North Shore Gas – Former South Plant
Manufactured Gas Plant
Waukegan, Lake County, Illinois

Record of Decision
For
Interim Action

DNAPL Contamination

U.S. Environmental Protection Agency Region 5

77 W Jackson Blvd
Chicago, IL 60604

July 2015

Table of Contents

TABLE OF CONTENTS, CONT'D

Figures

Tables

Appendices

LIST OF ACRONYMS AND ABBREVIATIONS

ARARs	Applicable or Relevant and Appropriate Requirements
AOC	Administrative Order on Consent
bgs	Below ground surface
BLRA	Baseline Human Health Risk Assessment
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	CERCLA Information System
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
DNAPL	Dense Nonaqueous Phase Liquid
EPA	U.S. Environmental Protection Agency
ELCR	Excess lifetime cancer risk
ERH	Electric Resistance Heating
EJ & E	Elgin Joliet and Eastern Railroad
ERA	Ecological Risk Assessment
FFS	Focused Feasibility Study
FS	Feasibility Study
FWS	Fish and Wildlife Service
FYR	Five-Year Review
HDD	Horizontal Directional Drilling
HHRA	Human Health Risk Assessment
HQ	Hazard quotient
IC	Institutional control
Illinois EPA	Illinois Environmental Protection Agency
mg/kg	Milligram per kilogram
MGP	Manufactured Gas Plant
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List

LIST OF ACRONYMS AND ABBREVIATIONS – CONT'D

NSG	North Shore Gas Company
PAH	Polynuclear Aromatic Hydrocarbon
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfD	Reference dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SL	Screening level
SLERA	Screening Level Ecological Risk Assessment
SRP	Site Remediation Program
SSI	Supplemental Site Inspection
TOC	Total Organic Carbon
VI	Vapor Intrusion
VOC	Volatile Organic Compound
WPD	Waukegan Port District

Part 1 – Declaration

1.1 Site Name and Location

North Shore Gas Former South Plant MGP Superfund Alternative Site
CERCLIS ID# ILD984809228
Waukegan, Lake County, Illinois

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents the interim remedial action (the "selected remedy") that the U.S. Environmental Protection Agency (EPA) chose to address the pool of undissolved tar-like material, which is classified as a dense, nonaqueous phase liquid (DNAPL), that is beneath the North Shore Gas (NSG) Former South Plant Manufactured Gas Plant (MGP) Superfund Alternative site in Waukegan, Illinois. The DNAPL is a continual source of groundwater contamination at the South Plant MGP site and is considered a principal threat waste. Implementing the selected remedy to address the DNAPL will significantly reduce the source of groundwater contamination and would then allow EPA to select a final remedial action to address contaminated soil and groundwater and potential soil vapor intrusion risks. EPA's decision to select an interim remedial action for DNAPL was made in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record file for the site (see Appendix 2).

The Illinois Environmental Protection Agency (Illinois EPA) has indicated its concurrence with the selected remedy. EPA will place the State's concurrence letter into the site Administrative Record upon receipt.

1.3 Assessment of Site

The interim remedial action described in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 Description of Selected Remedy

The selected remedy consists of the enhanced recovery of mobile DNAPL using a network of co-located horizontal groundwater injection and DNAPL recovery wells. Some DNAPL could be removed using horizontal recovery wells alone; however, by pumping water into co-located horizontal injection wells, a localized increase in hydraulic gradient will result, which will then increase the rate of migration of mobile DNAPL towards the recovery wells. Recovered DNAPL will be collected and shipped off-site for thermal treatment and disposal and any recovered groundwater will be treated on-site and re-used in the DNAPL recovery process.

The estimated cost to implement the selected remedy is $10.6 million and it will take approximately 8 years to extract all recoverable DNAPL from the ground.

1.5 Statutory Determinations

The selected interim remedy is protective of human health and the environment and will be consistent with any final site remedial actions, complies with federal and state requirements that are applicable or relevant and appropriate to this limited-scope action, and is cost-effective. The statutory preference for treatment of principal threat waste will be met because recovered DNAPL will be thermally treated (*i.e.*, used as fuel in a cement kiln oven) to reduce its volume and toxicity.

The selected interim remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, therefore, EPA will conduct a statutory review within five years after initiation of remedial action to ensure that the selected interim remedy continues to be protective of human health and the environment.

1.6 Data Certification Checklist

The following information is included in the *Decision Summary* section of this ROD. Additional information can be found in the Administrative Record file for this site.

