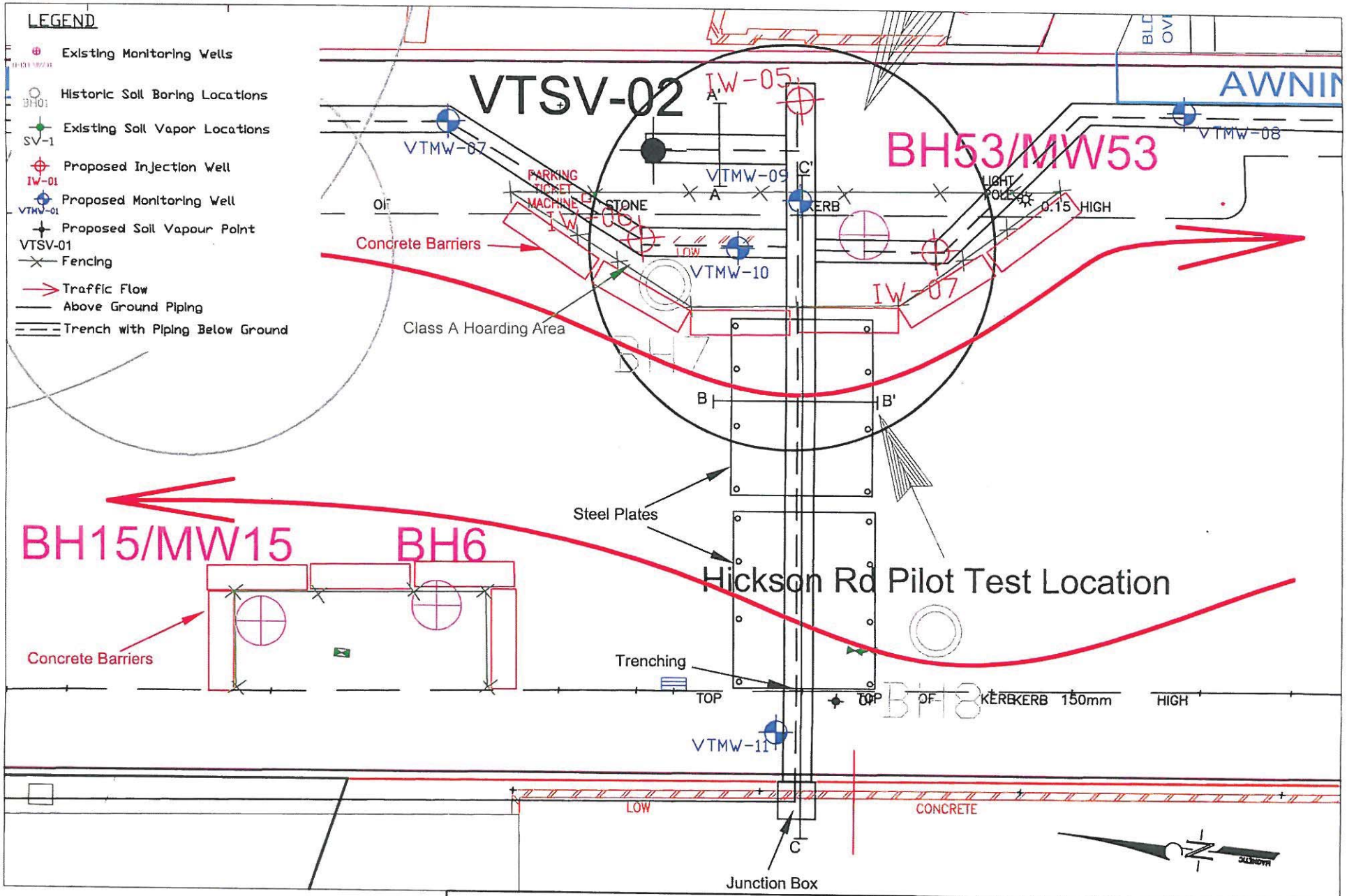

0 5 10

SCALE, METERS

Note: Exact location of wells is estimated based on previous maps

Lend Lease	VeruTEK TECHNOLOGIES	Hickson Pilot Test Treatment Area Map
Barangaroo Hickson Rd Miller Point		AUGUST 2010 FIGURE 2B

