

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						
				Total Depth						
			Surface Water	Stage						
		Well Construction	Elevations	Ground Surface						
				Top of Casing						
				Top of Screen						
				Bottom of Screen						
				Bottom of Well						
				Borehole Total Depth						
				Top of Filter Pack						
				Borehole Seal / Grount Elevations						
			Specifications	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									
	Interfacial Tensions	Air / NAPL								
		NAPL / Water								
		Air / Water								
	Vapor Pressure									
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						
				Pumping Rates	NAPL						
					Water						
				Pneumatic	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									