedial measure to mitigate the flow of PCE vapors from beneath the slab to the occupied tenant space. Currently implementing the record of decision with NYSDEC.

Vapor Intrusion Mitigation and Groundwater Investigation, Mahopac, New York—Designed and installed an SSDS after performing a sub-slab communication test for NYSDOH and NYSDEC. Responsible for coordination of annual system inspection and reporting, and tenant/owner education and guidance. Also coordinated quarterly groundwater sample reporting to NYSDEC.

Chemical Release Investigation with Vapor Intrusion Testing and Mitigation, Ridgefield, New Jersey—Oversaw field investigation to delineate a diving chlorinated solvent plume in a windowed confining layer. Developed a permanent vapor intrusion mitigation plan after conducting an indoor air investigation that revealed potential impacts to human health.

Assisted in designing, permitting, and installing the SSDS intended to disperse organic vapors before entering the office building. Implemented risk mitigation plan that included automatic remote notification if the SSDS failed.

Financial Analysis and Reporting

Streamlined SEC Environmental Liability Reporting, Seattle, Washington—Using Lean techniques, developed a streamlined budgeting and liability reporting process that increases value while adhering to reporting regulations. With focus on increasing stakeholder value, merged the budget process that the consultant team used with the SEC liability reporting process that the client desired. Developed software to automate the reporting and updating procedure. Worked with the corporate liability manager to conform to both SEC and internal accounting policies.

Real Estate Portfolio Valuation, Long Island, New York—Developed defensible liability estimates, which led to a $7 million savings in an IRS settlement. Working with a real estate appraiser, evaluated the assets and environmental liabilities in a 17-property portfolio at three key points in time. A remedial strategies matrix for the different time periods was merged into a decision tree with the properties' contamination characteristics using Monte Carlo simulation. An effective combination of computer estimation/ simulation tools (RACER and Monte Carlo) was used to justifiably support the estimates to the IRS.

Environmental Remediation Estimates Using Monte Carlo Analysis, Various Locations, U.S.—Determined and communicated environmental remediation cost risk to clients. Assisted owners with their internal budgeting process to communicate to their management the likely, best, and worst case scenarios. By understanding the range of costs associated with the project, management was equipped to make better decisions on expense allocation. Certain projects incorporated the management science of decision-tree analysis to consider alternate remedial technologies. In fact, the client was able to select a remedy based on the risk profile.

Remedial Strategy Selection through Probabilistic Estimating, Central Vermont Public Service, Vermont—Provided probabilistic estimating for different remedial strategies that helped the client to decide which decision-tree path was most appropriate for its business model. Utilized decision management tools in conjunction with cost estimates and sensitivity analyses to provide a full understanding of the likely results of choosing one strategy over another.

Remedial Scenario Cost Estimating, Various Locations, U.S.—Developed large-scale remediation cost estimates using RACER for an automobile-industry client. Based on the remedial investigation data results, created low/medium/high range cost estimates that encompassed a "no further action" option all the way to installing and operating high-end remediation systems for many years. These cost estimates were presented to the court as part of a package to support emerging from bankruptcy.

Defensible Environmental Liability Reports, Various Locations, U.S.—Performed multiple mathematical simulations for cost estimation and disclosure under Sarbanes-Oxley reporting requirements for environmental liability. Incorporated decision management structures into multiple-site and multiple-option estimates. Results provided were defensible estimates that evaluated entire liability portfolios.

Geothermal Testing and Design

First-Ever Standing Water Column (Open-Loop) Geothermal Study, New Haven, Connecticut—Designed first-ever geothermal standing water column exchange study to characterize the thermal capacity of the proposed geothermal cooling system. The study simulated system loads and observed subsurface effects to qualify wells to sustain continued operations while preventing emergency discharges (bleed-off) to the local sewer authority. Results include determining the effects of various temperature differentials, load cycling, and high-permeability zones. The study results were subsequently utilized to design the optimal geothermal well network by minimizing the cost of the wells while ensuring adequate thermal capacity during peak loading. This work was performed as part of an overall sustainable design effort under the Leadership in Energy and Environmental Design (LEED) New Construction program. The project was awarded LEED Platinum certification.

Standing Water Column Geothermal Design, New Haven, Connecticut—Conducted a geothermal response test for a private developer constructing a 700,000 square foot residential/retail complex. The results of the geothermal response test were used to design the optimal geothermal network that would provide an efficient level of heating/cooling for the building. This project has been selected by the U.S. Green Building Council as a pilot project for the LEED Program for Neighborhood Development.

Automated Closed-Loop Geothermal Analysis, Cambridge, Massachusetts—Assisted in constructing an automated geothermal closed-loop test that conformed to American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) building specifications. Modified existing open-loop thermal response testing equipment to perform unmanned closed-loop tests of shallow geothermal wells. Automated the system to perpetually adjust to stay in conformance with ASHRAE test methods. The equipment included a remote monitoring component for instantaneous data review and troubleshooting.

Property Management

Building Environmental Management, New York, New York—Oversaw emergency response to building water intrusion events to prevent the growth and subsequent abatement of mold spores. Conducted property visits to review Phase I action item implementation.

Litigation

Litigation Support for Petroleum and Chlorinated Solvent Releases, Edgemere, Queens, New York—*Alprof Realty v. Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints*, Civ. No. 09-cv-05190 (U.S.D.C. E.D.N.Y.): Provided litigation support for the Church

against a plaintiff that alleged responsibility for a chlorinated solvent plume allegedly migrating to the plaintiff's site from the defendant's property. Analyzed the subsurface information and identified erroneous depictions in the other expert's work. Identified potential release points and developed transport mechanisms utilizing the scientific method that demonstrated that contamination from defendant's property did not significantly flow onto plaintiff's property.

Litigation Support for Petroleum Source Identification and Cleanup Evaluation, Poughkeepsie, New York—Marist College and Marist Real Property Services, Inc. v. Chazen Engineering Services Inc., et al., Index No. 2365/09 (Supreme Court, State of New York, Dutchess County): Provided litigation support for Harris Corporation against plaintiffs alleging widespread petroleum contamination from a former owner' UST. Demonstrated that few petroleum impacts, if any, were attributable to Harris, and that the vast majority of excavated materials were either not contaminated or contaminated from other sources. Further demonstrated that most of the soils were excavated for construction purposes, rather than for remediating a petroleum spill, and, therefore, only the incremental cost of disposal would be attributable to the petroleum impacts.

Litigation Support for Construction Defect Claim, Portsmouth/Tiverton, Rhode Island—Cashman Equipment Corporation, Inc. v. Cardi Corporation, Inc., et al., C.A. NO. PC 11-2488 (Rhode Island Superior Court): Provided litigation support for a construction contractor against a subcontractor. Supported expert engineer in applying photogrammetry techniques to site construction photos in order to evaluate the placement of structural foundation elements (now encased in concrete). Concluded that the structural elements were not placed in accordance with the design drawings.

Litigation Support for Lead Impacts, Carteret, New Jersey—Reichhold, Inc. v. United States Metal Refining Company, et al., Civ. No. 03-453 (U.S.D.C., D.N.J.): Provided litigation support for a large, multinational mining and refining company against a plaintiff that alleged responsibility for lead impacts at a previously owned site. After review of the data, developed visual aids for court showing that the lead impacts were generally limited to areas where the plaintiff raised the grade with fill. Supported the science and legal teams during trial preparation and throughout the trial by gathering additional supporting evidence and generating opinions on new evidence submitted by plaintiff and testimony by plaintiff's consultants.

Litigation Support for an Oil Spill Investigation, Long Island City, Queens, New York—DMJ Associates, L.L.C. v. Capasso, et al., Civ. No. 07-285 (U.S.D.C., E.D.N.Y.): Provided litigation support for a New York City developer that resulted in rapid settlement of the case. Designed and executed a field investigation to locate preferential pathways for mobilized LNAPL across multiple properties and a local waterway. Examined chemical fingerprints to determine the extent of migration. Scientifically demonstrated that not only did the LNAPL contaminate the property at hand, but also contaminated adjacent properties and was discharging directly into the Newtown Creek.

Litigation Support for Federal Superfund Site, Lawrence Aviation Industries, Port Jefferson, Long Island, New York—United States of America v. Lawrence Aviation Industries, Inc., et al., Civ. No. 04-818 (U.S.D.C., E.D.N.Y.): Provided litigation support for Lawrence Aviation Industries (LAI) to defend against a USDOJ lawsuit alleging widespread trichloroethylene contamination. After reviewing the investigation reports, determined that there was no scientific link to a portion of the alleged contamination, and, in fact, there appeared to be a second source. Appeared before USDOJ and EPA to argue these new findings in favor of LAI. Additionally, discussed the potential for EPA to relinquish site control to LAI, so that LAI could implement a more modern and effective remedial strategy, rather than the antiquated, likely-unsuccessful technology mandated in the record of decision.

Underground Storage Tank Release Date Determination, Southern New Jersey—Used statistical analysis to determine when a UST began leaking. Conducted a detailed analysis of the fuel delivery receipts as compared to the local weather conditions. Using statistical methods, the initial discharge time frame was determined with 95 percent confidence.

Litigation Support for a Release Migrating toward I-95, Secaucus, New Jersey—Provided opinion on remedial investigation and action plans to negotiate a delay in litigation (with client). Worked with opposing party to incorporate additional scope of work into its investigation plan to fully characterize the release to groundwater. By successfully working with the opposing party's consultant, was able to delay the expense of trial for the client.

Litigation Support, Various Locations, New Jersey and New York—Provided technical review and opinions on various legal matters, mostly involving allocating liability for contamination. Disputed claims of scientific certainty for age-dating analyses of various methods. Collected and analyzed samples to produce independent liability allocation opinions.

PRESENTATIONS/POSTERS

Brodock, K., J. Rhodes, and P. Tornatore. 2005. Improving experience-based engineering estimates for environmental liabilities using Decisioneering® software. National Groundwater Association Conference on Remediation: Site Closure and the Total Cost of Cleanup.

Rhodes, J., and K. Brodock. 2005. Estimating environmental liabilities using probabilistic engineering methods. Web seminar.

Brodock, K., and J. Rhodes. 2005. Engineering estimates for environmental liability à la Crystal Ball. Crystal Ball Users Conference.

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Senior Managing Scientist

PROFESSIONAL PROFILE

Ms. Alana Carroll is an environmental geologist with experience managing a variety of environmental consulting projects in the New York metropolitan area and specializing in remedial investigations, conceptual site modeling, and remedial design and implementation. Ms. Carroll provides analytical, technical, and regulatory guidance to clients, including developers and environmental attorneys, on a variety of projects in various stages of investigation, remediation, and redevelopment and has managed projects in the New York State Brownfield Cleanup Program, the New York State Department of Environmental Conservation (NYSDEC) Spills and Voluntary Cleanup Programs, and New York City "e" Designation Program.

CREDENTIALS AND PROFESSIONAL HONORS

B.S., Geology, Hofstra University, Uniondale, New York, 2003

CONTINUING EDUCATION AND TRAINING

Graduate Coursework, Master's Program, Geology, Brooklyn College, Brooklyn, New York
Hazardous Waste Operations and Emergency Response 40-Hour Certification (2004; refreshers 2005, 2006, 2007, 2009, 2010, 2011, and 2012)
First Aid and CPR Certified (2012)
Amtrak Contractor Safety Training (2010 and 2011)

PROFESSIONAL AFFILIATIONS

Member of Geologic Society of America
Member of New Partners for Community Revitalization

RELEVANT EXPERIENCE

New York State Brownfield Cleanup Program, 520 West 28th Street, West Chelsea, Manhattan, New York—Managed multiple investigations to address New York State Spills, New York City E-Designation, and New York State Brownfield Cleanup programs. Prepared scopes of work to address requirements of both state and city regulations. Coordinated with city, state, and adjacent property owners for full scale excavation. Negotiated a nuanced

approach to support excavation that allowed material to be left onsite, while still meeting a Track 1 Cleanup.

New York State Brownfield Cleanup Program, Willets Point Development, Queens, New York—Managed the Brownfield Cleanup Program application and Phase I environmental site assessment effort for 45 parcels of industrialized land. Coordinated with multiple interested parties, including New York City Department of Housing Preservation and Development and the Economic Development Corporation.

New York State Brownfield Cleanup Program, 1299 First Avenue, East Side, Manhattan, New York—Managed multiple investigations to address onsite chlorinated solvent DNAPL in bedrock fractures. Site challenges included investigation and remedial action within existing, occupied building sites.

New York State Brownfield Cleanup Program, 34th Street and 42nd Street, West Side, Manhattan, New York—Designed and managed multiple investigations to address New York State Spills and Brownfield Cleanup programs. Prepared scopes of work to address requirements of both state regulations and those agreed to by the former owner. Coordinated with NYSDEC to modify scopes based on field observations and limitations, which resulted in not having to mobilize for additional investigations. Coordinated with multiple entities for access to perform investigations, including Javits Convention Center, Amtrak, New York City Department of Transportation, Metropolitan Transit Authority, and their contractors. Developed a three-phase analysis plan with the laboratory to determine the minimum required extent of excavation next to an Amtrak line while limiting analytical costs, decreasing in the extent of excavation, and lowering disposal and structural support requirement costs.

New York State Brownfield Cleanup Program 388 Bridge Street, Downtown Brooklyn, New York—Designed and managed all on- and offsite investigations of soil, soil gas, groundwater, and indoor air, including coordination of staff and subcontractors. Prepared investigation reports for submittal to client, project team, NYSDEC and the New York State Department of Health (NYSDOH). Participated in project team decision making with clients, lawyers, construction manager, and other consultants. Managed New York City Transit approvals for subsurface investigations near subway lines. Coordinated offsite access in residences, commercial spaces, and a private school. Participated in soil vapor extraction pilot test implementation and reporting. Helped with implementation of an offsite subslab depressurization system in an existing building; activities included system design/layout, installation oversight, testing, and long-term operation and maintenance. Responsible for NYSDEC/NYSDOH coordination and reporting for all investigations. Tracked project activities for inclusion in NYSDEC/NYSDOH programmatic submittals, including monthly reports and remedial schedules.