Information Item	Section in Record of Decision
Chemicals of concern and their respective concentrations	2.2 and 2.5
Baseline risks represented by the chemicals of concern	2.2 and 2.7
Cleanup levels established for chemicals of concern and the basis for these levels	2.8
How source materials constituting principal threats are addressed	2.11
Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater use in the baseline risk assessment and the ROD	2.6
Potential land and groundwater use that will be available at the site as a result of the selected remedy	2.6; groundwater will not be fully restored in this remedy.
Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected	2.10 and Table 3
Key factor(s) that led to selecting the remedy (*i.e.*, a description of how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, and highlighted criteria key to the decision)	2.10, 2.12, 2.13, and Table 2

1.7 Authorizing Signature

EPA, as the lead agency for the NSG Former South Plant MGP Superfund Alternative site (ILD982073785), formally authorizes this Interim Record of Decision.

Richard C. Karl, Director
Superfund Division
U.S. Environmental Protection Agency
Region 5

7-30-15
Date

Illinois EPA, as the support agency for the NSG Former South Plant MGP Superfund Alternative site (ILD982073785), has indicated their concurrence with this Interim Record of Decision. Their concurrence letter will be added to the Administrative Record (Appendix 1 of this ROD) upon receipt.

Part 2 – Decision Summary

2.1 Site Name, Location, and Brief Description

The nearly 23-acre NSG South Plant MGP site includes the 1.9-acre former South Plant MGP facility property located at 2 North Pershing Road and 1 South Pershing Road in Waukegan, Illinois (see Figure 1), and several adjacent properties where MGP-derived contaminants have been found (see Figure 2). The adjacent parcels include:

- The Waukegan Port District (WPD)-owned property located to the east of the former MGP parcel on Lake Michigan. The 13.1-acre WPD parcel includes a marina, a visitor center/administration building, a maintenance building, and asphalt-paved parking lots.

- The Akzo Nobel Aerospace Coatings, Inc. (Akzo) parcel located east/southeast of the former MGP and adjacent to Lake Michigan. The 6.2-acre property consists of buildings used for manufacturing paints and coatings and asphalt-paved parking lots.

- The Elgin, Joliet and Eastern (EJ&E) Railroad tracks and right-of-way located east and at the south end of the former MGP property. This parcel is approximately 0.7 acres.

- The City of Waukegan-owned parcels located southeast of the former MGP site between the EJ&E, Akzo, and WPD properties. One parcel is a vacated former city street that abuts a Commonwealth Edison substation and others include nearby roads and associated right-of-ways, totaling 0.5 acres.

