



Corrective Action & Remedy Project at the Commonwealth Oil Refining Company (CORCO)

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Abstract

The focus of this environmental engineering senior design project is to determine the contaminants of concern in all of the Commonwealth Oil and Refining Company (CORCO) facility and afterwards determine which technology could be implemented to remedy the soil and groundwater. A risk analysis was performed to determine the dose, the hazard risk and cancer risk for each contaminant. Since the CORCO was a petroleum refining company, the majority of the contaminants of concern are petroleum hydrocarbons, volatile organic compounds and some heavy metals. After the contaminants were determined two remedy technologies were selected; Soil Vapor Extraction for the soil and Pump and Treat for groundwater. Additionally as part of the project, a monitoring plan was developed for one of CORCO's area, the Caribe Isopropane Corporation Tanks. This was developed, to determine the levels of contaminants, since there is no current monitoring in the area. As a conclusion to this project, the levels of contamination at CORCO aren't of risk; therefore future passive projects could be developed in the area, as a photovoltaic farm.

Background

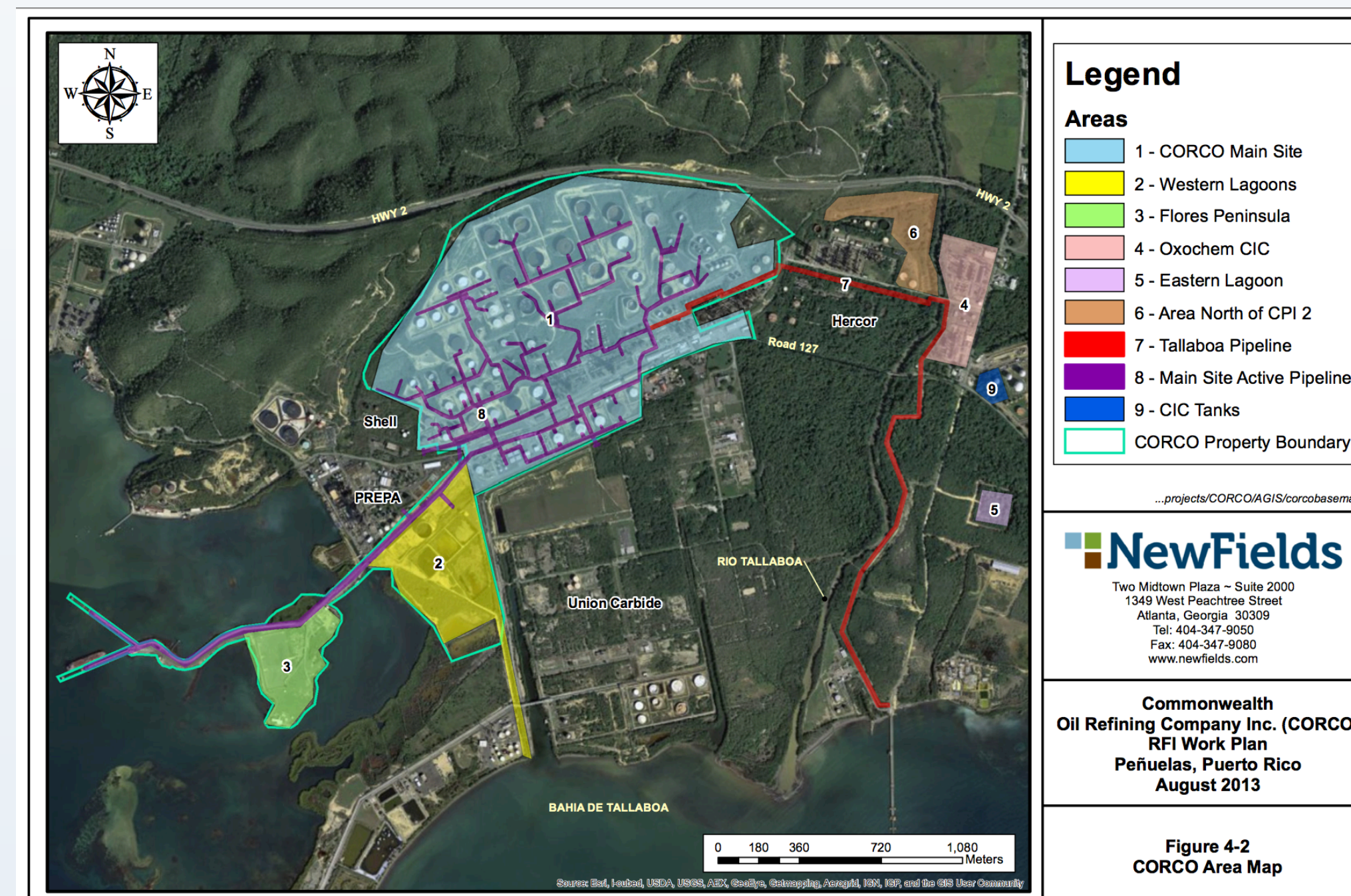
The Commonwealth Oil and Refining Company, Inc. (CORCO) facility is located on the south coast of Puerto Rico, on Route 127 in the city of Peñuelas, approximately 7 miles west of the city of Ponce. The facility was formerly a large petroleum refinery and part of a petrochemical manufacturing complex. The northern part of the 800-acre site, which contains most of the facility's numerous storage tanks, is hilly. The southern part, which borders the Caribbean Sea, consists of filled land that is flat.

