

**Table A-2.C. Technical implementation considerations for skimming**

Data requirements	Site-specific data for technology evaluation	LNAPL conductivity, LNAPL transmissivity	LNAPL transmissivity data indicate the LNAPL extraction rate. Transmissivity data may be obtained from LNAPL baildown tests or predictive modeling.
		LNAPL characteristics	Low-viscosity LNAPLs are more amenable to pumping than higher-viscosity LNAPLs. Hence, lighter-end, low-viscosity LNAPL such as gasoline, kerosene, jet fuel, diesel and No. 2 fuel oil are more amenable to pumping than a No. 6 fuel oil or Bunker C that may require belt skimmers.
		Soil type/grain size	Coarser-grained materials, homogeneous soils allow larger ROI to develop; finer-grained soils or interbeds impede or lessen capture.
		Safety precautions	Explosivity of LNAPL—potential need for bonding and grounding of metal equipment/containers and other associated safety requirements. Explosion-proof equipment and intrinsically-safe controls may be required. Storage areas must be secured.
		Available power/utilities	The power source must be determined. Drop-line power may be readily available. Alternatively, on-site sources such as generators or solar power may be needed. Power supply must be compatible with skimmer pump demand.
	Bench-scale testing	N/A	
	Pilot-scale testing	LNAPL ROI/ROC	Establish LNAPL ROI and capture zone based on LNAPL drawdown.
		LNAPL recovery rate, volume, chemical characteristics	Determine LNAPL recovery rate, volume, and chemical characteristics to assist with design of LNAPL storage, handling, and treatment/discharge options.
	Full-scale design	Number of extraction wells	Determine number of extraction wells necessary to achieve adequate zone of LNAPL recovery consistent with LNAPL site objective(s).
		Conveyance piping	Determine locations, lengths, materials for horizontal conveyance piping to/from wells and the recovery/treatment system. Assess pipe insulation and heat tracing needs for winter conditions, if applicable.
		LNAPL ROI/ROC	Establish LNAPL ROI and capture zone based on LNAPL drawdown.
	Performance and optimization metrics	LNAPL recovery rates and volumes	Basic system performance monitoring.
		System uptime vs. downtime	
		LNAPL recovery vs. groundwater recovery	Quantity of LNAPL recovered as a percentage of incidental recovered groundwater.
		Total LNAPL equivalent recovery cost metric	Cost per gallon of LNAPL recovered.
Modeling tools/ applicable models	Projected future LNAPL recovery	Use of decline curve analysis, semi-log plots, etc. to predict future LNAPL recoveries and help determine when LNAPL recovery is approaching asymptotic.	
		LNAPL Distribution and Recovery Model (LDRM) (API)	
Further information	<a href="https://www.epa.gov/ust/how-effectively-recover-free-product-leaking-underground-storage-tank-sites-guide-state">EPA. 1996. How to Effectively Recover Free Product at Leaking Underground Storage Tank Sites: A Guide for State Regulators. Office of Underground Storage Tanks. EPA 510-R-96-001. https://www.epa.gov/ust/how-effectively-recover-free-product-leaking-underground-storage-tank-sites-guide-state</a>		
	<a href="http://www.api.org/oil-and-natural-gas/environment/clean-water/ground-water/lnapl/ldrm">LNAPL Distribution and Recovery Model (LDRM) (API): http://www.api.org/oil-and-natural-gas/environment/clean-water/ground-water/lnapl/ldrm</a>		
	<a href="https://www.navfac.navy.mil/navfac_worldwide/specialty_centers/exwc/products_and_services/ev/erb/tech/rem/freeprodskim.html">Free product skimming: https://www.navfac.navy.mil/navfac_worldwide/specialty_centers/exwc/products_and_services/ev/erb/tech/rem/freeprodskim.html</a>		