Attachment 6: Hickson Road Pilot Trial Layout

Table 7a: Block 5 Monitoring Schedule

Test Phase	Monitoring Type	Parameters	Frequency*	Measurement/Sample Location	Sampler	Analysis Location
Pre-Injection Monitoring	Performance Monitoring	Temperature, pressure, Turbidity, pH, ORP, DO, specific conductivity	Once	VTMW-01, VTMW-02, VTMW-03, VTMW-04, VTMW-05, VTMW-06, VTMW-12, MW198, MW64, MW68, MW62, MW197	VeruTEK	Troll 9500, with flow cell
		IFT, ORP, pH, specific conductivity, temperature, turbidity	Once			On-Site Laboratory
	Groundwater Sampling	VOC, SVOC and TPH analysis	Once	VTMW-01, VTMW-02, VTMW-03, VTMW-04, VTMW-05, VTMW-06, VTMW-12, MW198, MW64, MW68, MW62, MW197		Off-Site Laboratory
	Soil Gas Sampling	PID, LEL, O_2, CO, H_2S, Odour	Once	VTSV-01, SV09, SV10, SV11; Utility Pits, Service Access Points, Monitoring Well Heads***	AECOM	PID and MultiGas Meters; Nasal Ranger
		TO-14A VOC analytes and naphthalene, according to USEPA Method TO-15	Once	VTSV-01, SV09, SV10, SV11		Off-Site Laboratory
	Soil Sampling	VOCs (USEPA Method 8260), SVOCs (USEPA Method 8270), TPH (USEPA Methods 3510/8015 & 5030/8260)	Once	5 Locations on Grid Basis	VeruTEK	Off-Site Laboratory
S-ISCO® Phase	Process Monitoring	Flow rate, pressure, and temperature	Hourly	Injection Feed	System Operator	Injection Equipment Meters
		Fe-TAML, persulfate, hydroxide & peroxide concentrations, and IFT	Daily		Laboratory Technician	On-Site Laboratory
	Performance Monitoring	Temperature, pressure, turbidity, pH, ORP, DO, specific conductivity	Continuous"	2-3 Monitoring Wells (locations TBD)	Field Technician	Troll 9500 in monitoring well**
		Temperature, pressure, turbidity, pH, ORP, DO, specific conductivity	Daily	Wells along Conductivity Front		Troll 9500, with flow-through cell
		Temperature, pressure, turbidity, pH, ORP, DO, specific conductivity	Weekly	VTMW-01, VTMW-02, VTMW-03, VTMW-04, VTMW-05, VTMW-06, VTMW-12, MW198, MW64, MW68, MW62, MW197		

Table 7a: Block 5 Monitoring Schedule

Test Phase	Monitoring Type	Parameters	Frequency*	Measurement/Sample Location	Sampler	Analysis Location
		Persulfate, peroxide, hydroxide, Fe, IFT, pH, turbidity, specific conductivity, TPH (C_{10}-C_{36})	Weekly		Laboratory Technician	On-Site Laboratory
		Day-lighting (Emergence of Injected Chemistry from the Ground)	Daily	Visual Inspection of Injection Wells for Evidence of Day-lighting	Field Technicians	Injection Wells
	Soil Gas Sampling	PID, LEL, O_2, CO, H_2S, Odour	Daily	VTSV-01, SV09, SV10, SV11, SVE System Effluent, Utility Pits, Service Access Points, Monitoring Well Heads***	Field Technicians	PID and MultiGas Meters; Nasal Ranger
		TO-14A VOC analytes and naphthalene, according to USEPA Method TO-15	Weekly	VTSV-01, SV09, SV10, SV11, SVE System Effluent	AECOM	Off-Site Laboratory
	Soil Sampling	VOCs (USEPA Method 8260), SVOCs (USEPA Method 8270), TPH (USEPA Methods 3510/8015 & 5030/8260)	Once	5 Locations Selected Randomly	AECOM	Off-Site Laboratory
Post-Injection Monitoring	Performance Monitoring	Temperature, pressure, turbidity, pH, ORP, DO, specific conductivity	Daily	TBD	AECOM	Troll 9500 in monitoring well**
		Temperature, pressure, turbidity, pH, ORP, DO, specific conductivity	Daily	Wells along Conductivity Front		Troll 9500, with flow cell
		Temperature, pressure, turbidity, pH, ORP, DO, specific conductivity	Weekly	VTMW-01, VTMW-02, VTMW-03, VTMW-04, VTMW-05, VTMW-06, VTMW-12, MW198, MW64, MW68, MW62, MW197		
		Persulfate, peroxide, hydroxide, Fe-TAML, IFT, pH, turbidity, specific conductivity	Weekly			On-Site Laboratory
	Groundwater Sampling	VOC, SVOC and TPH analysis	Once	VTMW-01, VTMW-02, VTMW-03, VTMW-04, VTMW-05, VTMW-06, VTMW-12, MW198, MW64, MW68, MW62, MW197		Off-Site Laboratory
	Soil Gas Sampling	PID, LEL, O_2, CO, H_2S, Odours	Once	VTSV-01, SV09, SV10, SV11, SVE System Effluent (if in use), Utility Pits,		PID and MultiGas