The facility is adjacent to a number of mostly non-operating chemical and petroleum refining facilities. During many of the years of its operation as a refinery, CORCO was involved in joint business ventures with a variety of these facilities. Since 1982, CORCO has been inactive as a refinery and now functions as a terminal for the marine transportation and land-based storage of crude oil and petroleum products. This area is currently comprised of highly desolated spaces between abandoned areas and scrap metals.

Objective

The objective of this project is to determine the extent of the threat posed by the presence, release or potential releases of site contaminants. This threat is obtained by performing a risk analysis for each contaminant present in the soil and in the groundwater. After knowing the chemicals of concern, the remedial technologies will be determined for the site existing contamination in the groundwater and soil.

CORCO Area Map

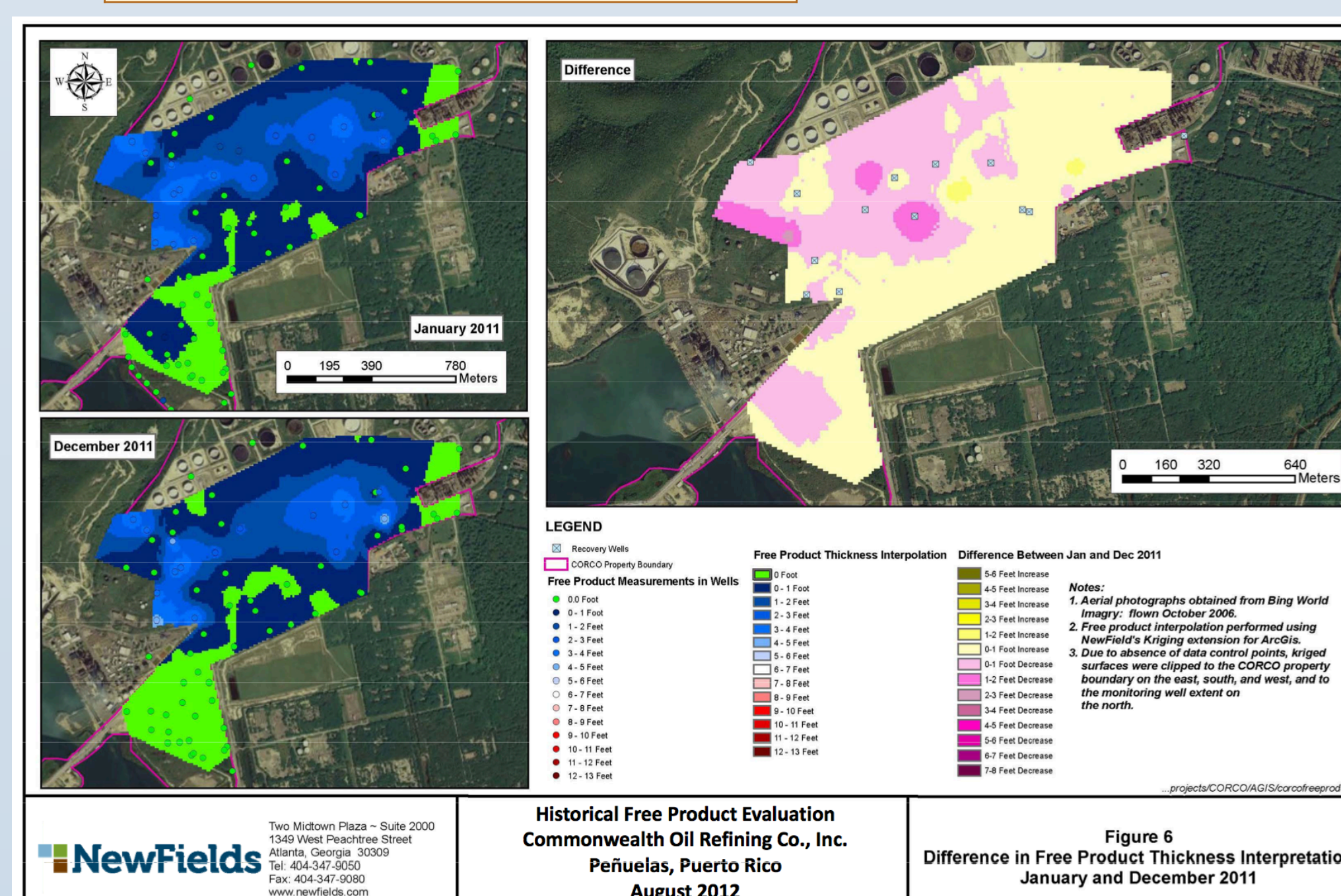


Risk Analysis

The major threat is the result of the unintended release of petroleum and petroleum products into the soil beneath the facility and to the groundwater within that soil. A subsurface plume of petroleum floats on top of the regional groundwater and is also partially dissolved within the groundwater. The plume represent a potential threat to the surface water of the Caribbean Sea and to its near shore ecosystem.

