

APPENDIX B

**TABLE B-1
 REMEDIAL INVESTIGATION/DESIGN BASIS CHECKLIST**

Checklist Item	Yes	No	Source of Data
SITE CONDITIONS Topography Adjacent Land Use Climate Well Search Nearby Receptors Access to Utilities Subsidence Potential Site-Specific Geologic Conditions Site Drainage Conditions			
SITE CONTAMINATION Source of Contamination Age of Contamination Soil Contamination			

TABLE B-1, Continued
REMEDIAL INVESTIGATION/DESIGN BASIS CHECKLIST

Checklist Item	Yes	No	Source of Data
GROUNDWATER			
Soil/Type/Description			
Stratigraphy			
Depth to Water/Seasonal and Tidal Fluctuations			
Confining Layer/Depth			
Total Porosity			
Specific Yield (Effective Porosity)			
Grain Size			
Bulk Dry Density			
Buffering Capacity			
Hydraulic Conductivity (Permeability Coefficient)			
Thickness of Capillary Fringe			
Microbial Assays			
Organic Carbon Content			
Ground Water Flow Direction/Velocity			
Groundwater Recharge			
Partitioning Coefficients			

TABLE B-1, Continued
REMEDIAL INVESTIGATION/DESIGN BASIS CHECKLIST

Checklist Item	Yes	No	Source of Data
HYDROGEOLOGY/SOIL CHARACTERIZATION Cations/Anions Total Dissolved Solids Total Suspended Solids Total Volatile Solids PH Oxidation-Reduction Potential Total Organic Carbon Biological Oxygen Demand Chemical Oxygen Demand Temperature Range Nitrogen and Phosphorus Microbial Assays Toxicity Tests Conductivity Dissolved Oxygen Hardness as Calcium Carbonate			

TABLE B-1, Continued
REMEDIAL INVESTIGATION/DESIGN BASIS CHECKLIST

Checklist Item	Yes	No	Source of Data
NAPL CHARACTERIZATION Source Density Viscosity Solubility LNAPL/Water Interfacial Tension Areal Extent Rate of Movement Apparent Thickness Formation Parameters			
REGULATORY/PERMITS Lead Agency Other Agency Involvement Permits			

**TABLE B-2
 FEASIBILITY STUDY CHECKLIST**

Checklist Item	Yes	No	Source of Data
DESIGN BASIS Cleanup Goals Containment Goals Plume Size/Configuration Construction Division Involvement Soil Contamination Areal Extent Contaminant Mass/Volume Pathways/Receptors Analysis Concentrations of Contaminants at Extraction Locations (Actual long term pump test wells) Remediation Targets Cleanup Duration Constraints			
PERFORMANCE CRITERIA Extent of Hydraulic Capture Water Balance Pore Volume Exchange Rate Dissolved Mass Recovery Rates and Mass Balance LNAPL Recovery Rates Concentration Trends			

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Amount of Drawdown			
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TABLE B-3
DESIGN CHECKLIST

Checklist Item	Yes	No	Source of Data
EXTRACTION/INJECTION SYSTEM DESIGN Screen Length and Depth Casing Materials and Diameter Screen Type Sand Pack Type Drilling Procedures Grout Well Headers Well Development O&M Plan Oversight Plan/Funding			
PUMP DESIGN Pump Specification Liquid Specifications Flow Rates Required Head/Discharge Pressure Valves and Other Wellhead Requirements Long-Term Service Considered Encrustation/Fouling Potential			

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O&M Plan			
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**TABLE B-3, Continued
 DESIGN CHECKLIST**

Checklist Item	Yes	No	Source of Data
PIPING DESIGN Piping System Layout Flow Rate Indicators/Recorders Materials of Construction Insulation/Heating Requirements Manifold Locations Pipe Supports Buried/Surface/Overhead Locations Valve Requirements Flow Lines Head Loss Considered Cleanout Locations Considered			
TREATMENT SYSTEMS Technology Options Filtration Requirements Feasibility Study Results Concentration Fluctuations Rental vs. Purchase Utility Requirements Local Utility Availability Space Required/Available			

TABLE B-3, Continued
DESIGN CHECKLIST

Checklist Item	Yes	No	Source of Data
ELECTRICAL/CONTROL			
Control Philosophy/Logic			
Remote Monitoring			
Safety Requirements			
Failure Modes for Valves			
Electrical/Fire Code Requirements			
Electrical Phase Balancing			
Alarms/Process Trips			
Automation Needs			
Startup/Shutdown Plans Required			

TABLE B-4
CONSTRUCTION CHECKLIST

Checklist Item	Yes	No	Source of Data
PRECONSTRUCTION REVIEW			
Specifications/Drawings Complete			
Construction Division Involvement			
Constructability Review			
Spill Prevention Considered			
Permits Obtained			
Material Order Lead-Time Considered			
Equipment Decontamination Area Designated			
Health & Safety Plan Developed			
Silt Run-Off Control Measures			
Water Source Approved for Construction			
Construction Waste Disposal			
Site Survey Completed			
Permanent Benchmark Identified			
Critical Path Identified			
Other Scheduling Constraints			

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Site Access Arrangements			
Site Security Plan Complete			