New York Department of Environmental Remediation, Class 2 State Superfund, Laurel Hill Site, Queens, New York—Managed multiphase, multiparcel project involving design, installation, and ongoing operation, maintenance, and monitoring of six remedial caps. Site challenges

included the division of the site into individual parcels that were independent of one another; subsequently, each parcel had a stormwater management design individual to the surrounding parcels. Other site challenges included the site position in a wetlands area fronting Newtown Creek and working with the New York City Department of Transportation to facilitate its schedule for the adjacent Kosciusko Bridge restoration.

New York State Brownfield Cleanup Program, Uniforms for Industry, Queens, New York—Designed and managed an alternative approach to the offsite soil vapor intrusion investigation. Utilized soil vapor modeling to evaluate potential human health risks and migration probabilities. Provided support for the design of a retrofitted passive venting system.

New York City Voluntary Cleanup Program West 28th Street, West Chelsea Manhattan, New York—Managed multiple investigations for satisfaction of E-Designations on a site below the High Line. Challenges included coordination with an adjacent property full scale excavation and construction excavation beneath the High Line.

New York State Spills Program, Gotham Center, Queens, New York—Responsible for proposal and budget development, subcontractor selection and coordination, negotiation, and preparation of subcontractor terms and agreements, budget, and invoice review for a comprehensive subsurface investigation. Prepared and implemented scope of work for delineation of soil contamination and calculation of contaminant mass estimates. Subsequent to interpretation of site data and subgrade characteristics, developed and presented remedial alternatives and associated costs for internal and client project teams. Prepared remedial investigation report in coordination with the New York City Economic Development Corporation and the client for submittal to state regulators.

New York State Brownfield Cleanup Program, Uniforms for Industry, Queens, New York—Designed and managed an alternative approach to the off-site soil vapor intrusion investigation. Utilized soil vapor modeling to evaluate potential human health risks and migration probabilities. Provided support for the design of a retrofitted passive venting system.

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Glenn Esler
Scientist

PROFESSIONAL PROFILE

Mr. Esler has more than 30 years of experience in the field of environmental chemistry, including 15 years in quality assurance and data quality management and 5 years as a GC/MS analyst. His technical specialties include design and implementation of laboratory quality management programs, laboratory and field audits, and data interpretation and assessment of compliance with regulatory requirements and project objectives. He has an in-depth working knowledge of EPA environmental analytical methods and EPA Contract Laboratory Program (CLP) national functional guidelines for data review. His experience includes environmental analysis, data verification and validation, preparation of quality assurance documentation, and coordination of subcontracting laboratories. He is also credentialed as a Certified Laboratory Auditor.

CREDENTIALS AND PROFESSIONAL HONORS

Sustainability Leadership Program Certificate, University of Oregon, Portland, Oregon, 2013
B.S., Geography, Portland State University, Portland, Oregon, 2008
A.S., Chemistry, Millersville University, Millersville, Pennsylvania, 1984

Certified Laboratory Auditor, iNARTE, 2009

CONTINUING EDUCATION AND TRAINING

EPA Office of Emergency and Remedial Response, 40-Hour Health and Safety Course (2010)
Certified Laboratory Auditor Training and Credentialing Program, iNARTE (2009)
Naval Sea Systems Command Laboratory Quality and Accreditation Office Sampling and Laboratory Testing E-Learning Training (2009)
Radiometric Data Validation, American Radiochemistry Society (2009)
SDSFIE Web Online Training Course (2005)
Analysts Guide to NELAC Assessment Short Course, Advanced Systems, Inc. (2004)
Basics of Quality Improvement Short Course, University of Delaware (1996)
Environmental Data Quality Short Course, American Chemical Society (1992)

RELEVANT EXPERIENCE

Quality Assurance and Quality Control

Airplane Manufacturer Superfund Site Laboratory and Field Audits, Washington—Conducted onsite laboratory and field audits in support of remedial action and treatment systems related to groundwater contamination. Wrote final report that provided an assessment of the laboratory and field sampling team's performance and ability to provide high-quality, defensible data, and areas where improvements are required.

NOAA, Lower Duwamish River (LDR), Washington—Conducted research related to the Natural Resources Damage Assessment program for PAH allocation in LDR sediments. Research was based on PAH footprint maps, tax parcel information, data from EPA and Ecology files, site histories, and other publically available reports produced over the last several decades. Also used Google Earth and ESRI's ArcView to aid in allocation to multiple sites along the LDR.

Energy Distribution Company, Indiana—Assisted with work plan preparation, laboratory coordination, and data validation, data review, and data quality assessment on public sewer sediments and stormwater sampling at the site. The site was identified as a potential source of PCBs to a public sewer system and river sediments associated with a National Priorities List site.

Railroad Transportation Laboratory Audits, Multiple Sites, United States—Conducted onsite laboratory audits and provided assistance in conjunction with the Laboratory Management Program. The program included establishment of a web site for distributing program information, development of a web-based project management tool to handle laboratory projects, documentation of laboratory procedures in an online and hardcopy manual, solicitation and establishment of standardized pricing for laboratory work, and presentation of the program to railroad officials, laboratories, and consultants. Also audited laboratories analyzing NPDES samples on behalf of client: evaluated laboratory reports for completeness, verification of reporting limits, and laboratory standard operating procedures. Wrote final report that provided an assessment of the laboratory's performance and ability to provide high quality, defensible data, and areas where improvements were required.

Cleanup of Base Oil/Water Separators, Air Force Center for Environmental Excellence, Grissom Air Reserve Base, Indiana—Assisted with quality assurance project plan (QAPP) preparation and DQOs and performed data validation, data review, and data quality assessment in conjunction with the site activities, which included sampling, analyzing, cleaning, collecting, removing, manifesting, and properly disposing of materials for nine oil/water separators in accordance with applicable state regulations.

Selfridge Air National Guard Base, Michigan—Assisted with QAPP preparation and formulation of DQOs for the collection of data to support the evaluation of the corrective action measures, site characterization, and determination of extent of contamination at a Michigan Air National Guard Base.

U.S. Department of the Navy, Naval Facilities Engineering Command Southwest, California—Assisted with the preparation of the pre-design sampling and analysis plan and remedial action work plan for the remedial design and remedial action at IR Site 1. Also assisted with laboratory procurement of analytical services and procurement of third-party data validation services.

Groundwater Monitoring Program, Arizona—Assisted in the development of the site-wide quality assurance management plan and the QAPP for an EPA Superfund site. Contaminants of concern were VOCs and perchlorate. Activities included groundwater program planning and execution, groundwater sampling, quarterly and annual reporting, QA/QC, data validation, and project problem solving. Supported the Project QA Manager, which included providing data validation, tracking quality control parameters, and handling laboratory data quality issues.

Partial Database Rebuild for a Sawmill Facility, Montana—Provided technical support for the partial reconstruction of the project database after discrepancies were found during quality assurance activities. Review third-party data validation reports and updated associated electronic data deliverables as appropriate.

Emergency Response at Bulk Chemical Terminal, New Orleans, Louisiana—Assisted with data analyses and audit of the analytical laboratory charges for samples collected related to the emergency response and cleanup of a chemical spill caused by flooding of a bulk chemical terminal during Hurricane Isaac.

Engineering Evaluation and Cost Analysis for a Former Chemical Manufacturing Facility, Portland, Oregon—Revised project QAPP based on EPA comments on a sediment sampling work plan, which was prepared to collect data for pre-remedial design to address sediments adjacent to the site. Coordinated with analytical laboratories for methods, quality control criteria, SOPs, quality assurance documentation, and costs for additional analyses. Researched and co-authored technical memorandum to EPA on the passive sampling effort to measure the freely dissolved porewater concentrations of DDT and its metabolites, PCDD/Fs, and PCBs described in the porewater chemistry section of the work plan.

Project Chemistry

Rail Yard Air Monitoring, Various Sites, Montana—Served as project chemist for semiannual air sampling program related to indoor air monitoring at several active rail yards throughout Montana. Oversaw data validation effort using various air analytical methods, including EPA TO-15 and MADEP VPH. Reviewed data validation reports and associated electronic data deliverables.

Air National Guard, One Clean Program, Multiple Sites, North/Midwest Region—Served as project chemist and oversaw preparation of the QAPP, data validation, and data management for this accelerated turnaround project, which included field investigation activities to determine the presence of environmental contamination at identified areas of concern at 38 sites at 11 installations in the Air National Guard's North/Midwest Region.

Oversaw the following: management of all analytical data using the Equis data management tool; Level III data validation consistent with the Environmental Restoration Program Air National Guard Investigation Guidance; creation of export templates from the database; generation of data tables for the Site Inspection Report; and the electronic data deliverables for the ESOH-MIS database.

Niblack Mining Corporation, Ketchikan, Alaska—Prepared a QAPP revision in support of routine monitoring of surface water and groundwater quality. Assisted in coordinating project logistics, sending sampling equipment to a remote location in Alaska, and subsequent delivery of samples to the analytical laboratory. Monitored laboratory's progress on sample analyses and reviewed and validated analytical results. Supported preparation of data quality reports summarizing analytical results.

Water Quality Monitoring for a Volcanogenic Massive Sulfide Mine Exploration Project, Alaska—Assisted with QAPP preparation in support of monitoring of surface water and groundwater quality. Assisted in coordinating project logistics, sending sampling equipment to a remote location in Alaska, and subsequent delivery of samples to the analytical laboratory. Monitored laboratories' progress on sample analyses and reviewed and validated analytical results.

Data Management and Validation

Deepwater Horizon Oil Spill, Natural Resource Damage Assessment—Working in conjunction with the natural resource damage assessment team responding to the *Deepwater Horizon* accident and oil spill in the Gulf of Mexico on behalf of BP Exploration & Production Inc. Provided chemistry support and performed data validation and review of data validation reports associated with the environmental sample collection activities.

Industrial Site Data Validation, Vancouver, Washington—Performed data validation for a project involving the presence of chlorinated solvents at an active manufacturing facility in Vancouver, Washington. Project included groundwater monitoring and nearby residential air sample analyses, which are being used by the Washington State Department of Ecology for human health risk assessment.

Electrical Equipment Repair Facility Site Investigation Data Validation and Data Quality Assessment, Oregon—Performed data validation, data review, and data quality assessment for the site investigation of historical PCB releases at an electrical equipment inspection, service, and repair facility. The site was identified by the Oregon Department of Environmental Quality as a potential source of PCBs detected in the public stormwater system and in Willamette River sediments.

Groundwater Monitoring Program Data Validation, Beaverton, Oregon—Performed validation of groundwater chemistry results generated as part of a RCRA Corrective Action Program. Monitoring required for the project included VOCs and Appendix IX List compounds.

Fort Lewis Thermal Remediation Project Data Review and Validation, Fort Lewis, Washington—Performed chemical data review and validation on project data, including water and air

samples for hydrocarbon and VOC analyses, using GC/photoionization detector and GC/MS, for a remediation project at Fort Lewis using electric resistance heating. The project was designed by U.S. Army Corps of Engineers to be performed using near-real-time data from a mobile laboratory to make decisions about the remediation process using the Triad Approach.

Field Investigation Oversight and Report Preparation for a Coal-Fired Electrical Power Plant, Indiana—Performed data validation for a large environmental investigation of a coal-fired power plant. Data included groundwater, soils, and plant tissues.

Interim Remedial Actions/PCB Soil Removals, Cape Canaveral Air Force Station, Brevard County, Florida—Performed data validation and data assessment for a RCRA Interim Measures delineation and cleanup effort at Space Launch Complex 40 at Cape Canaveral Air Station, Florida. The project involved delineating TSCA levels in soil to determine PCB concentrations >50 ppm.

Voluntary Property Assessment (VPA) Activities, Former Crosstie Chipping Facility, Alabama—Performed data validation and data assessment for VPA investigation activities. Work included collection of numerous soil, sediment, surface water, groundwater, and macroinvertebrate samples to evaluate the extent of PAH impacts to the site and surrounding areas resulting from former crosstie chipping operations.

Former Truck Manufacturing Facility Remediation Data Validation and Data Quality Assessment, Washington—Performed data validation, data review, and data quality assessment for remediation of a former truck manufacturing facility located adjacent to the Duwamish River. The project work consisted of the collection of stormwater and tidal sediments.

Memphis Air National Guard, Memphis, Tennessee—Performed data quality review and data assessment on VOC data from the risk assessment and remediation of petroleum-impacted soil and groundwater.

White Swan Cleaners/Sun Cleaners Superfund Site, New Jersey—Performed data validation on CLP data, and data quality review and assessment on the data for ongoing collection activities related to a Settlement Agreement with EPA Region 2 to conduct a RI/FS of a regional site that has been contaminated by tetrachloroethylene (PCE or "perc"). PCE (a dry cleaning solvent) has potentially impacted municipal water supply wells at a popular shoreline resort community.

Former Pharmaceuticals Facility Data Validation, Oregon—Performed data validation on the results related to the release of VOCs on the site. The primary contaminants of concern included trichloroethene, *cis*-1, 2-dichloroethene, and vinyl chloride, which were found at concentrations indicative of dense non-aqueous phase liquid.

Former Industrial Site Water Sampling Data Validation and Data Quality Assessment, New Jersey—Performed data validation, data review, and data quality assessment on the annual drinking water sampling at all homes surrounding a former industrial site, where the

chemicals of concern in groundwater include VOCs—primarily 1,1,1-trichloroethane, 1,1-dichloroethylene, and 1,1-dichloroethane.

Groundwater and Surface Water Monitoring, Naval Facilities Engineering Command (NAVFAC), Fort Gordon, Georgia—Performed data validation, data review, and data quality assessment on quarterly groundwater sampling. Quarterly monitoring of groundwater and surface water was performed under a NAVFAC contract in compliance with NPDES for a wastewater treatment facility and land-application system at the Pointes West Army Recreation Area in Columbia County, Georgia.

Site Characterization at Industrial Operation, Seattle, Washington—Performed data validation, data review, and data quality assessment on the soil boring and groundwater sampling at the site. Site activities included site characterization (i.e., field assessment, focused site characterization report, project management) at an industrial operation approximately 2.1 acres in size located in Seattle, Washington. The site was impacted with metals, PCBs, PAHs, TPH, and VOCs.