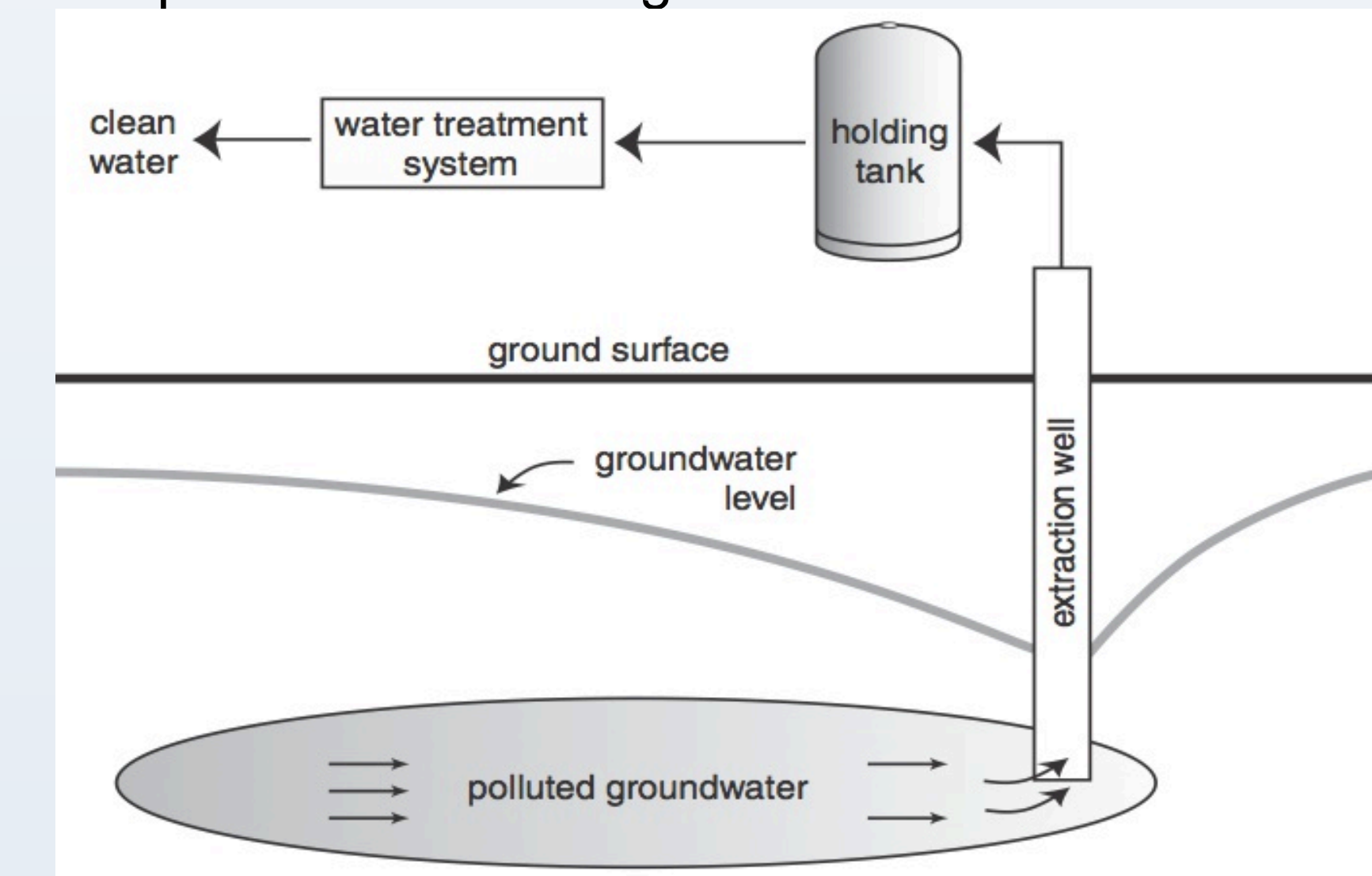
Contaminants of Concern

Groundwater Contaminants		Soil Contaminants	
Antimony	MTBE	Arsenic	
Arsenic	Naphthalene	Benzene	
Benzene	Pyrene	Benzo(a)pyrene	
Cadmium	Silver	Chromium	
Chromium	Toluene	Naphthalene	
Cobalt	Trichloroethylene	Xylene	
Copper	Vanadium		
Ethylbenzene	Xylene		



Groundwater Technology

The "Pump and Treat" technology was selected to treat CORCO's groundwater. "Pump and treat" is a technology that works by pumping out contaminated groundwater with the use of pumps. After extracting the contaminated groundwater, it will be treated by slowly passing through a granular activated carbon that will adsorb the contaminants from the groundwater. This technology will be implemented in the areas that free product is not being recovered from the subsurface.