**TABLE B-4, Continued
CONSTRUCTION CHECKLIST**

Checklist Item	Yes	No	Source of Data
<p>PRECONSTRUCTION REVIEW, Cont.</p> <p>Shift Schedule Set</p> <p>Manpower Determined</p> <p>Union Issues Resolved</p> <p>All Construction Techniques Specified</p> <p>Utilities Cleared</p>			
<p>CONSTRUCTION</p> <p><u>Wells/Trenches :</u></p> <p>Construction Techniques in Compliance with Plans/Specs</p> <p>Full Time Oversight by Qualified Engineer or Geologist</p> <p>Trench Supports Used</p> <p>Well Location Identified on Wellhead</p> <p>Well Depth Referenced to Permanent Benchmark</p> <p>Materials in Compliance with Specifications</p> <p>Wells Located as Shown on Drawings</p> <p>Trenches Located as Shown on Drawings</p> <p>Well Casings Installed as Specified</p> <p>Casings Designed to Support</p>			

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Wellhead Equipment			
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**TABLE B-4, Continued
CONSTRUCTION CHECKLIST**

Checklist Item	Yes	No	Source of Data
<p>CONSTRUCTION <u>Wells/Trenches, Continued:</u> Well Screens Installed as Shown on Drawings Well Centralizers Installed Properly Bollards or Other Protection Installed as Specified Surface Completion Method According to Specifications Trench Width/Slope According to Specifications</p>			
<p><u>Pumps:</u> Pumps Installed at Specified Depth Foundations Complete Where Needed Level Control Devices Installed Injection Pumps Operational Storage Tanks in Place/Not Leaking Dual-Phase Pumping in Place Full Time Oversight Submittals Required</p>			
<p><u>Piping Installation:</u> Piping Sloped According to Specification</p>			

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Cleanouts Installed Per Specification			
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**TABLE B-4, Continued
 CONSTRUCTION CHECKLIST**

Checklist Item	Yes	No	Source of Data
<p><u>Piping Installation, Continued:</u></p> <p>Piping Insulated as Required</p> <p>Pipe Supports Per Specification</p> <p>Piping Complete From Wells to Treatment</p> <p>Piping Complete From Trenches to Treatment</p> <p>Piping Flushed/Cleaned</p> <p>Strainers/Filters Installed/Cleaned</p> <p>Valves Installed, Operation Verified</p> <p>Pressure Test Complete</p>			
<p><u>Electrical:</u></p> <p>Grounding Installed/Checked</p> <p>Lighting/HVAC Functional</p> <p>Lockouts/Panels/Covers in Place</p> <p>Disconnects in Sight of Unit Being Controlled</p> <p>Controls/Alarms Functional</p> <p>Power Connected to Monitoring Devices</p>			

**TABLE B-4, Continued
 CONSTRUCTION CHECKLIST**

Checklist Item	Yes	No	Source of Data
<p><u>Electrical Subsystems:</u> Instruments Calibrated Water Treatment System Installed/Functional Outfall/Disposal Systems Functional</p>			
<p>POST CONSTRUCTION As-Built Drawings Updated As-Built Approved/Issued Temporary Structures Removed Operating Manual Ready as Reference Decontamination Area Cleaned</p>			
<p>SUBSURFACE No Piping Leaks Drawdown Within Specified Tolerance Monitoring Points Compositions Within Expected Ranges Temperatures and Pressures Within Expected Ranges</p>			
<p>PUMPS Pump Test and Specific Gravity Measurement Flow Rates</p>			

Start/Stop From All Control Mechanisms			
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**TABLE B-4, Continued
 CONSTRUCTION CHECKLIST**

Checklist Item	Yes	No	Source of Data
<p>PUMPS, Continued</p> <p>Current Draw/Voltage Match Specification for All Phases</p> <p>No Excessive Noise/Vibration/Temperature Rise</p> <p>Dual-Phase Systems are Compatible with Each Other</p>			
<p>SYSTEMS</p> <p>Control System Operates Within Set Parameters</p> <p>Instruments Hold Calibrations</p> <p>Observed and Followed Published Startup/Shutdown Plans</p>			

TABLE B-5

STARTUP/BASELINE PERFORMANCE CHECKLIST

Checklist Item	Complete	Date
BASELINE		
Flow Rate Baseline		
NAPL Recovery Baseline		
Water Recovery Baseline		
Water Injection Baseline		
Treatment Effectiveness		

TABLE B-5, Continued
STARTUP/BASELINE PERFORMANCE CHECKLIST

Checklist Item	Expected	Measured
CHEMICAL CHARACTERISTICS Concentrations at Wellhead(s)/Trench(es) Concentrations Leaving Treatment System Concentrations in Monitoring Points Concentrations in Injection Water		
PHYSICAL CHARACTERISTICS Ground Water Temperatures Wellhead Pressures Ambient Temperature Water Flow Rates Temperatures/Pressures in Treatment System Injection Water Temperature/Pressure Ground Water Drawdown Monitoring Point Drawdown/Mounding Volume of NAPL Pumped Pump Amperages		

TABLE B-5, Continued
STARTUP/BASELINE PERFORMANCE CHECKLIST

Checklist Item	Expected	Measured
BIOLOGICAL CHARACTERISTICS Dissolved Oxygen Concentrations Dissolved Carbon Dioxide Concentrations Nutrient Concentrations Water pH		
MAINTENANCE Lubricate all Rotating Equipment per Manufacturer's Instructions Clean all Traps and Filters Check Instrument Calibrations Check Control System Logic and Alarms Checks for Encrustation and Biofouling		