West Virginia Department of Environmental Protection Brownfield Sites Data Validation and Data Quality Assessment, West Virginia—Performed data validation, data review, and data quality assessment using EPA Region 3 modifications to CLP National Functional Guidelines associated with Phase I surface soil sampling and follow-up Phase II subsurface soil sampling, groundwater investigations, and surface water and sediment sampling at various Brownfield sites throughout West Virginia.

Massachusetts Military Reservation Closure Data Validation, Cape Cod, Massachusetts—Performed data validation of samples submitted for explosives compounds analysis and perchlorate, which are associated with verification that post-excavation bottom soils and expansion area soils are below established action levels in order to obtain closure determination for the CS-19 and CS-18 Source Area sites at the Massachusetts Military Reservation in Cape Cod. Soil samples from the expansion areas were collected using the multi-increment sampling approach proposed by Cold Regions Research and Engineering Laboratory.

Susanville Sawmill and Cogeneration Facility, Susanville, California—Performed expedited data validation and associated report writing associated with air, water, soil, and product samples collected during the overall scope of work, which included site investigations and remediation at the proposed treatment cell area and fuel and maintenance area.

Rosiclare Mine Site, Rosiclare, Illinois—Performed data validation of soil, sediment, and groundwater samples and report writing for the RI/FS effort associated with issues involving historical fluorspar mine tailings.

Rental Car Maintenance Facility, San Jose, California—Performed expedited data validation and report writing associated with samples collected during the overall scope of work, which included removal and disposal of USTs, an AST, below-ground hydraulic lifts, and a car wash structure.

Former Ashland Lease Area, Shoreham Facility, Minneapolis, Minnesota—Performed data validation of quarterly groundwater samples analyzed for anions, conventional parameters, and VOCs and report writing for the monitoring program for the four remedial actions currently underway at the site: Soil Vapor Extraction, Light Non-Aqueous Phase Liquid Monitoring and Recovery, Till Bioremediation, and Outwash Pump and Treat.

Smeltertown Superfund Site OU1, Salida, Colorado—Performed data validation of groundwater samples analyzed for metals and report writing for the annual groundwater monitoring program.

Chemical Distribution Facility, Santa Ana, California—Performed data validation of semiannual groundwater samples analyzed for PCE, TCE, chemical degradation products of PCE and TCE, and 1,4-dioxane and report writing as part of oversight of groundwater monitoring and soil remediation at the site.

Waste Rock Water Quality Assessment Open Pit Gold Mine Expansions, Nevada—Performed data validation associated with ongoing humidity cell test results of existing waste rock, alluvium, and drill cores of expansion material. Assisted with the QA report associated with the twenty-week results of the first round of humidity cell tests.

Former DDT Manufacturing Facility, Portland, Oregon—Performed data validation associated with stormwater monitoring at a former pesticide manufacturing facility under the jurisdiction of the Oregon Department of Environmental Quality. Also monitored laboratories' progress on sample analyses and reviewed and validated analytical results.

Blackwell Zinc Site, Blackwell, Oklahoma—Performed data validation associated with mitigation strategies of metals loading to the City's wastewater treatment plant resulting from infiltration of contaminated groundwater to the City's sanitary collection system.

Soil and Groundwater Investigation at Former Allied Engineering Facility, Alameda, California—Performed data validation on historical data and recent data associated with assessment and potential remediation of groundwater and sediment at the site.

Slag and Sewage Site, Past Costs and River Sediment Evaluation, Fox Point Park, Wilmington, Delaware—Performed Stage 2B and Stage 3 data validation associated with the sediment RI/FS in the Delaware River.

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Kevin P. McCarty, P.G.
Principal Geologist

PROFESSIONAL PROFILE

Mr. Kevin McCarty is a principal geologist with more than 25 years of experience providing investigative and remediation technical advice to project managers, coordinating and supervising all section staff, preparing and commenting on work plans and progress, providing guidance on protocols/equipment/specialty contractors, and organizing/coordinating schedules of staff and equipment in the performance of investigations and remediation on a wide variety of projects. Mr. McCarty worked on a wide variety of project sites that have been involved with regulatory programs and oversight of the New York State Department of Environmental Conservation (NYSDEC). These sites have included each division within NYSDEC and have covered nearly every region within New York State. Mr. McCarty has a long and trusted relationship with all levels of NYSDEC management and works with the department regularly on interpreting and implementing program enhancements. He is highly regarded for his knowledge of solid waste management in construction projects, which encompasses material generated from both upland locations and excavations, demolition of existing structures, and material removed from underwater excavation or dredging. He has worked and continues to work with all three regions of NYSDEC in the application of environmental conservation law and the New York's Solid Waste Management Policy in creating sustainable solutions on large construction efforts.

Mr. McCarty also has extensive environmental construction management experience on above and belowground projects. He has historically managed the environmental construction management aspects for the New York City Department of Environmental Protection (NYCDEP) Bureau of Engineering Design and Construction Combined Sewer Overflow Program. He continues to work with NYCDEP and has recently rewritten the NYCDEP environmental and material management specifications for the Departments $2.1 billion dollar annual capital construction program.

CREDENTIALS AND PROFESSIONAL HONORS

B.A., Geology/Earth Science, Western Connecticut State University, Danbury, Connecticut, 1985

Professional Geologist, Pennsylvania (License No. PG0024455G), Delaware (License No. S4-0001302)

CONTINUING EDUCATION AND TRAINING

Hazardous Waste Operations and Emergency Response 40-Hour Certification (1985; refreshers 1988-2012)
Hazardous Waste Operations Management and Supervisor 8-hour Certification (2008)
First Aid and CPR Certified (1988-2011)

PROFESSIONAL AFFILIATIONS

Board of Directors for the New York City Partnership of Brownfield Practitioners
Board of Directors for New Partners for Community Revitalization
Member of the Downstate Soil Reuse Committee, New York City Department of Environmental Protection
Member of the New York City Brownfields Task Force
Charter Member of the Hudson Valley Brownfields Partnership Steering Committee

RELEVANT EXPERIENCE

Emergency Response

Hurricane Sandy Flood Cleanup in New York City Financial District, New York—Managed pumping and dewatering operations following the flooding of the lower section of Manhattan. Coordinated numerous contractors with pumping capacity to clear 53 million gallons of flooded office and parking garage space that contained water and ruptured fuel oil tank contents. Effort included NYCDEP and NYSDEC permits, insurance company coordination, and building health and safety coordination for the overall effort.

Environmental Investigation

Voluntary Cleanup Agreements at a Former Manufactured Gas Plant, New York—Coordinated with city and state agencies for review and approval of documents related to 13 voluntary cleanup agreements for a former manufactured gas plant site between New York City and the State of New York under Voluntary Cleanup and Brownfields programs.

Environmental Impact Study for a Planned New York City Jail, New York, New York—Managed portions of an environmental impact study to locate a New York City jail on a then currently unclosed construction and demolition landfill.

Environmental Impact Study for a Mixed Use Development, Queens, New York—Managed portions of an environmental impact study for a mixed use commercial, residential, and open space development on more than 60 acres in Willets Point, Queens, New York. Managed all aspects of redevelopment internal to the project, including costs, subsurface geotechnical conditions, mitigation, remediation, FEMA and floodplain issues, and importation and settlement of fill and energy.

Environmental Impact Study for a Multiuse Waterfront Port, New York—Managed portions of an environmental impact study for proposed commercial, residential, and educational facilities at waterfront port and shipping terminal.

Yankee Stadium Pocket Parks Project, New York—Conducted an environmental site assessment for two new replacement parks slated to be constructed as part of the much larger Yankee Stadium rebuild. Both sites had petroleum spills that need to be addressed.

Anheuser Busch/Greenway Remediation and Redevelopment, Bronx, New York—Managed a project involving the classification and reuse of more than 43,000 cubic yards of material generated on adjacent construction project to raise the development site out of the 100-year floodplain. Successful project completion saved the City of New York more than $6 million in disposal costs and the developer more than $0.5 million toward the purchase of new fill. The project was awarded the 2010 Diamond Award for environmental projects in New York State and was a national finalist.

Development of Fulton Fish Market, New York—Evaluated most efficient method of beneficial reuse for excavated material taken from an area historically used to dispose of coal tar. Final selection was incineration in a NYSDEC-permitted waste-to-energy facility where the material would be used for fuel. In the end, a total of 7.6 megawatts of electricity was generated and placed into the local electrical grid as well as a significant amount of steam energy that was supplied via underground piping to local industrial facilities. The electrical generation equivalent was enough to supply 10,000 homes with power for 3.5 months. Project received an ACEC Diamond Award, an EPA Region 2 Phoenix Award, and 2011 New York City Sustainable Remediation Award.

Large Design/Construction Management

Corona Vortex Chamber, Queens, New York—Evaluated the predesign and design of installation of an underground wastewater treatment plant facility within a city street. Prepared a full range of construction specifications, and managed all aspects of material handling, classification, and disposal of more than 70,000 cubic yards of material during construction.

Combined Sewer Overflow Tank, Flushing, New York—Assessed pilot locations for a 28 million gallon underground combined sewer tank. Performed soil and geotechnical assessment of chosen locations, prepared construction specifications for entire construction effort. Effort included excavation to depths 45 ft below water table and *in situ* classification of more than 470,000 cubic yards of material. Construction management included oversight of entire excavation, staging, and approval for disposal. Additional effort included working with NYSDEC to create management efforts for fill material and deposition/testimony for construction change order lawsuit.

PUBLICATIONS

McCarty, K. 2006. Market fresh. *Civil Engineering ASCE.* 76(6):60-65.

APPENDIX E

HEALTH AND SAFETY PLAN WITH COMMUNITY AIR MONITORING PLAN (HASP/CAMP)

APPENDIX E
SITE HEALTH AND SAFETY PLAN

U-Haul Site
555 West 22nd Street
New York, New York 10011
NYSDEC BCP No. C231101

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau B
625 Broadway, 12th Floor
Albany, NY 12233-7020

Prepared for
23rd and 11th Associates LLC
c/o The Related Companies
60 Columbus Circle
New York, NY 10023

Prepared by

61 Broadway
Suite 1601
New York, NY 10006

Final
January 2018

CONTENTS

LIST OF ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

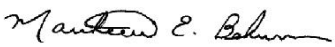
CFR	Code of Federal Regulations
CHSM	Corporate Health and Safety Manager
CPR	cardiopulmonary resuscitation
CPT	cone penetration test
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
IDLH	immediately dangerous to life and health
Integral	Integral Consulting Inc.
NYSBCP	New York State Brownfield Cleanup Program
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PFD	personal flotation device
PID	photoionization detector
PPE	personal protective equipment
SHSP	site health and safety plan
SSO	site safety officer
STEL	short-term exposure limit
SVOC	Semivolatile organic compound
VOC	Volatile organic compound

SITE HEALTH AND SAFETY PLAN APPROVAL

This site health and safety plan has been reviewed and approved for Remedial Investigation at 555 West 22nd Street, New York, NY.

October 27, 2016

Project Manager Date



August 1, 2016

Corporate Health and Safety Manager Date

SITE HEALTH AND SAFETY PLAN ACKNOWLEDGMENT

In the absence of an appropriate subcontractor or consultant health and safety plan, and with the written approval of Integral Consulting Inc. (Integral) corporate health and safety manager, the subcontractor or consultant may utilize the Integral site health and safety plan (SHSP), provided there is written concurrence from the subcontractor or consultant that they will directly administer the plan for their employees and assume all risks associated with any possible errors or omissions in the plan. This SHSP does not cover any construction activities. The Integral SHSP is a minimum standard for the site and will be strictly enforced for all Integral personnel, or its subcontractors or consultants where applicable.

I have reviewed the SHSP prepared by Integral, dated January 2018 for the Remedial Investigation fieldwork. I understand the purpose of the plan, and I consent to adhere to its policies, procedures, and guidelines while an employee of Integral, or its subcontractors or consultants. I have had an opportunity to ask questions regarding this plan, which have been answered satisfactorily by Integral.

Employee signature	Company	Date
Employee signature	Company	Date
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1 INTRODUCTION

It is the policy of Integral Consulting Inc. (Integral) to provide a safe and healthful work environment that is compliant with applicable regulations. No aspect of the work is more important than protecting the health and safety of all workers.

This site health and safety plan (SHSP) provides general health and safety provisions to protect workers from potential hazards during field activities performed for the Remedial Investigation Investigation for the U-Haul facility located at 555 West 22nd Street, New York, NY (hereafter referred to as the site). This SHSP has been prepared in accordance with state and federal Occupational Safety and Health Administration (OSHA) safety regulations (29 CFR [Code of Federal Regulations] 1910 and 29 CFR 1926).

Work performed for the Remedial Investigation will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements.

Attachments to the SHSP provide a site-specific map and specific routes to the hospital from the Site (Attachment 1), regulatory notices (Attachment 2), safety procedures (Attachment 3), material safety data sheets (Attachment 4), an employee exposure/injury incident report (Attachment 5), and a near-miss incident report (Attachment 6).

This SHSP has been prepared to identify potential site hazards to the extent possible based on information available to Integral. Integral cannot guarantee the health or safety of any person entering this site. Because of the potentially hazardous nature of this site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness at this site. The health and safety guidelines in this plan were prepared specifically for this site and should not be used on any other site without prior evaluation by trained health and safety personnel.

A copy of this SHSP must be in the custody of the field crew during field activities. All individuals performing fieldwork must read, understand, and comply with this plan before undertaking field activities. Once the information has been read and understood, the individual must sign the Site Health and Safety Plan Acknowledgment form provided as part of this plan. The signed form will become part of the project file.

This plan may be modified at any time based on the judgment of the Integral site safety officer (SSO) in consultation with the project manager and Integral corporate health and safety manager (CHSM) or designee. Any modification will be presented to the onsite team during a safety briefing and will be recorded in the field logbook.

1.1 OBJECTIVES AND METHODS

The primary objective of the Remedial Investigation (RI) is to collect and evaluate data at the Site to define the nature and extent of contamination on and offsite, if present. Field activities for data collection will include:

- Advancement of 23 borings to the anticipated depth of 17 feet below grade (ftbg)), with the collection of two soil samples from each boring;
- Install 3 permanent groundwater monitoring wells and 8 temporary groundwater wells for the collection of twelve groundwater samples;
- Install 11 soil vapor monitoring points and collect eleven soil vapor samples; and
- Collect 4 indoor air and 2 ambient air samples.