Table 7a: Block 5 Monitoring Schedule

Task Phase	Monitoring Type	Parameters	Frequency*	Measurement/Sample Location	Sampler	Analysis Location
				Service Access Points, Monitoring Well Heads***		Meters; Nasal Ranger
		TO-14A VOC analytes and naphthalene, according to USEPA Method TO-15	Weekly	VTSV-01, SV09, SV10, SV11, SVE System Effluent (if in use)		Off-Site Laboratory
	Soil Sampling	VOCs (USEPA Method 8260), SVOCs (USEPA Method 8270), TPH (USEPA Methods 3510/8015 & 5030/8260)	Once	5 Locations on Grid basis		Off-Site Laboratory

*** Minimum monitoring conditions. Frequency may be changed based on the result of the continuing monitoring program and consistency of the pilot trial operation.**
**** The *in situ* Trolls may be rotated among wells based on monitoring data collected.**
***** PID and Multi-gas monitoring will take place in both: the breathing space at each of these locations; as well as, *within* the nominated utility pits (shown as service monitoring locations) to monitor accumulation.**

Table 7b: Hickson Road Monitoring Schedule

Test Phase	Monitoring Type	Parameters	Frequency*	Measurement/Sample Location	Sampler	Analysis Location
Pre-Injection	Performance Monitoring	Temperature, pressure, Turbidity, pH, ORP, DO, specific conductivity	Once	VTMW-07, VTMW-08, VTMW-09, VTMW-10, VTMW-11, MW15, MW53, BH6	VeruTEK	Troll 9500, with flow-through cell
		IFT, ORP, pH, specific conductivity, temperature, turbidity	Once			On-Site Laboratory
	Groundwater Sampling	VOC, SVOC and TPH analysis	Once	VTMW-07, VTMW-08, VTMW-09, VTMW-10, VTMW-11, MW15, MW53, BH6		Off-Site Laboratory
	Soil Gas Sampling	PID, LEL, O_2, CO, H_2S, Odours	Once	VTSV-02, VTSV-03, VTSV-04, VTSV-05, Utility Pits, Service Access Points, Monitoring Well Heads***		PID and MultiGas Meters; Nasal Ranger
		TO-14A VOC analytes and naphthalene, according to USEPA Method TO-15	Once	VTSV-02, VTSV-03, VTSV-04	AECOM	Off-Site Laboratory
	Soil Sampling	VOCs (USEPA Method 8260), SVOCs (USEPA Method 8270), TPH (USEPA Methods 3510/8015 & 5030/8260)	Once	5 Locations on Grid Basis	AECOM/ VeruTEK	Off-Site Laboratory
SEPR™ Phase	Process Monitoring	Flow rate, pressure, and temperature	hourly	Injection Feed	System Operator	Injection Equipment Meters
		Peroxide concentration and IFT	Daily		Laboratory Technician	On-Site Laboratory
	Performance Monitoring	Temperature, pressure, turbidity, pH, ORP, DO, specific conductivity	Continuous	2 to 3 Monitoring Wells (locations TBD)	Field Technicians	Troll 9500 in monitoring well**
		Temperature, pressure, turbidity, pH, ORP, DO, specific conductivity	Daily	VTMW-07, VTMW-08, VTMW-09, VTMW-10, VTMW-11, MW15, MW53, BH6		Troll 9500, with flow-through cell
		Peroxide, Fe, IFT, pH, turbidity, specific conductivity, TPH (C_{10}-C_{36})	Weekly		Laboratory Technician	On-Site Laboratory