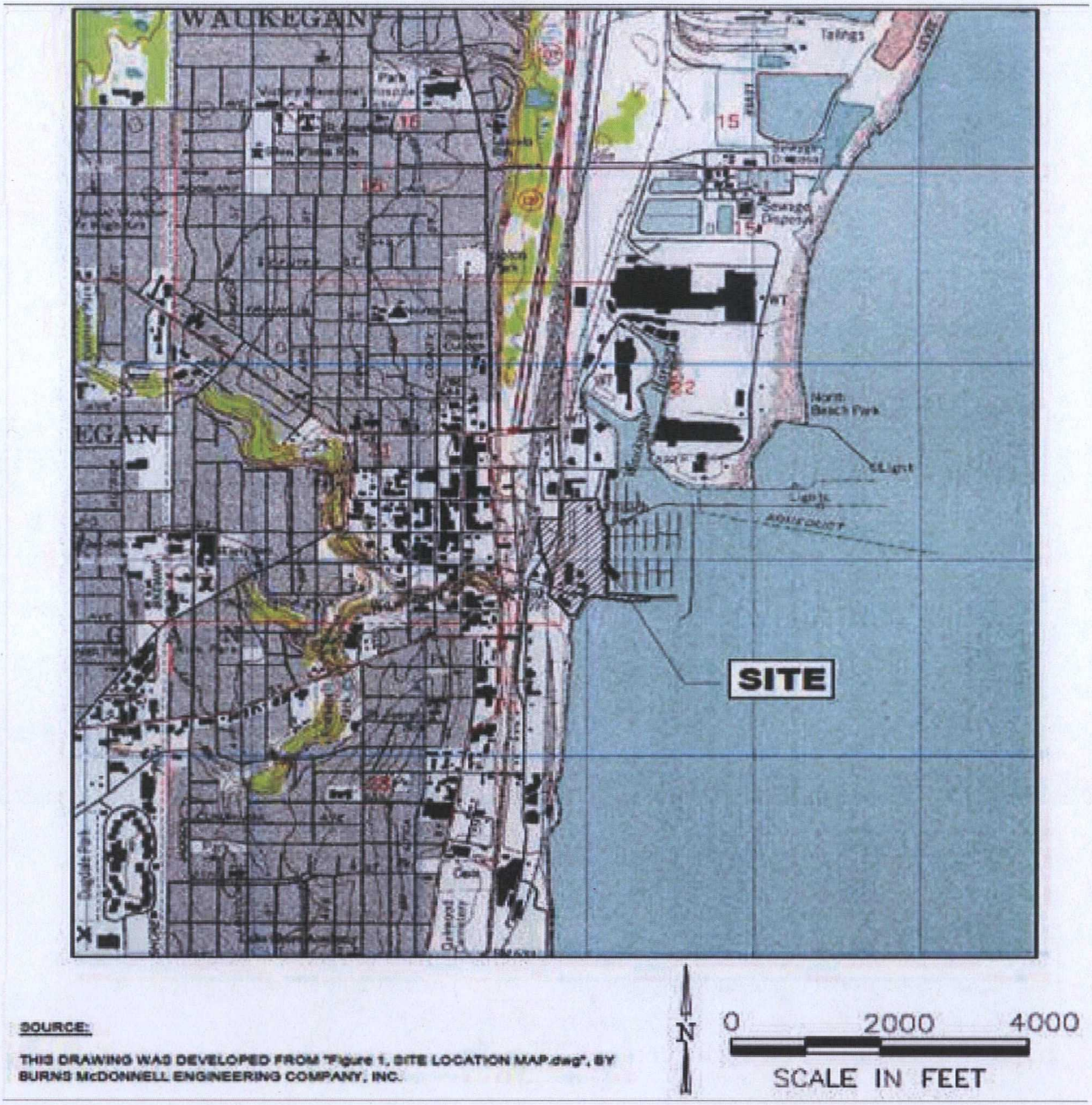
The South Plant MGP property is bounded to the north by a city-owned parking lot and to the west by a Union Pacific Railroad train yard. There are no known MGP residuals on these adjacent properties and both are upgradient of the former MGP site based on the localized groundwater flow direction. South Waukegan Harbor and Lake Michigan are located approximately 600 feet east of the former MGP property. The Waukegan River is located approximately 1,000 feet south of the former MGP property and flows east past the Akzo property into Lake Michigan. South Waukegan Harbor was constructed in the mid-1980s as a marina for recreational boats and has a southern exit to Lake Michigan (see Figure 2).

2.2 Site History and Enforcement Activities

Site History

The Waukegan Pipeline Service Company constructed the original South Plant MGP in 1897 and the Waukegan Gas, Light, and Fuel Company purchased it in 1898. NSG purchased the facility in 1900 and leased the southern 0.37 acres from the EJ&E Railroad. Aerial surveys and available information indicate that this facility was comprised of three gas holders ranging in capacity from 60,000 to 518,000 cubic feet; an office building with a storage room; a coal shed; boilers; oil and tar tanks; an engine house; ammonia stills; and a generator house. The South Plant MGP

Figure 1: Site Location



operated on a full-time basis from 1898 to 1927. NSG shut it down in 1927 but later operated it as a peak production unit during high demand periods between 1935 and 1946 (see Figure 3). NSG permanently closed the South Plant MGP in 1946 and demolished it in 1951.

MGPs such as the South Plant facility were industrial facilities that were found in every sizable town or city in the U.S. from the 1820s to right after World War II. MGPs heated coal in large industrial ovens to produce manufactured gas used for street lighting, heating, and cooking. After the war, natural gas use replaced manufactured gas use because it was abundant, lower priced, and cleaner burning. Some MGPs continued to operate after the war, but most ceased operations

Figure 2: NSG Former South Plant MGP site property boundaries

by the 1960s and were torn down. Typically, the above-ground structures, such as buildings, tar/oil tanks, and storage sheds, were demolished and the foundations were backfilled, leaving hardly any visible traces of the former operations. Below-ground structures such as underground piping and storage tanks, along with residual contaminants, were often left behind.

History of Remedial Activities

NSG has conducted contaminant investigations and cleanup activities at the South Plant MGP site since the early 1990s. Most of these pre-CERCLA cleanup actions were conducted in accordance with Illinois' voluntary Site Remediation Program (SRP). The investigations focused on identifying sources of MGP residuals and evaluating soil and groundwater conditions. NSG dug test pits, took soil borings, and installed groundwater monitoring wells. Groundwater and soil samples were analyzed for a variety of chemicals of potential concern. NSG also worked to delineate the extent of the groundwater contaminant plume and the DNAPL pool.