Prior to the advancement of soil borings, all locations will be hand cleared for utilities and subsurface infrastructure. Soil borings will be installed using a track mounted or Bobcat Geoprobe® utilizing direct push technology to the groundwater interface depth, approximately 10 ftbg. Continuous soil samples will be collected using four (4) or five (5) foot macrocore samplers fitted with dedicated acetate liners. The soil/fill retrieved from each sampler will be field screened with a PID for VOCs and described by Integral field personnel on boring logs.

1.2 ORGANIZATION

This SHSP covers the following field activities: drilling oversight, community air monitoring, and soil, groundwater, soil vapor, and air sampling. Chemical and physical hazard evaluations are presented in Sections 2 and 3, respectively. Specific health and safety guidelines associated with each task, including a brief description of the work, are discussed in Section 11 (Task-Specific Safety Procedures).

1.3 ROLES AND RESPONSIBILITIES

All Integral personnel, subcontractors, or consultants and visitors on this site must comply with the requirements of this SHSP. The specific responsibilities and authority of management, safety and health, and other personnel on this site are detailed in the following paragraphs.

1.3.1 Site Safety Officer

The SSO has full responsibility and authority to implement this SHSP and to verify compliance. The SSO reports to the project manager and is onsite or readily accessible to the site during all work operations. The SSO is responsible for assessing site conditions and directing and controlling emergency response activities. The specific responsibilities of the SSO include:

- Managing the safety and health functions on this site
- Serving as the onsite point of contact for safety and health concerns
- Assessing site conditions for unsafe acts and conditions and ensuring corrective action
- Ensuring that all Integral employees and subcontractors understand and follow the SHSP
- Ensuring that daily work schedules and tasks are reasonable for the required levels of effort and weather conditions
- Confirming local emergency response phone numbers and locations
- Conducting and documenting the initial and daily or periodic health and safety briefings
- Evaluating and modifying the level of protective apparel and safety equipment, based on site conditions
- Ensuring that the field team observes all necessary decontamination procedures.

If the SSO determines that site conditions are unsafe, he or she has the authority to suspend field operations until the problem is corrected. The SSO can modify SHSP procedures in the field. Any changes must be documented in the field logbook, and field staff must be immediately informed of the change. The project manager and Integral's CHSM must be notified by phone or email within 24 hours of any major changes to the SHSP.

1.3.2 Project Manager

The project manager has overall responsibility to ensure that personnel working onsite are safe. The specific responsibilities of the project manager include:

- Ensuring that the SHSP is developed prior to the field work or site visit
- Reviewing and approving the SHSP prior to the field work or site visit
- Ensuring employee understanding of and compliance with the SHSP.

1.3.3 Corporate Health and Safety Manager

The CHSM provides guidance to the project manager and SSO on SHSP preparation and reviews and approves the SHSP. The CHSM also serves as an arbitrator if there is a conflict between the project manager, SSO, and field personnel. In addition, the CHSM[1] conducts periodic unannounced audits of Integral field operations to ensure compliance with the SHSP.

[1] The audit task may be delegated to an office health and safety representative by the CHSM.

1.3.4 Field Personnel

All Integral personnel and subcontractors on this site are responsible for reading and complying with this SHSP, using the proper personal protective equipment (PPE), reporting unsafe acts and conditions, and following the work and safety and health instructions of the project manager and SSO. All Integral personnel, subcontractors, or consultants can and are encouraged to suspend field operations if they feel conditions have become unsafe.

1.4 SITE DESCRIPTION

The site is comprised of four tax lots (approx. 33,671 square feet) containing a one-to-three-story facility used entirely by U-Haul as company storage, public storage, rental vehicle parking, vehicle maintenance and servicing, retail U-Haul store and office. An asphalt paved lot, facing 11th Avenue, is used for truck storage.

Owners/tenants:

- **Site history:** A Phase I Environmental Site Assessment (ESA) performed by Integral in December 2015, indicated that the site has had a long history of commercial use including iron work shops, a wood "factory" and distributer, a machine shop, wood yard, cotton mill, stables, parking garages, and offices.
- **Current site use:** Storage, parking, vehicle maintenance and servicing, and a retail U-Haul store and offices.
- **Hazardous waste site:** No
- **Industrial waste site:** No
- **Topography (if applicable):** Fairly level land, 7 feet above sea level.
- **Site access:** Entrance on 23rd Street and 11th Ave.
- **Nearest drinking water/sanitary facilities:** Onsite
- **Nearest telephone:** Field crew members will have cell phones
- **Size of site:** 33,671 square feet
- **Pathways for hazardous substance dispersion:** Inhalation and dermal

A detailed site map is provided in Attachment 1 to this SHSP.

1.5 PROJECT MANAGER AND OTHER KEY CONTACTS

	Name (Affiliation)	Work Telephone	Cell Phone
Project manager	Alana Carroll (Integral)	(212) 440-6707	(646) 895-1430
Site safety officer	Jordan Junion (Integral)	(212) 440-6705	(414) 315-8977
Corporate health and safety manager	Matt Behum (Integral)	(410) 573-1982 x 512	(443) 454-1615
Facility contact	Ian Brown, General Manager	(212) 620-4177	
Client contact	[Jim Harris] (The Related Companies)	(212) 421-5332	

2 CHEMICAL HAZARD EVALUATION

Potentially hazardous chemicals known to exist at the site are primarily VOCs and SVOCs. The chemicals of concern, applicable chemical properties, and potential exposure routes are presented in the following sections.

The following table lists the historical site maximum constituent concentrations for constituents at 562 W 23rd Street. In addition, the table lists the properties of sample preservatives and decontamination chemicals that may be used at the site (i.e., Alconox/Liquinox and Hydrochloric Acid (HCL)). The table also lists the chemical properties and OSHA permissible exposure limit (PEL), short-term exposure limit (STEL), and immediately dangerous to life and health (IDLH) level. Some chemicals used during equipment decontamination or sample preservation may volatilize and enter the field crew's breathing zone and be inhaled. Breathing zone air can be monitored to ensure that the chemicals do not exceed the PEL. If any of the chemicals exceed the PEL, immediate action is required (e.g., don respirators, leave site) as designated in the "Air Monitoring" section (Section 5) of this SHSP.

Chemical Properties

Chemical of Concern	Concentration (site maximum or range expected)	Medium	OSHA PEL (ppm)	OSHA STEL (ppm)	OSHA IDLH (ppm)	IP(eV)	Carcinogen or Other Hazard
Alconox (Tetrasodium Pyrophosphate)	Concentrated	Decon	--	--	--	--	Flammable
Benzene	585 ppb	Groundwater	1	5	500	9.25	Flammable
Ethylbenzene	585 ppb	Groundwater	100	125	800	8.82	Flammable
Hydrochloric Acid (HCl)	Concentrated	Preservative	5	--	50	12.74	Corrosive, reactive
Isobutylene	Concentrated	Gas	--	--	--	--	Flammable
Methyl tert-butyl ether (MTBE)	53 ppb	Groundwater	--50 (ACGIH TWA)	--	--	--	Flammable
Toluene	585 ppb	Groundwater	200	150	500	8.82	Flammable
Xylenes	585 ppb	Groundwater	100	150	900	8.56	Flammable

Notes: -- = none established
ACGIH = American Conference of Government Industrial Hygienists time-weighted average
BTEX = benzene, toluene, ethylbenzene, and xylenes
Ca = carcinogen
IDLH = immediately dangerous to life and health
IP(eV) = ionization potential (electron volts)
mg/kg = milligrams per kilogram
NA = not available
P = poison
PEL = permissible exposure limit

ppb = parts per billion
ppm = parts per million
STEL = short-term exposure limit

The table below summarizes the chemical characteristics and potential chemical exposure routes at the site.

	Likely	Possible	Unlikely
Potential Chemical Exposure Routes at the Site:			
Inhalation		X[a,b]	
Ingestion			X[a,b]
Skin absorption		X[a,b]	
Skin contact		X[a,b]	
Eye contact		X[a,b]	
Chemical Characteristics:			
Corrosive	X[b]		X[a]
Flammable	X[a,b]		
Ignitable			X[a,b]
Reactive	X[a]		X[b]
Volatile		X[b]	X[a]
Radioactive			X[a,b]
Explosive			X[a,b]
Biological agent			X[a,b]
Particulates or fibers			X[a,b]
If likely, describe:	Hydrochloric acid is corrosive and highly reactive. Always wear nitrile gloves and safety glasses when filling sample containers with this acid. Chemicals of concern include BTEX which are flammable chemicals.		

Notes:
[a] Decontamination chemicals and preservative
[b] Soil and groundwater

3 PHYSICAL HAZARD EVALUATION AND GUIDELINES

The following sections present general physical hazards guidelines.

3.1 GENERAL PHYSICAL HAZARDS

The following table presents possible physical hazards that are expected to be present during field activities.

Possible Hazard	Yes	No	Proposed Safety Procedure
Heavy equipment	X		Stay back from operating equipment; wear safety vests and hard hats; coordinate and maintain eye contact with equipment operator.
Material handling	X		Lift properly; seek assistance if necessary; do not overfill coolers or boxes. Seek assistance if drums must be moved.
Compressed air equipment	X		Equipment must be equipped with pressure release valves, drains, and gauges.
Confined spaces		X	Integral personnel are not trained or authorized to enter confined spaces under any circumstances. Only qualified and properly trained subcontractors are allowed to enter confined spaces.
Adverse weather	X		Seek shelter during electrical storms; work in adverse weather conditions only with proper training and equipment.
Work in remote areas		X	Use buddy system; carry radio and/or cellular/satellite phone; bring sufficient equipment in case of accident or injury (first aid kit, shelter if appropriate).
Biohazard		X	Avoid contact with potential biological or infectious materials; wear impermeable gloves, disposable coveralls, and respirator, as appropriate; wash hands and face as soon as possible after contact and before eating or drinking. Use disinfectants as necessary..
Plant/animal hazards		X	Know local hazards and take appropriate precautions. Use insect repellent if mosquitoes are persistent.
Uneven terrain/tripping	X		Use caution, wear properly fitting shoes or boots, and keep work area orderly.
Heights		X	Integral personnel are not trained or authorized to work at heights greater than 6 ft above ground surface under any circumstances. Qualified subcontractors must use fall protection (harness, lanyard, or proper railings) when working above 6 ft above ground surface. All fall protection equipment needs to be inspected annually and replaced every 5 years.
Noise	X		Wear ear protection when working around heavy equipment and other noise sources.

Possible Hazard	Yes	No	Proposed Safety Procedure
Excavations		X	Do not enter excavations greater than 3 ft in depth without evaluation by a qualified person and implementation of applicable trenching and excavation safeguards as required by law.
Heat stress	X		Follow heat stress information (Attachment 3). *Note:* potential for heat stress will depend on season and location of the site.
Cold/hypothermia	X		Keep warm and dry; bring changes of clothes; do not work in extreme conditions without proper equipment and training. Follow cold stress information (Attachment 3). *Note:* potential for cold/hypothermia will depend on season and location of the site.
Falling objects	X		Wear hard hats near overhead hazards (i.e., winch).
Drill rigs	X		Avoid all pinch points; do not operate or stand near rig during electrical storms; stay a safe distance (25 ft) from power lines; level drill rig.

Summary of potential physical hazards posed by proposed site activities:

Activity	Potential Hazard
Soil sampling	Uneven terrain/tripping, cold/hypothermia, falling objects, heavy equipment, material handling, adverse weather, heat stress
Drilling oversight	Heavy equipment, high traffic areas, uneven terrain/tripping, drill rigs, falling objects, noise, compressed air equipment, adverse weather, water hazard, heat stress, cold/hypothermia.
Sample handling/mobilization	Material handling

4 PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT

The following sections address PPE and safety equipment required for completing the field activities.

4.1 PERSONAL PROTECTIVE EQUIPMENT

Based on the hazards identified above in Sections 2 and 3, the following table identifies the PPE required for site activities.

	Level of Protection	
Site Activity	Initial	Contingency[a]
Soil sampling	D	Leave site
Sample handling	D	Leave site
Decon	D	Leave site

Notes:
[a] Based on unexpected change in site conditions

Each level of protection will incorporate the following PPE:

Level D	Long pants and work coveralls, hard hat, latex or nitrile gloves under work gloves, eye protection, and steel-toe boots are required. Hearing protection is required as needed.

4.2 SAFETY EQUIPMENT

The following safety equipment will be onsite during the proposed field activities.

Air Monitoring (check the items required for this project)

- [X] PID
- [ ] LEL/O_2 meter
- [ ] H_2S meter
- [ ] Detector pump and tubes (e.g., benzene)
- [ ] Air sampling pumps
- [ ] Miniram (particle monitors)
- [ ] Radiation meter
- [ ] Other:

First Aid Kit Mandatory, including absorbent compress, adhesive bandages, adhesive tape, antiseptic, burn treatment, medical exam gloves, sterile pad, cardiopulmonary resuscitation (CPR) shield, triangle bandage, scissors—for cutting off the PPE from an injured person (check additional items required for the site)

- [X] Emergency blanket
- [ ] Insect repellent
- [X] Sunscreen
- [ ] Other: _____

Other (check the items required for this project)

- [X] Eyewash
- [X] Drinking water
- [ ] Stopwatch for monitoring heart rate for heat stress monitoring[2]
- [ ] Thermoscan® thermometer for heat stress monitoring
- [ ] Survival kit[3]
- [ ] Personal flotation device
- [ ] Cool vests
- [ ] Fit test supplies
- [X] Fire extinguisher (drill rigs and onboard larger sampling vessels)
- [ ] Windsock
- [X] Cellular phone
- [ ] Radio sets
- [ ] Global positioning system
- [ ] Other: _____

[2] Heart rate monitoring requires special training.
[3] Consult the CHSM for guidance for site-specific survival kits.