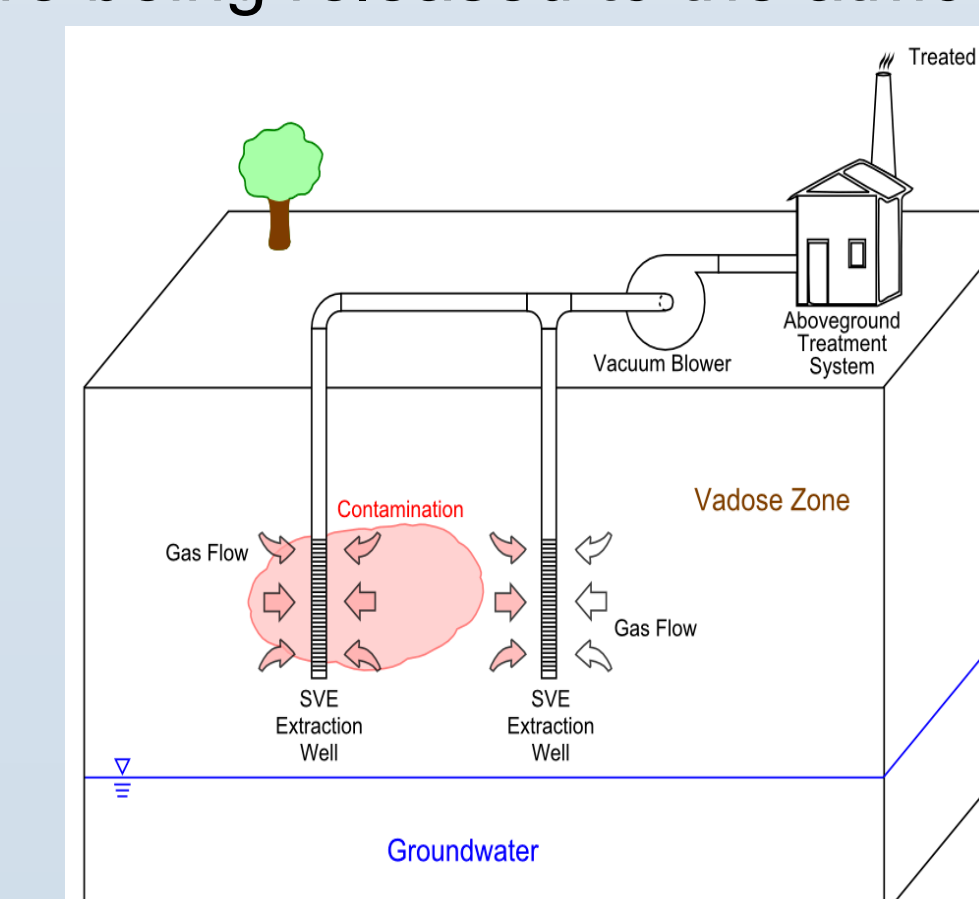
Example of the technology taken from www.clu-in.org

Estimated Costs for Pump and Treat Technology

Well Installation	\$100 per foot
Rent of equipment	\$150 per day
Groundwater Treatment	\$20 per 1,000 gallons

Soil Technology

The Soil Vapor Extraction (SVE) technology was selected to treat CORCO's soil. SVE is a remedial technology that reduces the concentration of volatile constituents in petroleum products adsorbed to soils. This technology works by inducing airflow through wells in the subsurface, this air will be induced by a vacuum, enhancing the volatilization of the volatile organic compounds present in the soil. The negative pressure inside the extraction well, generated by the vacuum blower, causes the air in the soil to move towards the well. Then the soil gas is removed by the vacuum pump and treated above ground. The extracted gas is then treated with carbon adsorption before being released to the atmosphere.



