

Table 1: Practical NAPL Conceptual Site Model Elements and Tiered Approach

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Notes:

- Shading under Tier indicates task is appropriate for that tier
- Where multiple tiers are shaded for a task, higher tiers may have greater density of implementation
- Table is color-coded with light green for measured tasks, light red for modeled tasks
- Potential tier differentiators include (but are not limited to):
 - Site Subsurface Complexity
 - NAPL Release or Plume Size
 - Increasingly Complex Tiered Lists of Characterization Tasks
 - Potentially Complete Exposure Pathways
 - Sensitivity of Potential Receptors
 - Density of Investigation Sampling
- Comments or requested revisions should be directed to mhawthorne@h2altd.com

		Level						Tier					
A	B	C	D	E	F	G	H	1	2	3			
Characterization	Measure	Survey	Locations	Borings	Core Locations								
					Direct Push / LIF								
				Wells	Observation								
					Monitoring								
					Recovery								
					Water Supply	Drinking							
					Irrigation								
				Structures	Buildings								
					Utilities	Sewer							
						Water							
						Electric							
						Natural Gas							
			Transport Pipelines	Crude Oil									
					Natural Gas								
					Refined Fuels								
			Equipment / Systems										
		Elevations	Surface Water										
			Top of Casing										
			Ground Surface										
			Surface Water Elevations										
		Fluid Gauging	Wells	Air / NAPL									
				Air/Water									
				NAPL / Water									
			Surface Water	Total Depth									
		Well Construction	Elevations	Stage									
				Ground Surface									
				Top of Casing									
				Top of Screen									
				Bottom of Screen									
				Bottom of Well									
				Borehole Total Depth									
				Top of Filter Pack									
			Specifications	Borehole Seal / Grount Elevations									
				Well Casing Diameter									
				Screen Diameter									
				Borehole Diameter									
				Well Material									
				Screen Type	Slotted								
			Perforated										
			Continuous Wrap										
Screen Opening Diameter													
Seal Material Surface Casing	Flush Mount												
	Stickup												
Fluid Properties	Density	NAPL											
		Water											
	Viscosity	Air / NAPL											
		NAPL / Water											
		Air / Water											
	Fingerprint	Simulated Distillation											
		PIANO											
	Gas Chromatogram												

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Characterization	Measure	Aquifer Properties	Discrete Samples (lab analyses unless marked as field)	Saturation	Air	Total Saturation	TPH					
					NAPL	Residual versus Mobile Saturation	1000G and Other Analyses					
								Water	Irreducible Water Content			
					Producible Water Content							
				Chemical-of-Concern Concentrations	Chemical-Specific							
					Total Petroleum Hydrocarbon							
				Hydraulic Conductivity								
				Intrinsic Permeability								
				Capillary-Pressure Curves								
				Porosity								
				van Genuchten Parameters	alpha							
					N							
				Descriptive Stratigraphy (visual field analysis)	Soil / Rock Type							
					Grain Size							
					Bedding							
					Texture							
					Cementation							
					Primary Porosity							
					Secondary Permeability Features	Macropores						
						Fractures						
			Color									
			Odor									
			Pore Gas Screening									
			Grain-Size Analysis									
			Core Photography	Visible Light								
				Ultraviolet Light								
			Continuous Profile	CPT Soil Behavior Type (SBT)	Tip Pressure							
					Skin Friction							
					SBT Index							
				Laser Induced Fluorescence (LIF)	ROST							
					TarGOST							
			Membrane Interface Probe (MIP)	Vertek								
			Aquifer Test Performance	Hydraulic	Slug Testing							
					Drawdown Pumping							
					Recharge							
				Pneumatic	Pumping Rates	NAPL						
						Water						
					Vacuum							
				Air Flow Rate								
				Mass Removal								
			Model (Analyze)	Data Qualification	Exploratory Spatial Data Analysis (ESDA)	Descriptive Statistics						
						Box Plots						
						Scatterplots						
						LISA Analysis						
				Data Validation								
				Geologic	Cross-Sections							
					Fence Diagrams							
					3D Model							
				Hydrogeologic	Time Series Analysis	Hydrostratigraphs	Basic					
							Advanced	Production HSG				
	Hydrographs											
Dependent Variable Analysis	Diagnostic Gauge Plots	ANT										
		CGWS										
	Discharge versus Drawdown Graphs											
Aquifer Test Analysis	Hydraulic	Water K, T, S			Many Options (see ASTM)							
		NAPL Kn, Tn			Baildown Test							
					Manual Skimming / Ratio Test							
					Existing Recovery Data Analysis							
				Tracer Testing								
Pneumatic	Air Permeability											

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Characterization	Model (Analyze)	Fluid Modeling	Analytical	LNAPL Migration Potential	Seepage Velocity							
					Others							
				LNAPL Distribution and Recovery Model (LDRM)	Inputs	Literature Values						
						Site-Specific Measurements						
					Calibration	LNAPL Transmissivity						
						Recovery Rate Data						
					Outputs	LNAPL / Water Saturation Profiles						
						LNAPL Specific Volume Profiles						
				LNAPL Thickness Profiles								
				LNAPL Transmissivity Profiles								
			Technology-Specific Comparisons	LNAPL Recovery Rates over Time								
				Total Recoverable LNAPL								
			Single Phase Models	Capture Zone Analysis	KT3D H2O							
					Capture Zone Equations							
					Air2D / Air3D							
			Numerical	Modflow								
				Modpath								
		FEFlow										
		Bioslurp										
		Others										
		Geostatistical Analysis	Kriging / Estimation	Simple Kriging								
				Ordinary Kriging								
				Kriging with a Trend								
Multivariate Kriging (Co-Kriging)												
Stochastic Simulation	Multigaussian											
	Non-Parametric	Indicator Kriging										