5 AIR MONITORING

Air monitoring will be conducted when entering previously uncharacterized sites, when working in the vicinity of uncontained chemicals or spills, when opening containers and well casings, and prior to opening confined spaces. (Note: Integral personnel are not trained or authorized to enter confined spaces under any circumstances.) Air monitoring must be conducted to identify potentially hazardous environments and determine reference or background concentrations. Air monitoring can sometimes be used to augment judgment in defining exclusion zones.

Air monitoring may be discontinued at sites where there have been multiple sampling events in the same area/media during similar activities with no action level exceedances. In such instances, the air monitoring results must be well documented and there must be approval from the CHSM prior to discontinuing the air monitoring. Air monitoring must be reinstated for fieldwork in different areas of the site or when sampling new media.

5.1 INTRODUCTION

Personal air monitoring involves collection of samples within the breathing zone of the field personnel to better understand exposures, ensure appropriate levels of PPE, and document compliance with regulation. Such samples may be full shift, for comparison to PELs (or other applicable occupational exposure limits), or short term, for comparison to STELs. Some chemicals in soil or aqueous media may volatilize or become aerosolized and be inhaled by field personnel.

Breathing zone air can be monitored to ensure that the chemicals do not exceed a regulatory or project-specific action level (generally 50 percent of the PEL). Integral commonly uses photoionization detectors (PIDs) and dust meters (e.g., MINIRAM) for monitoring volatile organic compounds and particle constituents, respectively. In practice, the air directly in the field personnel's breathing zone is monitored with the PID or dust meter for 10–15 seconds. The highest reading is recorded in the project logbook and checked against the site-specific action level in the table below. If any of the constituents exceed the action level presented in Section 5.4, immediate action is required (e.g., don respirators, leave site, etc.), as designated.[4]

The following sections provide general guidance on the selection and calibration of PIDs and dust meters, which are typically rented for Integral field projects.

[4] Note that neither the PID nor the MINIRAM can identify chemicals. The PID detects total ionizable volatile organic compounds and the MINIRAM detects total particles of sufficient diameter to be detected.

5.2 PHOTOIONIZATION DETECTORS

It is critical to order a PID with a detector lamp with the appropriate ionization energy to detect constituents of interest at the site. The ionization energy of the lamp must be greater than the ionization potential of the constituents of interest (ionization potentials are listed in the National Institute of Occupational Safety and Health pocket guide to chemicals and are presented in Section 2). Be sure that the meter arrives at least a day prior to the start of the fieldwork so field personnel can familiarize themselves with the operation of the meter and confirm that it was not damaged during shipping. Field personnel must also read the operation manual to become familiar with its operation prior to use in the field. Note that moisture may damage the detector lamp and/or provide erroneous readings, so a moisture filter is used on the probe. Also note that the PID will only accurately quantitate the material used in the calibration process. A response factor is used to measure the sensitivity of the PID to a particular chemical present at the site. Response factors are normally presented in the operation manual for the PID.

The PID must be calibrated daily in accordance with the manufacturer's specifications, which are provided in the operation manual. The calibration typically requires the use of a span gas (generally 100 parts per million isobutylene) and zero gas (generally fresh air). Be sure that all the required calibration equipment/supplies are provided with the PID (e.g., span gas cylinder, regulator, tubing, and Tedlar™ bag). Record calibration data in the field logbook.

5.3 DUST METERS

It is critical that the dust meter is capable of measuring the concentrations of airborne dust that are at or below the site-specific action levels presented below. Be sure that the meter arrives at least a day prior to the start of the fieldwork so field personnel can familiarize themselves with the operation of the meter and confirm that it was not damaged during shipping. Field personnel must also read the operation manual to become familiar with its operation prior to use in the field.

The dust meter must be field checked (i.e., zeroed) daily in accordance with the manufacture's specifications, which are provided in the operation manual. The dust meter field check typically involves zeroing the meter with ambient or filtered air. Be sure that all the required zeroing and operational equipment/supplies are provided with the dust meter. Record field-check data in the field logbook.

5.4 ACTION LEVELS

The following action levels have been established to determine appropriate actions to be taken during site investigation activities:

Instrument	Observation	Action	Comments
PID	<2 ppm over background for 1 minute	Continue working	
PID	≥2 ppm over background sustained for 1 minute	Evacuate site	

Note:

ppm = parts per million

Air monitoring will be conducted at least every 30 minutes, or more frequently if odors are observed by the field crew. Maintain, calibrate and field check all air monitoring equipment in accordance with the manufacturer's recommendations.

6 HEALTH AND SAFETY TRAINING AND MEDICAL MONITORING

The following sections present requirements for health and safety training and medical monitoring.

6.1 HEALTH AND SAFETY TRAINING AND MEDICAL MONITORING

State and federal laws establish training requirements for workers at uncontrolled hazardous waste sites (including areas where accumulations of hazardous waste create a threat to the health and safety of an individual, the environment, or both). Integral and subcontractor personnel are required to complete the following training requirements prior to working at the site.

6.1.1 Training Requirements

Task	No Training	24-hour	40-hour[a]	Supervisor[b]	First Aid/CPR[c]	Medical Monitoring
Integral Field Personnel						
Jordan Junion			X	X	X	X
Stacey Ng			X	X	X	X
Leah Werner			X		X	X

Notes:

[a] Must have current OSHA 8-hour refresher if it has been more than a year since the OSHA 40-hour training.

[b] At least one person onsite must be OSHA HAZWOPER supervisor trained if this is a hazardous waste site.

[c] At least one member of each team of two or more people onsite must be first aid/CPR trained.

[d] Integral subcontractors and consultants may have requirements that are more stringent than those listed above. These are minimum training and monitoring requirements required to work on this site.

6.1.2 Site Safety Meetings

Site safety meetings must be held before beginning new tasks or when new staff enter the site. Site safety meetings should be held at a minimum of once a week and should be held daily on complex or high hazard projects. Tailgate safety meetings must occur every morning during review of the day's work plan, covering specific hazards that may be encountered. Additional meetings will be held at any time health and safety concerns are raised by any of the personnel. Attendance and topics covered are to be documented in the field logbook.

6.2 MEDICAL MONITORING

OSHA requires medical monitoring for personnel potentially exposed to chemical hazards in concentrations in excess of the PEL for more than 30 days per year and for personnel who must use respiratory protection for more than 30 days per year. Integral requires medical monitoring for all employees potentially exposed to chemical hazards.

Will personnel working at this site be enrolled in a medical monitoring program?	Yes X	No _____

7 EMERGENCY RESPONSE PLAN

The following sections discuss emergency recognition and prevention, emergency response and notification, emergency decontamination, site communications, and use of the buddy system.

7.1 EMERGENCY RECOGNITION AND PREVENTION

It is the responsibility of all personnel to monitor work at the site for potential safety hazards. All personnel are required to immediately report any unsafe conditions to the SSO. The SSO is responsible to immediately take steps to remedy any unsafe conditions observed at the work site.

The following are examples of some emergency situations that could occur during the West 23rd field activities:

- Slips, trips, and falls (on sloped areas, steel stairs, etc.)
- Lacerations from scrap metal (in soil, waste piles, etc.)
- The air monitoring action level is exceeded
- Entrainment of clothes or objects in moving equipment or parts
- Serious injury or illness (e.g., physical injury, heart attack)
- Severe thunderstorm with lightning.

Immediate actions will be taken by the field team under the leadership of the SSO in response to these emergencies.

7.2 EMERGENCY RESPONSE AND NOTIFICATION

If an emergency at the site warrants it, all personnel must immediately evacuate the affected work area and report to the SSO at the predetermined emergency assembly location:

Field vehicle

In case of injury, field personnel should take precautions to protect the victim from further harm and notify local or facility emergency services. In remote areas, it will be necessary to have first aid-trained personnel on the field team. The victim may require decontamination prior to treatment if practicable—requirements will vary based on site conditions.

Emergency medical care will be provided by:

- [X] Local emergency medical provider (i.e., fire department)
- [ ] Facility emergency medical provider
- [ ] First aid-trained field staff (for remote areas only)

Local Resources	Name	Telephone	Notified Prior to Work (Yes/No)?
Fire	FDNY	911	No
Police	NYPD	911	No
Ambulance	FDNY	911	No
Hospital	Bellevue Hospital Center	(212) 562-4141	No
Site phone	Sam McTavey	(914) 643-1057	Yes
Directions to the hospital:	Consult attached maps.		

The SSO must confirm that the hospital listed is still in operation and that it has an emergency room. **It is required that the SSO drive to the hospital so that the directions are practiced and understood prior to initiating fieldwork.**

Corporate Resource	Name	Work Telephone	Cell Phone
Integral CHSM [a]	Matt Behum	Office: (410) 573-1982 x 512	(443) 454-1615
Integral President	Bill Locke	Office: (720) 465-3315	(303) 548-1111
Integral Human Resources Manager	Amy Logan	Office: (720) 465-3312	NA
Incident Intervention	WorkCare	Office: (800) 455-6155	NA
Medical consultant	Dr. Peter Greaney, MD (WorkCare)	Office: (800) 455-6155 ext. 2219	NA

Notes:

[a] If the CHSM cannot be reached, call Eron Dodak [Office: (503)943-3614; Cell: (503)407-2933]. If Eron Dodak cannot be reached call Ian Stupakoff [Office: (360)705-3534, ext. 20; Cell: (360)259-2518]. If Ian Stupakoff cannot be reached, call David Livermore [Office: (503)943-3613; Cell: (503)806-4665].

In case of serious injuries, death, or other emergency, the Integral CHSM must be notified immediately at the phone numbers listed above. The Integral CHSM will notify the project manager and Integral's President. The project manager will notify the client.

7.3 EMERGENCY DECONTAMINATION PROCEDURES

In case of an emergency, if possible, gross decontamination procedures will be promptly implemented. If a life-threatening injury occurs and the injured person cannot undergo

decontamination procedures onsite, then the medical facility will be informed that the injured person has not been decontaminated and given information regarding the most probable chemicals of concern.

Decontamination procedures will only be used if practical and if they will not further injure the person or delay treatment. Decontamination procedures should not be implemented if there is not a reasonable possibility that the injured party requires such intervention. The SSO will make the determination whether or not to decontaminate the injured person. The following steps will be followed for decontaminating injured personnel while onsite:

- If it will not injure the person further, cut off PPE using scissors or scrub the gross contamination from the injured person's PPE (e.g., Tyvek® coveralls, work boots) with a Liquinox® or Alconox® solution followed by a rinse with tap or deionized/distilled water
- Remove PPE if feasible without further injuring the person.

7.4 SITE COMMUNICATIONS

Each field team will carry a cell phone or satellite phone that is in good working order. If there is any type of emergency that requires the site to be evacuated (e.g., severe thunderstorm with lightening, chemical release), the field team leader will blow the air horn three times. When the horn sounds, all personnel will meet at the predetermined emergency assembly location, provided the muster point is in safe territory. All other emergency notifications that do not require evacuation (e.g., a person falling overboard) will be conducted using a cell or satellite phone. Emergency phone numbers are listed above in Section 7.2.

7.5 BUDDY SYSTEM

The buddy system will be used at the site at all times. The buddy system is a system of organizing employees into field teams in such a manner that each employee of the field team is designated to be observed by at least one other employee in the field team. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

8 WORK ZONES

Work zones are defined as follows:

Exclusion zone	Any area of the site where hazardous substances are present, or are reasonably suspected to be present, and pose an exposure hazard to personnel
Contamination reduction zone	Area between the exclusion and support zones that provides a transition between contaminated and clean zones
Support zone	Any area of the site, so designated, that is outside the exclusion and contamination reduction zones

Site control measures in work zones are described below for each type of field activities.

8.1 GEOPROBE® BORINGS AND SOIL SAMPLING

Exclusion zone: An approximate 12 ft radius around the Geoprobe drill rig will be marked with orange traffic safety cones or caution tape. Only properly equipped and trained personnel (i.e., wearing modified D protective clothing) will be allowed in this area.

Contamination reduction zone: After sampling is completed at a station, the exclusion zone will become the contamination reduction zone.

Support zone: All areas outside the exclusion and contaminant reduction zones.

Controls to be used to prevent entry by unauthorized persons: No unauthorized personnel will be allowed into the exclusion/contaminant reduction zones.

9 EQUIPMENT DECONTAMINATION AND PERSONAL HYGIENE

9.1 EQUIPMENT DECONTAMINATION PROCEDURES

After sampling is completed, the exclusion zone will be used as the contaminant reduction zone for decontamination activities, provided there is no contamination remaining after the sampling is completed. To minimize or prevent personal exposure to hazardous materials, all personnel working in the exclusion zone and contaminant reduction zone will comply with the following decontamination procedures:

- All personnel will wash sediment and chemicals from their raingear or Tyvek® coveralls before leaving the exclusion zone.
- All gloves, Tyvek®, rain gear, and rubber boots will be removed prior to entering the field vehicle.

Decontamination equipment required at the site includes the following:

- Buckets or tubs
- Laboratory grade distilled/deionized water
- Site water
- Scrub brushes (long-handled)
- Liquinox® or Alconox® detergent
- Plastic bags
- Foil
- Paper towels
- Garbage bags
- Clean garden sprayer

All non-disposable components of the sampling equipment (e.g., stainless steel spoons and bowls used for sample compositing) that contact the sediment will be decontaminated using the following steps:

1. Rinse with site water/tap water
2. Wash with Alconox® or Liquinox® detergent
3. Rinse with site water/tap water
4. Allow to air dry

5. Wrap up compositing equipment in aluminum foil.

9.2 PERSONAL HYGIENE

The following personal hygiene practices will be used at the site to reduce exposure to chemicals.

- Long hair will be secured away from the face so it does not interfere with any activities.
- All personnel leaving potentially contaminated areas will wash their hands, forearms, and faces in the contaminant reduction zone prior to entering any clean areas or eating areas.
- Personnel leaving potentially contaminated areas will shower (including washing hair) and change to clean clothing as soon as possible after leaving the site.
- No person will eat, drink, or chew gum or tobacco in potentially contaminated areas. Single portion drink containers and drinking of replacement fluids for heat stress control will be permitted only in support areas.
- Smoking is prohibited by Integral personnel and subcontractors in all areas of the site because of the potential for contaminating samples and for the health of the field team.