Table 7b: Hickson Road Monitoring Schedule

Test Phase	Monitoring Type	Parameters	Frequency*	Measurement/Sample Location	Sampler	Analysis Location
		NAPL presence	Daily		Field Technicians	NAPL Probe
		Water Level	Daily			Depth Probe
		Day-lighting (Emergence of Injected Chemistry from the Ground)	Daily	Visual Inspection of Injection Wells for Evidence of Day-lighting		Injection Wells
	Soil Gas Sampling	PID, LEL, O_2, CO, H_2S, Odours	Daily	VTSV-02, VTSV-03, VTSV-04, VTSV-05, SVE System Effluent, Utility Pits, Service Access Points, Monitoring Well Heads***		PID and MultiGas Meters; Nasal Ranger
		TO-14A VOC analytes and naphthalene, according to USEPA Method TO-15	Weekly	VTSV-02, VTSV-03, VTSV-04, VTSV-05, SVE System Effluent	AECOM	Off-Site Laboratory
S-ISCO® Phase	Process Monitoring	Flow rate, pressure, and temperature	Hourly	Injection Feed	System Operator	Injection Equipment Meters
		Fe-TAML, peroxide concentration and IFT	Daily		Laboratory Technician	On-Site Laboratory
	Performance Monitoring	Temperature, pressure, turbidity, pH, ORP, DO, specific conductivity	Continuous	2 to 3 Monitoring Wells (locations TBD)	Field Technicians	Troll 9500 in monitoring well**
		Temperature, pressure, turbidity, pH, ORP, DO, specific conductivity	Daily	VTMW-07, VTMW-08, VTMW-09, VTMW-10, VTMW-11, MW15, MW53, BH6		Troll 9500, with flow-through cell
		Peroxide, Fe, IFT, pH, turbidity, specific conductivity, TPH (C_{10}-C_{36})	Weekly		Laboratory Technician	On-Site Laboratory
		Water level	Daily		Field Technicians	Depth Probe
		Day-lighting (Emergence of Injected Chemistry from the Ground)	Daily	Visual Inspection of Injection Wells for Evidence of Day-lighting		Injection Wells

Table 7b: Hickson Road Monitoring Schedule

Task Phase	Monitoring Type	Parameters	Frequency*	Measurement/Sample Location	Sampler	Analysis Location
	Soil Gas Sampling	PID, LEL, O_2, CO, H_2S, Odours	Daily	VTSV-02, VTSV-03, VTSV-04, VTSV-05, SVE System Effluent, Utility Pits, Service Access Points, Monitoring Well Heads***		PID and MultiGas Meters; Nasal Ranger
		TO-14A VOC analytes and naphthalene, according to USEPA Method TO-15	Weekly	VTSV-02, VTSV-03, VTSV-04, VTSV-05, SVE System Effluent	AECOM	Off-Site Laboratory
	Soil Sampling	VOCs (USEPA Method 8260), SVOCs (USEPA Method 8270), TPH (USEPA Methods 3510/8015 & 5030/8260)	Once	5 Locations Selected Randomly	AECOM	Off-Site Laboratory
Post-Injection Monitoring	Performance Monitoring	Temperature, pressure, turbidity, pH, ORP, DO, specific conductivity	Daily	VTMW-07, VTMW-08, VTMW-09, VTMW-10, VTMW-11, MW15, MW53, BH6	AECOM	Troll 9500, with flow-through cell
		Peroxide, Fe, IFT, pH, turbidity, specific conductivity, TPH (C_{10}-C_{36})	Weekly			On-Site Laboratory
	Groundwater Sampling	VOC, SVOC and TPH analysis	Once	VTMW-07, VTMW-08, VTMW-09, VTMW-10, VTMW-11, MW15, MW53, BH6		Off-Site Laboratory
	Soil Gas Sampling	PID, LEL, O_2, CO, H_2S, Odours	Once	VTSV-02, VTSV-03, VTSV-04, VTSV-05, SVE System Effluent, Utility Pits, Service Access Points, Monitoring Well Heads***		PID and MultiGas Meters; Nasal Ranger
		TO-14A VOC analytes and naphthalene, according to USEPA Method TO-15	Weekly	VTSV-02, VTSV-03, VTSV-04, VTSV-05, SVE System Effluent		Off-Site Laboratory
	Soil Sampling	VOCs (USEPA Method 8260), SVOCs (USEPA Method 8270), TPH (USEPA Methods 3510/8015 & 5030/8260)	Once	5 Locations On Grid basis		Off-Site Laboratory

*** Minimum monitoring conditions. Frequency may be changed based on the result of the continuing monitoring program and consistency of the pilot trial operation.**
**** The *in situ* Trolls may be rotated among wells based on monitoring data collected.**
***** PID and Multi-gas monitoring will take place in both: the breathing space at each of these locations; as well as, *within* the nominated utility pits (shown as service monitoring locations) to monitor accumulation.**