TABLE 3.2
Assembled Alternative Screening — Upper Vadose Soil and Perched Groundwater Remediation Zone (3 to 35 Feet Below Ground Surface)

Assembled Alternative	Alternative Description	Effectiveness[1]	Implementability[2]	Cost[3]	Comments
No Action	Does not involve any proactive treatment, removal, or monitoring of contaminated media.	Good	Poor	None	Not protective of human health due to presence of elevated COPCs. Retained for comparison, per the NCP.
Monitored Natural Attenuation (MNA)	Collect and analyze groundwater samples to document and/or model the persistence of contaminant concentrations or their natural attenuation.	Good	Poor	$2,190,000 - $3,040,000	Retained. Potentially applicable in conjunction with other technologies. Not time feasible for "hot spots." MNA or monitoring in general is critical to the implementation of any alternative.
Soil Excavation/Onsite Treatment/Backfill[4]	Excavate contaminated soil to 35-ft bgs; onsite soil washing treatment; backfill of remediated soil; groundwater not addressed.	Moderate to Good	Poor to Moderate	$16,200,000 - $22,500,000	Difficult to implement due to multidirectional GW flow and low permeability of perched zone; process would be slow to maintain objectives.
Permeable Reactive Barrier[4]	Install zero-valent PRB into subsurface; monitor groundwater to assess abiotic dechlorination; does not address soil.	Moderate to Good	Moderate	$3,140,000 - $4,360,000	Viable technology. Potential still exists for leaching to deeper zones.
Pump and Treat/UV Oxidation[4]	Extract groundwater via pumping wells; treat extracted groundwater *ex-situ* via UV oxidation.	Good	Fair to Good	$8,610,000 - $12,000,000[2]	Difficult to implement due to multidirectional GW flow and low permeability of perched zone; process would be slow to maintain objectives.
High-Vacuum Dual-Phase Extraction/ UV Oxidation/FTO and GAC	Extract contaminated groundwater and soil vapor via pumping wells and vapor extraction wells; treat groundwater *ex-situ* via UV oxidation; treat vapor *ex-situ* via FTO for 1st year followed by GAC until cleanup criteria met.	Good	Demonstrated	$3,290,000 - $4,570,000	Retained. Potentially feasible technology. Pilot tests indicate this technology would be effective at the Site. FTO most efficient ex-situ treatment for soil vapor, but may face community issues.
High-Vacuum Dual-Phase Extraction/ UV Oxidation/GAC	Extract contaminated groundwater and soil vapor via pumping wells and vapor extraction wells; treat groundwater *ex-situ* via UV oxidation; treat vapor *ex-situ* via GAC until cleanup criteria met.	Good	Demonstrated	$3,250,000 - $4,510,000	Retained. Potentially feasible technology. Pilot tests indicate this technology would be effective at the Site. GAC not effective for low molecular weight VOCs or compounds with low adsorptive capacity.
In-Situ Chemical Oxidation	Inject oxidizing agents into the subsurface; monitor degradation process through groundwater sampling and analysis; does not address contaminated soil.	Good	Potential	$2,290,000 - $3,180,000	Retained. Treatability study required to determine effectiveness of oxidant delivery process.

TABLE 3.2
Assembled Alternative Screening — Upper Vadose Soil and Perched Groundwater Remediation Zone (3 to 35 Feet Below Ground Surface)

Assembled Alternative	Alternative Description	Effectiveness[1]	Implementability[2]	Cost[3]	Comments
Enhanced *In-Situ* Bioremediation	Inject organic substrate into the subsurface; monitor bioremediation process (reductive dechlorination) through groundwater sampling and analysis; does not address contaminated soil.	Good	Moderate to Good	$1,560,000 - $2,170,000	Retained. Most effective for degradation of chlorinated ethenes; must evaluate feasibility of combining aerobic/anaerobic processes in different plume areas to address petroleum, aromatic hydrocarbons and vinyl chloride.
Electrical Resistance Heating with Vapor Extraction/FTO and GAC[4]	Electrodes are inserted into the subsurface to heat soil and groundwater to approximately 100ºC; volatized contaminants are collected through vapor extraction; vapor treated *ex-situ* via FTO for 1st year followed by GAC until cleanup criteria are met; designed for localized "hot spots" (i.e., does not address entire contaminant plume).	Moderate to Good	Good	$9,790,000 - $13,600,000	Short duration for "hot spot" treatment; high cost/energy requirement. Does not address entire contaminant plume.
Electrical Resistance Heating with Vapor Extraction/GAC[4]	Electrodes are inserted into the subsurface to heat soil and groundwater to approximately 100ºC; volatized contaminants are collected through vapor extraction; vapor treated *ex-situ* via GAC until cleanup criteria are met; designed for localized "hot spots" (i.e., does not address entire contaminant plume).	Moderate to Good	Good	$8,840,000 - $12,300,000	Short duration for "hot spot" treatment; high cost/energy requirement. Does not address entire contaminant plume.

[1] Effectiveness is the ability to perform as part of a comprehensive alternative that can meet RAOs under conditions and limitations that exist at the site.
[2] Implementability is the likelihood that the alternative could be implemented under the regulatory, technical, and schedule constraints. Technical Implementability encompasses the applicability/feasibility of performing the alternative's technologies. Administrative Implementability encompasses permitability, regulatory acceptance, and community acceptance.
[3] Cost is the estimated total present worth (direct capital costs and present worth operation and maintenance costs) for each assembled alterative. Cost estimates are considered order-of-magnitude and are provided for comparative purposes only, relative to the other alternatives.
[4] Alternative descriptions, detailed evaluations, and comparative analyses for these assembled remedial alternatives may be referenced in Appendix E.

COPCs	Chemicals of Potential Concern	NCP	National Contingency Plan
FTO	Flameless Thermal Oxidation	VOCs	Volatile Organic Contaminants
GAC	Granular Activated Carbon		