10 VEHICLE SAFETY, SPILL CONTAINMENT, AND SHIPPING INSTRUCTIONS

10.1 VEHICLE SAFETY

Integral's vehicle safety program requires the following:

- Cell phone usage while driving is not allowed, including the use of hands-free devices. If it not feasible to wait to use the cell phone until arriving at the destination, pull off the road and park in a safe location to use the cell phone. Do not pull to the side of the road to use a cell phone because this significantly increases the risk of a rear-end collision.
- All vehicles are to be operated in a safe manner and in compliance with local traffic regulations and ordinances.
- Drivers are to practice defensive driving and drive in a courteous manner.
- Drivers are required to have a valid driver's license and liability insurance (per local state laws).
- Seat belts are to be worn by the driver and all passengers.
- No persons are allowed to ride in the back of any trucks or vans, unless equipped with seatbelts.
- Vehicles are to be driven in conformance with local speed limits.
- Personnel who are impaired by fatigue, illness, alcohol, illegal or prescription drugs, or who are otherwise physically unfit, are not allowed to drive or work on Integral field sites.
- Personnel are to avoid engaging in other distractions such as changing radio stations while driving.
- Motor vehicle accidents are to be reported to the responsible law enforcement agency, the Integral human resources manager, and the Integral CHSM on the same day of occurrence. Documentation of damage should be photographed.
- Personnel who have experienced work-related vehicle accidents or citations may be required to complete a defensive driving program.

10.2 SPILL CONTAINMENT

No bulk chemicals will be used at the site.

10.3 SHIPPING INFORMATION

Federal laws and international guidelines place restrictions on what materials may be shipped by passenger and cargo aircraft. In addition, 49 CFR regulates labeling, manifesting, and shipment of all packages containing potentially hazardous materials. In the course of this field investigation, the following items will be shipped to and from the site as shown below:

Item	Hazardous Constituent	Quantity	Packaging	How Shipped
Samples	None	24 solid matrix samples	Coolers	Lab Courier
Preservatives (HCl)	None		Original package	Lab Courier

A 24-hour emergency response number (on any shipping documents such as a Uniform Hazardous Waste Manifest, Shipper's Declaration of Dangerous Goods, etc.) is required for shipments of all dangerous or hazardous goods. Integral does not have a 24-hour emergency contact number for dangerous or hazardous goods shipment. No dangerous or hazardous goods may be shipped by Integral until an account is set up with a 24-hour emergency response service such as CHEM-TEL (1-813-248-0573). If any hazardous or dangerous goods need to be shipped for a project, they must be shipped directly to the site by the supplier. Any hazardous or dangerous goods that are not used in the course of the field effort must remain at the site.

The samples will be prepared and labeled for shipment in accordance with the sampling and analysis plan developed for the site.

Air shipment of equipment with lithium batteries is required to note the presence of these batteries. Warning labels are available from the equipment rental agency and can be copied.

11 TASK-SPECIFIC SAFETY PROCEDURE SUMMARY

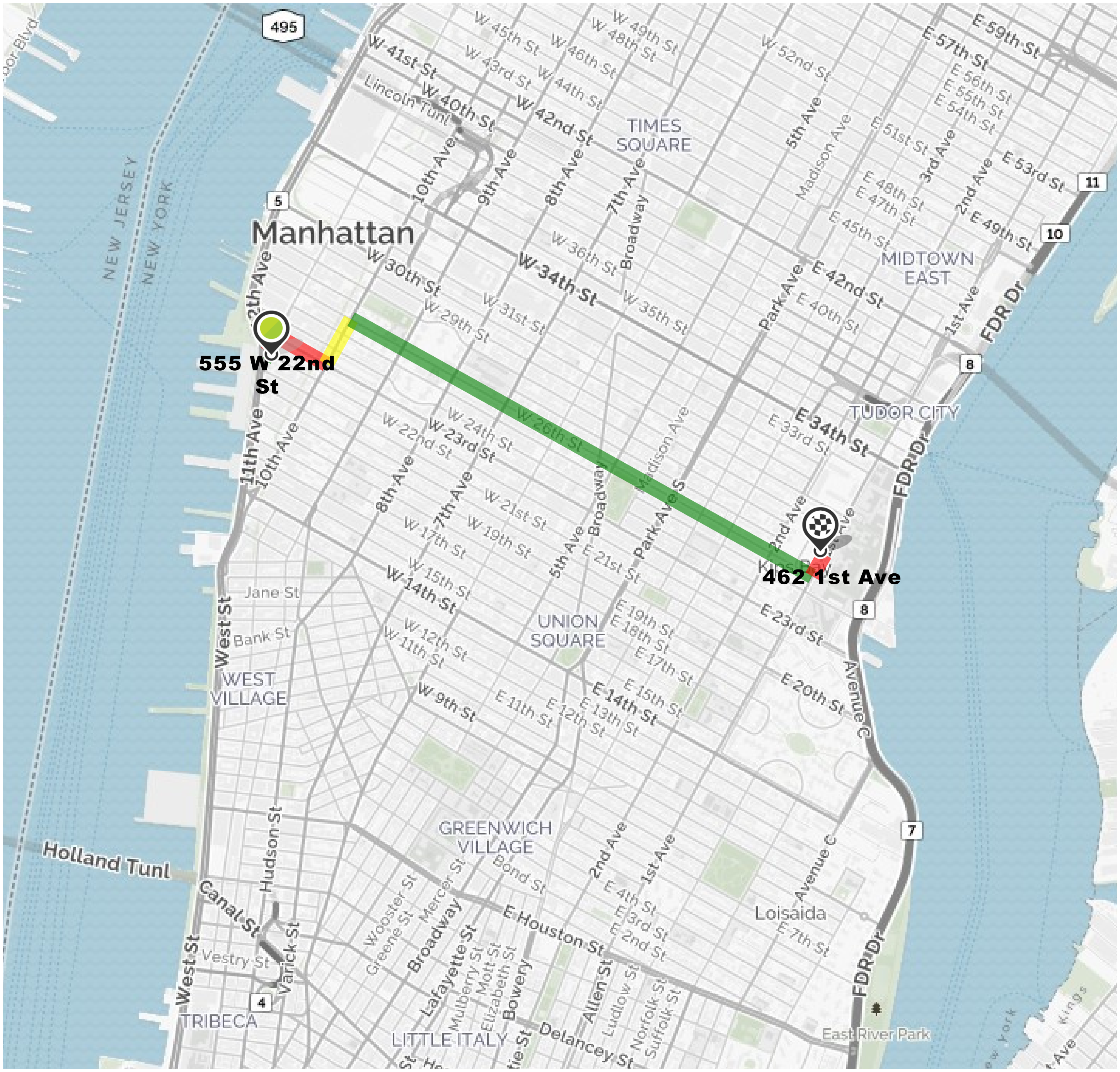
11.1 GEOPROBE® BORINGS

Notify the New York one-call utility locating service 48 hours prior to initiating field work (811) and obtain a utility locating ticket. Confirm the absence of underground and overhead utilities before starting drilling activities. Be sure that all utilities are marked or have a designation that they are not present in the area. The New York one-call utility locating service should have marked all utilities present in the area. Take a few minutes to examine the locations of fire hydrants, gas meters, etc. to make sure that the utility locating marks make sense. If there is any doubt as to the location of underground utilities, call the public or a private utility locator. Finally, check for overhead utilities and obstructions such as trees.

Integral personnel will wear a hard hat, safety glasses, traffic safety vests, and steel-toe boots at all times. The exclusion zone around the drill rig will be marked with orange traffic cones or caution tape and personnel will police the area to make sure no unauthorized personnel enter the exclusion zone. Avoid getting soil and sample preservatives (nitric and hydrochloric acid) on clothes or skin. Exercise care when lifting, assembling, and decontaminating equipment. Always stay clear of the Geoprobe® rig and be aware of its location. Keep in eye contact with the driller. Stay away from pinch points. Know the location of the "kill switch" on the rig. Keep equipment organized.

ATTACHMENT 1

SITE MAP AND HOSPITAL ROUTE


555 W 22nd St
462 1st Ave
Manhattan
TIMES SQUARE
MIDTOWN EAST
TUDOR CITY
UNION SQUARE
WEST VILLAGE
GREENWICH VILLAGE
TRIBECA
LITTLE ITALY
Loisaida
East River Park
NEW JERSEY
NEW YORK
Holland Tunl
Lincoln Tunl
FDR Dr
W 34th St
E 42nd St
E 34th St
W 23rd St
W 14th St
E 14th St
E 23rd St
E Houston St
Delancey St
Canal St
W 26th St
Park Ave S
Broadway
West St
Hudson St
Varick St

ATTACHMENT 2

REGULATORY NOTICES

You Have a Right to a Safe and Healthful Workplace.

IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.

The *Occupational Safety and Health Act of 1970 (OSH Act)*, P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act*. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at **www.osha.gov**. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

1-800-321-OSHA
www.osha.gov

U.S. Department of Labor • Occupational Safety and Health Administration • OSHA 3165

ATTACHMENT 3

SAFETY PROCEDURES

FROSTBITE

What happens to the body:

Freezing in deep layers of skin and tissue; pale, waxy-white skin color; skin becomes hard and numb; usually affects fingers, hands, toes, feet, ears, and nose.

What to do: (land temperatures)

- Move the person to a warm, dry area. Don't leave the person alone.
- Remove wet or tight clothing that may cut off blood flow to the affected area.
- **Do not** rub the affected area because rubbing damaged the skin and tissue.
- Gently place the affected area in a warm water bath (105°) and monitor the water temperature to **slowly** warm the tissue. Don't pour warm water directly on the affected area because it will warm the tissue too fast, causing tissue damage. Warming takes 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm. **Note:** If there is a chance the affected area may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible.

How to Protect Workers

- Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help the worker.
- Train workers about cold-induced illnesses and injuries.
- Select proper clothing for cold, wet, and windy conditions. Layer clothing to adjust to changing environmental temperatures. Wear a hat and gloves, in addition to underwear that will keep water away from the skin (polypropylene.)
- Take frequent short breaks in warm, dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Use the buddy system (work in pairs.)
- Drink warm, sweet beverages (sugar water, sports-type drinks.) **Avoid drinks with caffeine** (coffee, tea, or hot chocolate) **or alcohol**.
- Eat warm, high-calorie foods like hot pasta dishes.

Workers are at increased risk when…

- They have predisposing health conditions such as cardiovascular disease, diabetes, and hypertension.
- They take certain medications. Check with your doctor, nurse, or pharmacy and ask if medicines you take affect you while working in cold environments.
- They are in poor physical condition, have a poor diet, or are older.

HYPOTHERMIA - (Medical Emergency)

What happens to the body:

Normal body temperature (98.6°F/37°C) drops to or below 95°F/35°C; fatigue or drowsiness; uncontrolled shivering; cool, bluish skin; slurred speech; clumsy movements; irritable, irrational, or confused behavior.

What to do: (land temperatures)

- Call for emergency help (i.e., ambulance or 911).
- Move the person to a warm, dry area. Don't leave the person alone.
- Remove wet clothing and replace with warm, dry clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if he is alert. **Avoid drinks with caffeine** (coffee, tea, or hot chocolate) **or alcohol**.
- Have the person move his arms and legs to create muscle heat. If he is unable to do this, place warm bottles or hot packs in the armpits, groin, neck, and head areas. **Do not** rub the person's body or place him in a warm water bath. This may stop his heart.

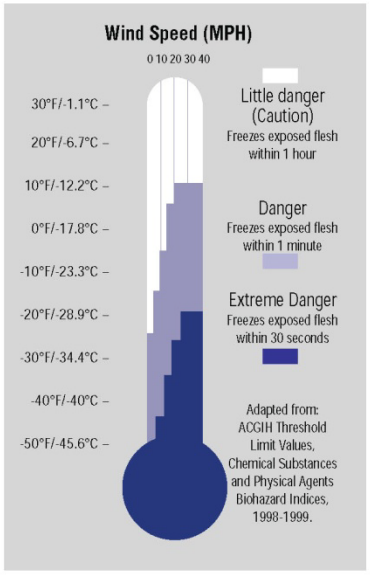
What to do: (water temperatures)

- Call for emergency help (i.e., ambulance or 911). Body heat is lost up to 25 times faster in water.
- **Do not** remove any clothing. Button, buckle, zip, and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.
- Get out of the water as quickly as possible or climb on anything floating. **Do not** attempt to swim unless a floating object or another person can be reached because swimming or other physical activity uses body heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

THE COLD STRESS EQUATION

LOW TEMPERATURE + WIND SPEED + WETNESS = INJURIES & ILLNESS

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result. **Hypothermia** can occur when *land temperatures* are **above** freezing or *water temperatures* are below 98.6°F/37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.



Oregon Occupational Safety & Health Division
440-3336E S (9/03)

HEAT EXHAUSTION

What happens to the body:

Headaches, dizziness, or light-headedness, weakness, mood changes, irritability or confusion, feeling sick to your stomach, vomiting, fainting, decreased and dark-colored urine, and pale, clammy skin.

What should be done:

- Move the person to a cool shaded area. Don't leave the person alone. If the person is dizzy or light-headed, lay him on his back and raise his legs about 6-8 inches. If the person is sick to his stomach, lay him on his side.
- Loosen and remove heavy clothing.
- Have the person drink some cool water (a small cup every 15 minutes) if he is not feeling sick to his stomach.
- Try to cool the person by fanning him. Cool the skin with a cool spray mist of water or wet cloth.
- If the person does not feel better in a few minutes call for emergency help (ambulance or call 911.)

(If heat exhaustion is not treated, the illness may advance to heat stroke.)

HEAT STROKE - A Medical Emergency

What happens to the body:

Dry, pale skin (no sweating); hot red skin (looks like a sunburn); mood changes; irritability, confusion, and not making any sense; seizures or fits, and collapse (will not respond).

What should be done:

- Call for emergency help (i.e., ambulance or 911.)
- Move the person to a cool, shaded area. Don't leave the person alone. Lay him on his back and if the person is having seizures, remove objects close to him so he won't hit them. If the person is sick to his stomach, lay him on his side.
- Remove heavy and outer clothing.
- Have the person drink some cool water (a small cup every 15 minutes) if he is alert enough to drink anything and not feeling sick to his stomach.
- Try to cool the person by fanning him or her. Cool the skin with a cool spray mist of water, wet cloth, or wet sheet.
- If ice is available, place ice packs in armpits and groin area.