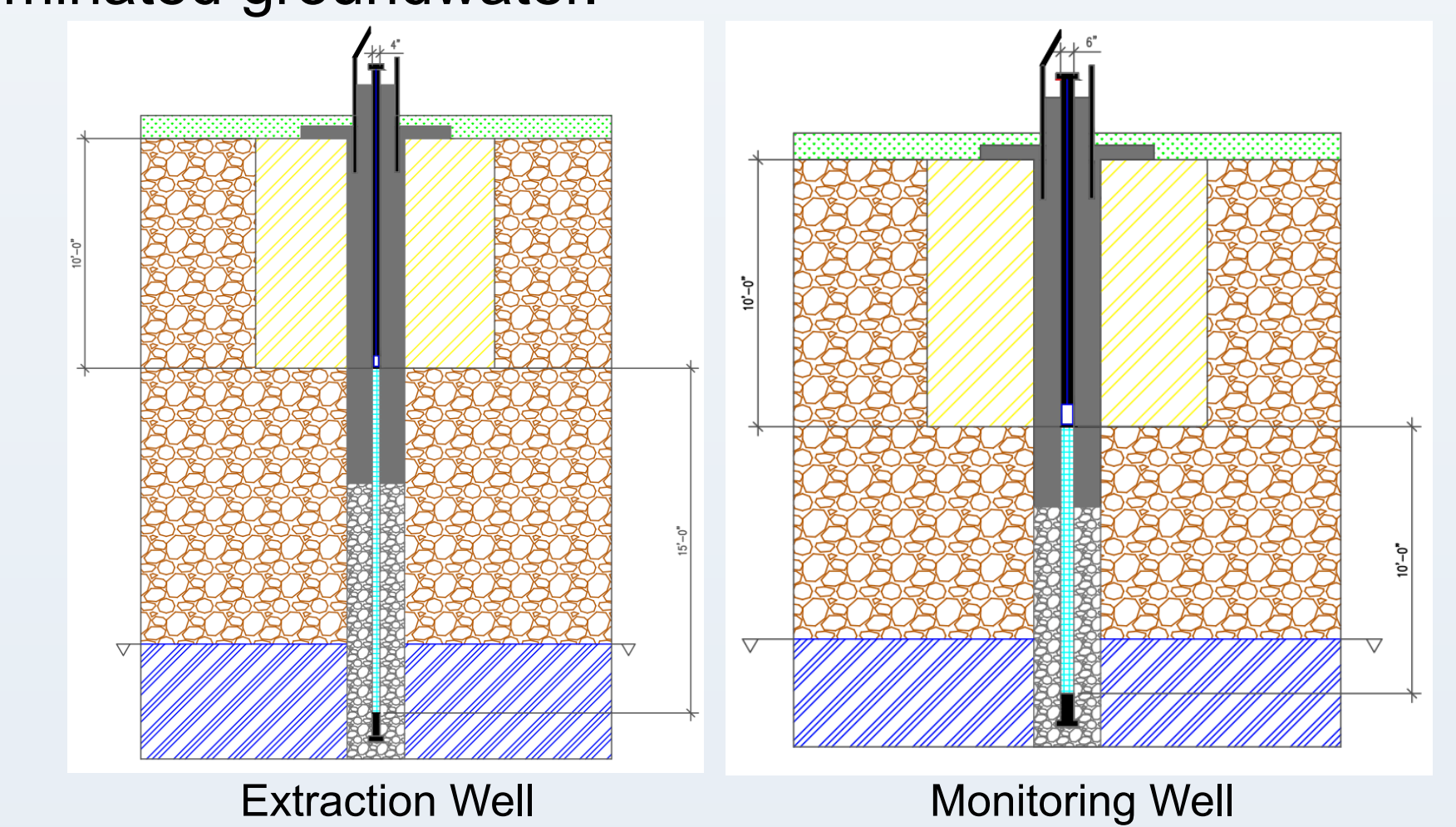
Example of the technology taken from www.clu-in.org

Estimated Costs for SVE Technology at CORCO Main site

Main Site Area:	16,100,000 ft ²
Cost per cubic feet	\$27
Total Cost	\$2,609 billions

Monitoring Plan for CIC

Currently of all CORCO, the Caribe Isopropane Corporation (CIC) Tanks area, is the only one that is not being monitored. The proposed monitoring wells will cover a radius of 1,000 meters. There will be 7 wells installed, 6 wells are going to be used for monitoring the contaminants of concern and the remaining well is going to be used for extraction of the contaminated groundwater.



Future Uses for CORCO Terrain

Following the risk assessment results, the CORCO Terrain can be used for passive projects. A photovoltaic farm could be develop here. The CORCO Main site consists of around 400 acres. This would mean that around 800,000 photovoltaic cell could be implemented, generating around 185 megawatts (MW).



Acknowledgements

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