How to Protect Workers

- Learn the signs and symptoms of heat-induced illnesses and what to do to help the worker.
- Train workers about heat-induced illnesses.
- Perform the heaviest work during the coolest part of the day.
- Slowly build up tolerance to the heat and the work activity (usually takes up to 2 weeks.)
- Use the buddy system (work in pairs.)
- Drink plenty of cool water (one small cup every 15-20 minutes.)
- Wear light, loose-fitting, breathable (like cotton) clothing.
- Take frequent short breaks in cool, shaded areas (allow your body to cool down.)
- Avoid eating large meals before working in hot environments.
- Avoid caffeine and alcoholic beverages (these beverages make the body lose water and increase the risk of heat illnesses.)

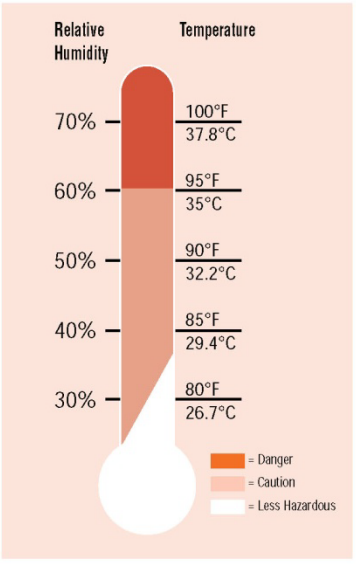
Workers are at increased risk when...

- They take certain medications. Check with your doctor, nurse, or pharmacy to see if medicines you take affect you when working in hot environments.
- They have had a heat-induced illness in the past.
- They wear personal protective equipment.

THE HEAT EQUATION

HIGH TEMPERATURE + HIGH HUMIDITY + PHYSICAL WORK = HEAT ILLNESS

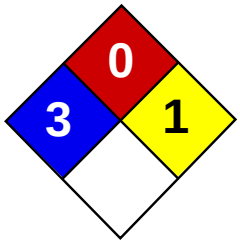
When the body is unable to cool itself through sweating, **serious** heat illnesses may occur. The most severe heat-induced illnesses are **heat exhaustion** and **heat stroke**. If actions are not taken to treat heat exhaustion, the illness could progress to heat stroke and **death**.



Oregon Occupational Safety & Health Division
440-3333E-S(9/03)

ATTACHMENT 4

MATERIAL SAFETY DATA SHEETS



Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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Last Updated: 05/21/2013 12:00 PM

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Isobutylene

Safety Data Sheet P-4614

according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1979 Revision date: 02/27/2015 Supersedes: 12/01/2009

SECTION: 1. Product and company identification

1.1. Product identifier

Product form	:	Substance
Name	:	Isobutylene
CAS No	:	115-11-7
Formula	:	C4H8 / CH2=C(CH3)2
Other means of identification	:	Isobutene

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	:	Industrial use. Use as directed.

1.3. Details of the supplier of the safety data sheet

Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113 - USA
T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146
www.praxair.com

1.4. Emergency telephone number

Emergency number	:	Onsite Emergency: 1-800-645-4633 CHEMTREC, 24hr/day 7days/week — Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887 (collect calls accepted, Contract 17729)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Flam. Gas 1 H220
Liquefied gas H280

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS02 GHS04

Signal word (GHS-US) : DANGER

Hazard statements (GHS-US) :
H220 - EXTREMELY FLAMMABLE GAS
H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION.
CGA-HG04 - MAY FORM EXPLOSIVE MIXTURES WITH AIR
CGA-HG01 - MAY CAUSE FROSTBITE.

Precautionary statements (GHS-US) :
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from Heat, Open flames, Sparks, Hot surfaces. - No smoking
P271+P403 - Use and store only outdoors or in a well-ventilated place.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely
P381 - Eliminate all ignition sources if safe to do so
CGA-PG05 - Use a back flow preventive device in the piping.
CGA-PG12 - Do not open valve until connected to equipment prepared for use.
CGA-PG06 - Close valve after each use and when empty.
CGA-PG11 - Never put cylinders into unventilated areas of passenger vehicles.
CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F).

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2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS-US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substance

Name	Product identifier	%
Isobutylene (Main constituent)	(CAS No) 115-11-7	100

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

First-aid measures after skin contact : For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

None.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide, Dry chemical, Water spray or fog.

5.2. Special hazards arising from the substance or mixture

Fire hazard : EXTREMELY FLAMMABLE GAS. If venting or leaking gas catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device.

Explosion hazard : EXTREMELY FLAMMABLE GAS. Forms explosive mixtures with air and oxidizing agents.

Reactivity : No reactivity hazard other than the effects described in sub-sections below.

5.3. Advice for firefighters

Firefighting instructions : **DANGER: FLAMMABLE LIQUID AND VAPOR.** Evacuate all personnel from danger area. Use self-contained breathing apparatus. Immediately cool surrounding containers with water spray from maximum distance, taking care not to extinguish flames. Avoid spreading burning liquid with water. Remove ignition sources if safe to do so. If flames are accidentally extinguished, explosive reignition may occur. Reduce vapors with water spray or fog. Stop flow of liquid if safe to do so, while continuing cooling water spray. Remove all containers from area of fire if safe to do so. Allow fire to burn out. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1919 Subpart L - Fire Protection.

Special protective equipment for fire fighters : Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.

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Other information : Containers are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : **DANGER: Flammable liquid and gas under pressure.** Forms explosive mixtures with air. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if safe to do so. Reduce vapors with fog or fine water spray, taking care not to spread liquid with water. Shut off flow if safe to do so. Ventilate area or move container to a well-ventilated area. Flammable vapors may spread from leak and could explode if reignited by sparks or flames. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an appropriate device.

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Try to stop release. Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only non-sparking tools. Use only explosion-proof equipment.

Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

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7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store only where temperature will not exceed 125°F (52°C). Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g., NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16.

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Isobutylene (115-11-7)		
ACGIH	ACGIH TLV-TWA (ppm)	250 ppm

8.2. Exposure controls

Appropriate engineering controls : Use an explosion-proof local exhaust system. Local exhaust and general ventilation must be adequate to meet exposure standards. MECHANICAL (GENERAL): Inadequate - Use only in a closed system. Use explosion proof equipment and lighting.

Eye protection : Wear safety glasses when handling cylinders; vapor-proof goggles and a face shield during cylinder changeout or whenever contact with product is possible. Select eye protection in accordance with OSHA 29 CFR 1910.133.

Skin and body protection : Wear metatarsal shoes and work gloves for cylinder handling, and protective clothing where needed. Wear neoprene gloves during cylinder changeout or wherever contact with product is possible. Select per OSHA 29 CFR 1910.132, 1910.136, and 1910.138.

Respiratory protection : When workplace conditions warrant respirator use, follow a respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable). Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure (e.g., an organic vapor cartridge). For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).

Thermal hazard protection : Wear cold insulating gloves when transfilling or breaking transfer connections.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Gas

Molecular mass : 56 g/mol

Color : Colorless.

Odor : Sweetish.

Odor threshold : Odor threshold is subjective and inadequate to warn for overexposure.

pH : Not applicable.

Relative evaporation rate (butyl acetate=1) : No data available

Relative evaporation rate (ether=1) : Not applicable.

Melting point : -140.3 °C

Freezing point : No data available

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Boiling point	:	-6.9 °C
Flash point	:	-80 °C (closed cup)
Critical temperature	:	144 °C
Auto-ignition temperature	:	465 °C
Decomposition temperature	:	No data available
Flammability (solid, gas)	:	1.8 - 8.8 vol %
Vapor pressure	:	260 kPa
Critical pressure	:	4000 kPa
Relative vapor density at 20 °C	:	No data available
Relative density	:	0.63
Specific gravity / density	:	0.599 g/cm³ (at 20 °C)
Relative gas density	:	2
Solubility	:	Water: 388 mg/l
Log Pow	:	2.35
Log Kow	:	Not applicable.
Viscosity, kinematic	:	Not applicable.
Viscosity, dynamic	:	Not applicable.
Explosive properties	:	Not applicable.
Oxidizing properties	:	None.
Explosive limits	:	No data available

9.2. Other information

Gas group	:	Liquefied gas
Additional information	:	Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

May occur.

10.4. Conditions to avoid

High temperature. Catalyst.

10.5. Incompatible materials

Halogens. Oxidizing agents. Acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce : Carbon monoxide. Carbon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Isobutylene (\f)115-11-7	
LC50 inhalation rat (mg/l)	620 mg/l/4h
LC50 inhalation rat (ppm)	≥ 10000
ATE US (gases)	10000.000 ppmV/4h
ATE US (vapors)	620.000 mg/l/4h
ATE US (dust, mist)	620.000 mg/l/4h

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Skin corrosion/irritation : Not classified

pH: Not applicable.

Serious eye damage/irritation : Not classified

pH: Not applicable.

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Isobutylene (115-11-7)	
National Toxicology Program (NTP) Status	1 - Evidence of Carcinogenicity

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No known ecological damage caused by this product.

12.2. Persistence and degradability

Isobutylene (115-11-7)	
Persistence and degradability	The substance is biodegradable. Unlikely to persist.

12.3. Bioaccumulative potential

Isobutylene (115-11-7)	
Log Pow	2.35
Log Kow	Not applicable.
Bioaccumulative potential	Not expected to bioaccumulate due to the low log Kow (log Kow < 4). Refer to section 9.

12.4. Mobility in soil

Isobutylene (115-11-7)	
Mobility in soil	No data available.
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Other adverse effects

Effect on ozone layer : None.

Effect on the global warming : No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Do not attempt to dispose of residual or unused quantities. Return container to supplier.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN1055 Isobutylene, 2.1

UN-No.(DOT) : UN1055

Proper Shipping Name (DOT) : Isobutylene

Department of Transportation (DOT) Hazard Classes : 2.1 - Class 2.1 - Flammable gas 49 CFR 173.115

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Hazard labels (DOT) : 2.1 - Flammable gas

DOT Special Provisions (49 CFR 172.102) : 19 - For domestic transportation only, the identification number UN1075 may be used in place of the identification number specified in column (4) of the 172.101 table. The identification number used must be consistent on package markings, shipping papers and emergency response information.
T50 - When portable tank instruction T50 is referenced in Column (7) of the 172.101 Table, the applicable liquefied compressed gases are authorized to be transported in portable tanks in accordance with the requirements of 173.313 of this subchapter.

Additional information

Emergency Response Guide (ERG) Number : 115 (UN1055)

Other information : No supplementary information available.

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers: - Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

Transport by sea

UN-No. (IMDG) : 1055

Proper Shipping Name (IMDG) : ISOBUTYLENE

Class (IMDG) : 2 - Gases

MFAG-No : 115

Air transport

UN-No.(IATA) : 1055

Proper Shipping Name (IATA) : Isobutylene

Class (IATA) : 2

Civil Aeronautics Law : Gases under pressure/Gases flammable under pressure

SECTION 15: Regulatory information

15.1. US Federal regulations

Isobutylene (115-11-7)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Delayed (chronic) health hazard Sudden release of pressure hazard Fire hazard

15.2. International regulations

CANADA

Isobutylene (115-11-7)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

Isobutylene (115-11-7)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

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15.2.2. National regulations

Isobutylene (115-11-7)
Listed on the AICS (Australian Inventory of Chemical Substances) Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China) Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory Listed on the Korean ECL (Existing Chemicals List) Listed on NZIoC (New Zealand Inventory of Chemicals) Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)

15.3. US State regulations

Isobutylene(115-11-7)	
U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

Revision date : 2/27/2015 12:00:00 AM

Other information : When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product.

Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

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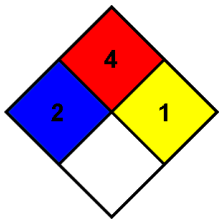
NFPA health hazard	: 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.
NFPA fire hazard	: 4 - Will rapidly or completely vaporize at normal pressure and temperature, or is readily dispersed in air and will burn readily.
NFPA reactivity	: 1 - Normally stable, but can become unstable at elevated temperatures and pressures or may react with water with some release of energy, but not violently.



HMIS III Rating

Health	: 1 Slight Hazard - Irritation or minor reversible injury possible
Flammability	: 4 Severe Hazard
Physical	: 2 Moderate Hazard

SDS US (GHS HazCom 2012) - Praxair

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

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MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**ALCONOX®**
CHEMICAL FAMILY NAME:	Detergent.
PRODUCT USE:	Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	Alconox, Inc.
ADDRESS:	30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE:	**TOLL-FREE in USA/Canada** 800-255-3924
	International calls 813-248-0585
BUSINESS PHONE:	914-948-4040
DATE OF PREPARATION:	May 2011
DATE OF LAST REVISION:	February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS

EUROPEAN and (GHS) Hazard Symbols

Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 207-638-8 Index# 011-005-00-2
EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray
P264: Wash hands thoroughly after handling
P271: Use only in well ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

Risk Phrases:
R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:
S8: Keep container dry
S22: Do not breath dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

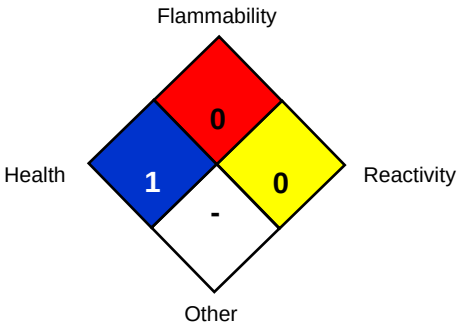
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable and has no known explosion hazards.
Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m³	5 mg/m³	5 mg/m³
Sodium Carbonate	497-19-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 – 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable
DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.
SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No Data available at this time.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
PACKING GROUP: Not Applicable.
DOT LABEL(S) REQUIRED: Not Applicable
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Effective date: 05/12/2015 **Revision:** 05/12/2015

LIQUINOX

1 Identification of the Substance/mixture and of the Company/Undertaking

1.1 Product identifier

Trade name: LIQUINOX

Application of the substance / the preparation: Hand detergent.

1.2 Relevant identified uses of the substance or mixture and uses advised against:

No additional information available.

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer/Supplier:

Alconox, Inc.
30 Glenn St., Suite 309
White Plains, NY 10603
Phone: 914-948-4040

Further information obtainable from: Product Safety Department.

1.4 Emergency telephone number:

ChemTel Inc.: (800)255-3924, +1 (813)248-0585

2 Hazards Identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008:

Classification according to Directive 67/548/EEC or Directive 1999/45/EC:

GHS07

Skin Irrit. 2, H315: Causes skin irritation.

Information concerning particular hazards for human and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to the latest editions of the EU-lists, and extended by company and literature data

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008:

The product is classified and labelled according to the CLP regulation.

Hazard pictograms:

GHS07

Signal word: Warning

Hazard-determining components of labelling:

Alkyl benzene sulfonic acid, sodium salt.

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Effective date: 05/12/2015 **Revision:** 05/12/2015

LIQUINOX

Hazard statements:
H315: Causes skin irritation.

Precautionary statements:

P332+P313: If skin irritation occurs: Get medical advice/attention.

P302+P352: IF ON SKIN: Wash with plenty of soap and water.

P501: Dispose of contents/container in accordance with local/regional/national/international regulations.

Other Hazard description:
WHMIS-classification and symbols:
D2B - Toxic material causing other toxic effects

NFPA ratings (scale 0 - 4)

Health = 1
Fire = 0
Reactivity = 0

HMIS-ratings (scale 0 - 4)

HEALTH	1
FIRE	0
REACTIVITY	0

Health = 1
Fire = 0
Reactivity = 0

2.3 Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/Information on Ingredients

3.2 Chemical characterization: Mixture
Description: Hazardous ingredients of mixture listed below.

Identifying Nos.	Description	Wt. %
CAS: 68081-81-2	Alkyl benzene sulfonic acid, sodium salt	10 - 25%
CAS: 1300-72-7 EINECS: 215-090-9	Sodium xylene sulphonate	2.5 - 10%
CAS: 84133-50-6	Alcohol Ethoxylate	2.5 - 10%
CAS: 68603-42-9 EINECS: 271-657-0	Coconut diethanolamide	2.5 - 10%
CAS: 17572-97-3 EINECS: 241-543-5	Ethylenediaminetetraacetic acid, tripotassium salt	2.5 - 10%

Additional information: For the wording of the listed risk phrases refer to section 16.

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Effective date: 05/12/2015 **Revision:** 05/12/2015

LIQUINOX

4 First Aid Measures

4.1 Description of first aid measures

General information:

Take affected persons out into the fresh air.

After inhalation:

Supply fresh air; consult doctor in case of complaints.

After skin contact:

Immediately wash with water and soap and rinse thoroughly for 30 minutes. If skin irritation continues, consult a doctor.

After eye contact:

Remove contact lenses if worn.

Rinse opened eye for at least 30 minutes under running water, lifting upper and lower lids occasionally. Immediately consult a doctor.

After swallowing:

Do not induce vomiting; call for medical help immediately. Rinse out mouth and then drink plenty of water.

A person vomiting while laying on their back should be turned onto their side.

4.2 Most important symptoms and effects, both acute and delayed:

Irritating, all routes of exposure.

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information available.

5 Firefighting Measures

5.1 Extinguishing media:

Suitable extinguishing agents:

CO2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

5.2 Special hazards arising from the substance or mixture:

No additional information available.

5.3 Advice for firefighters:

Protective equipment:

Wear self-contained respiratory protective device.

Wear fully protective suit.

6 Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation.

Particular danger of slipping on leaked/spilled product.

6.2 Environmental precautions:

Dilute with plenty of water.

Do not allow to enter sewers/ surface or ground water.

6.3 Methods and material for containment and cleaning up:

Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).

Clean the affected area carefully; suitable cleaners are: Warm water

Dispose contaminated material as waste according to item 13. Ensure adequate ventilation.

6.4 Reference to other sections:

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information

7 Handling and Storage

7.1 Precautions for safe handling:

No special precautions are necessary if used correctly.

Information about fire - and explosion protection:

No special measures required.

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Effective date: 05/12/2015 **Revision:** 05/12/2015

LIQUINOX

7.2 Conditions for safe storage, including any incompatibilities:
Storage:
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: No special requirements.
Further information about storage conditions: None

7.3 Specific end use(s): No additional information available.

8 Exposure Controls/Personal Protection

8.1 Control parameters
Ingredients with limit values that require monitoring at the workplace:
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

Additional information: The lists valid during the making were used as basis.

8.2 Exposure controls:
Personal protective equipment:
General protective and hygienic measures:
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.
Respiratory protection:
Not required under normal conditions of use.
Protection of hands:


Protective gloves

The glove material has to be impermeable and resistant to the product. Selection of the glove material should be based on the penetration time, rates of diffusion and the degradation of the glove material.

Material of gloves:
The selection of a suitable gloves does not only depend on the material, but also on the quality, and varies from manufacturer to manufacturer.
Penetration time of glove material:
The exact break through time has to be determined by the manufacturer of the protective gloves. DO NOT exceed the breakthrough time set by the Manufacturer.
For long term contact, gloves made of the following materials are considered suitable:
Butyl rubber, BR
Nitrile rubber, NBR
Natural rubber (NR)
Neoprene gloves
Eye protection:


Safety glasses
Goggles recommended during refilling.

Body protection: Protective work clothing

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Effective date: 05/12/2015 **Revision:** 05/12/2015

LIQUINOX

9 Physical and Chemical Properties

9.1 Information on basic physical and chemical properties:

General Information:	
Appearance:	
Form:	Liquid
Color:	Light Yellow
Odor:	Odorless
Odor threshold:	Not determined.
pH-value:	8.5
Change in condition:	
Melting point/Melting range:	Not determined.
Boiling point/Boiling range:	100°C
Flash point:	Not applicable.
Flammability (solid, gaseous):	Not applicable.
Ignition temperature:	Not applicable.
Decomposition temperature:	Not determined.
Self-igniting:	Product is not selfigniting.
Danger of explosion:	Product does not present an explosion hazard.
Explosion limits:	
Lower:	Not determined.
Upper:	Not determined.
Vapor pressure at 20°C:	23 hPa
Density:	1.08 g/cm³
Relative density:	Not determined.
Vapor density:	Not determined.
Evaporation rate:	Not determined.
Solubility in / Miscibility with water:	Fully miscible.
Segregation coefficient (n-octanol/water):	Not determined.
Viscosity:	
Dynamic:	Not determined.
Kinematic:	Not determined.
Solvent content:	
Organic solvents:	Not determined.
Solids content:	Not determined.
9.2 Other information:	No additional information available.

10 Stability and Reactivity

10.1 Reactivity:

10.2 Chemical stability:

Thermal decomposition / conditions to be avoided:

No decomposition if used according to specifications.

10.3 Possibility of hazardous reactions:

Reacts with strong oxidizing agents. Reacts with strong acids.

10.4 Conditions to avoid:

No additional information available.

10.5 Incompatible materials:

No additional information available.

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Effective date: 05/12/2015 **Revision:** 05/12/2015

LIQUINOX

10.6 Hazardous decomposition products:
Carbon monoxide and carbon dioxide
Sulphur oxides (SOx)
Nitrogen oxides

11 Toxicological Information

11.1 Information on toxicological effects:
Toxicity data: Toxicity data is available for mixture:
Primary irritant effect:
On the skin: Irritating to skin and mucous membranes.
On the eye: Strong irritant with the danger of severe eye injury.
Sensitization: No sensitizing effects known.
Additional toxicological information:
The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version: Irritant

12 Ecological Information

12.1 Toxicity:
Aquatic toxicity: No additional information available.
12.2 Persistence and degradability: Biodegradable.
12.3 Bioaccumulative potential: Does not accumulate in organisms.
12.4 Mobility in soil: No additional information available.
Additional ecological information:
General notes:
Water hazard class 1 (German Regulation) (Self-assessment): slightly hazardous for water.
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
Must not reach sewage water or drainage ditch undiluted or un-neutralized.
12.5 Results of PBT and vPvB assessment:
PBT: Not applicable.
vPvB: Not applicable.
12.6 Other adverse effects: No additional information available.

13 Disposal Considerations

13.1 Waste treatment methods:
Recommendation:
Smaller quantities can be disposed of with household waste.
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.
Uncleaned packaging:
Recommendation: Disposal must be made according to official regulations.
Recommended cleansing agents: Water, together with cleansing agents, if necessary.

14 Transport Information

14.1 UN-Number:
DOT, ADR, ADN, IMDG, IATA: Not Regulated

14.2 UN proper shipping name:
DOT, ADR, IMDG, IATA: Not Regulated

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14.3 Transport hazard class(es):
DOT, ADR, IMDG, IATA:
Class: Not Regulated
Label: -

14.4 Packing group:
DOT, ADR, IMDG, IATA: Not Regulated

14.5 Environmental hazards:
Marine pollutant: No

14.6 Special precautions for user: Not applicable.

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: Not applicable.

UN "Model Regulation": Not Regulated

15 Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:
United States (USA):
SARA:
Section 355 (extremely hazardous substances): None of the ingredient is listed.
Section 313 (Specific toxic chemical listings): None of the ingredient is listed.
TSCA (Toxic Substances Control Act): All ingredients are listed.

Proposition 65 (California):
Chemicals known to cause cancer: None of the ingredient is listed.
Chemicals known to cause reproductive toxicity for females: None of the ingredient is listed.
Chemicals known to cause reproductive toxicity for males: None of the ingredient is listed.
Chemicals known to cause developmental toxicity: None of the ingredient is listed.

Carcinogenic Categories:
EPA (Environmental Protection Agency): None of the ingredient is listed.
TLV (Threshold Limit Value established by ACGIH): None of the ingredient is listed.
NIOSH-Ca (National Institute for Occupational Safety and Health): None of the ingredient is listed.
OSHA-Ca (Occupational Safety & Health Administration): None of the ingredient is listed.
Canadá:
Canadian Domestic Substances List (DSL): All ingredients are listed.
Canadian Ingredient Disclosure list (limit 0.1%): None of the ingredient is listed.
Canadian Ingredient Disclosure list (limit 1%): None of the ingredient is listed.

15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other Information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Relevant phrases:
H315: Causes skin irritation.

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Abbreviations and Acronyms:

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road.
IMDG: International Maritime Code for Dangerous Goods.
DOT: US Department of Transportation.
IATA: International Air Transport Association.
GHS: Globally Harmonized System of Classification and Labelling of Chemicals.
ACGIH: American Conference of Governmental Industrial Hygienists.
NFPA: National Fire Protection Association (USA).
HMIS: Hazardous Materials Identification System (USA).
WHMIS: Workplace Hazardous Materials Information System (Canada).
VOC: Volatile Organic Compounds (USA, EU).
LC50: Lethal concentration, 50 percent.
LD50: Lethal dose, 50 percent.

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ATTACHMENT 5

EMPLOYEE EXPOSURE/INJURY INCIDENT REPORT

Employee Exposure/Injury Incident Report

(completed by the CHSM or designee)

Employee:			
Office or field location:			
Incident:			
Potential or known exposure (describe):			
Physical injury or illness (describe):			
Location (city and state):		Project and Contract No.	
Date of incident:		Time of incident:	
Date incident reported:		Person to whom incident was reported:	
Weather condition during incident:		Temperature:	Precipitation:
Wind speed and direction:		Cloud cover:	
Name of materials potentially encountered (chemical exposure):			
Chemical and phase (i.e., liquid, solid, gas, vapor, fume, mist), radiological, etc.:			
Describe the exposure/injury in detail and the parts of the body affected (attach extra sheets if necessary):			
Describe exact onsite or offsite location where the incident occurred:			
What was the employee doing when the exposure/injury occurred? (Describe briefly as site reconnaissance, soil sampling, etc.):			

How did the incident occur? Describe fully the factors that led to or contributed to the incident:					
Was medical treatment given? ☐ Yes ☐ No If yes, when?					
By whom?		Name of paramedic:			
		Name of physician:			
		Other:			
Where?	Onsite		Offsite		
If offsite, name of hospital or clinic:					
Length of inpatient stay (dates):					
Was Integral Consulting management notified? ☐ Yes ☐ No If yes, when?					
Name and title of manager(s) notified:					
Did the exposure/injury result in permanent disability or death? ☐ Yes ☐ No					
If yes, explain:					
Number of days away from work		Number of days of restricted work activity:			
Has the employee returned to work? (Yes / No) If yes, date:					
Names of other persons affected during the incident:					
Names of persons who witnessed the incident:					
Name and title of field team leader or immediate supervisor at the site:					
Was the operation being conducted under an established safety plan? ☐ Yes ☐ No					

If yes, attach a copy. If no, explain:	

Was personal protective equipment (PPE) used by the employee? ☐ Yes ☐ No

If yes, list items:	

Did any limitations in safety equipment or PPE affect or contribute to exposure? ☐ Yes ☐ No

If yes, explain:	

Attachments to this report:		Medical report(s) (if not confidential)		Site safety plan
		Other relevant information		

Employee's signature		Date
Site safety officer's signature		Date
Project manager's signature		Date

Corporate health and safety manager review and comments

Corrective action/procedure changes carried out on the project:
Corrective actions to be taken to prevent similar incidents at other sites:

Corporate Health and Safety Manager's signature		Date

ATTACHMENT 6

NEAR-MISS INCIDENT REPORT

Near-Miss Incident Report

(completed by field staff)

Employee:	
Office or site location:	

Near-Miss Incident (check one or more): Exposure ☐ Physical injury ☐ Property damage ☐

Location (city and state):		Project and Contract No.	
Date of incident:		Time of incident:	

Fully describe the incident, including how it happened, persons involved, if chemicals were involved in the incident, etc.:

Was the operation being conducted under an established safety plan? ☐ Yes ☐ No

If yes, attach a copy. If no, explain:	

Employee's signature		Date
Project Manager's signature		Date
Site safety officer's signature		Date

Corporate health and safety manager review and comments

Corrective action/procedure changes carried out at the site:		
Corrective actions to be taken to prevent similar incidents at other sites:		
Corporate Health and Safety Manager's signature		Date