Previous Environmental Investigations

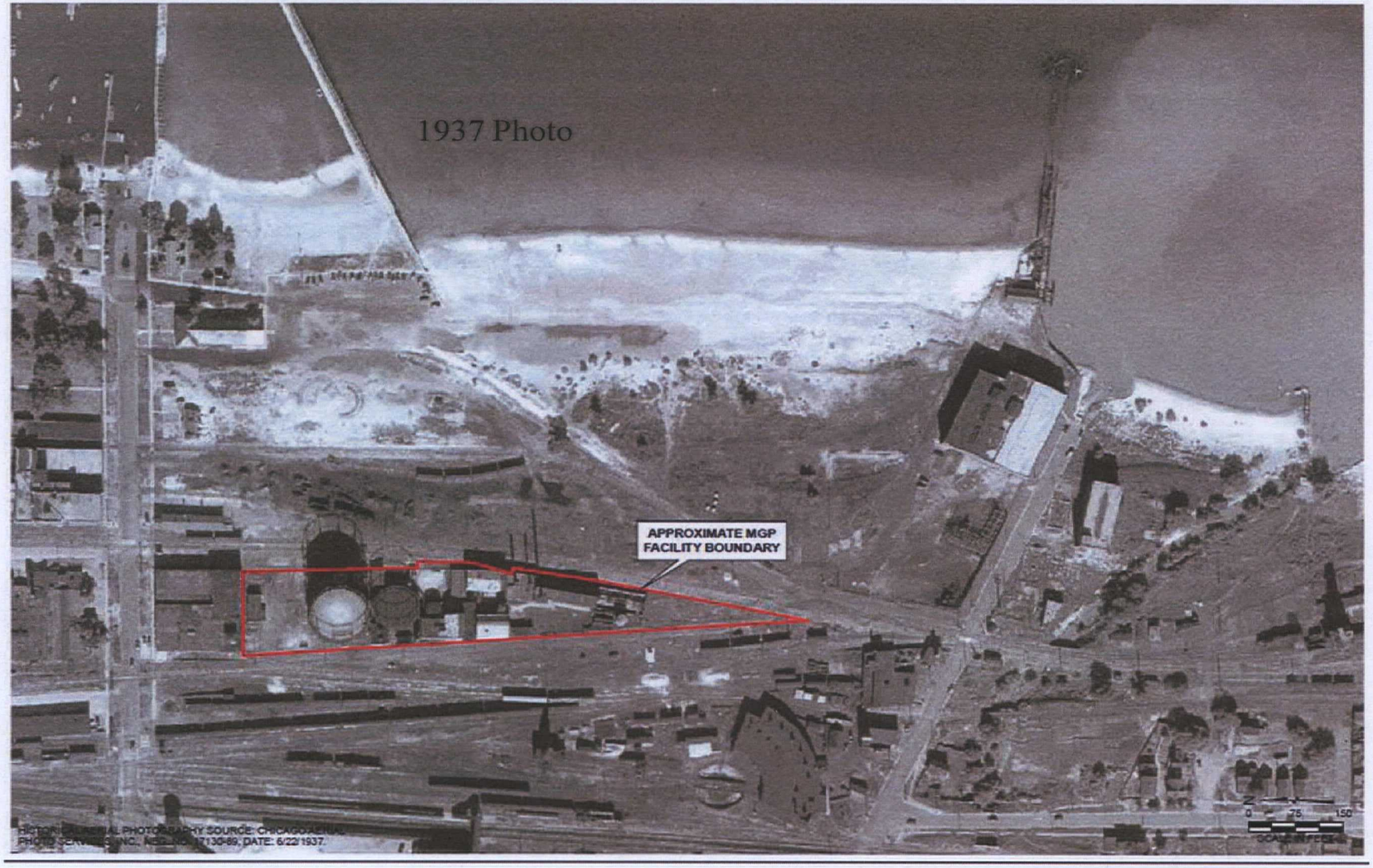
Illinois EPA conducted a Preliminary Site Inspection in September 1991 and a Screening Site Inspection (SSI) in November 1991, collecting 11 surface soil samples on the former MGP property as part of the SSI. Based on the preliminary site inspection and the sampling results, Illinois EPA recommended that the South Plant MGP site be placed into the EPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) and that the site be assigned a medium-priority status. The state issued several reports summarizing these site activities, including:

- CERCLA Preliminary Assessment Report, NSG Plant (Illinois EPA, 1991)
- CERCLA 1992 Screening Site Inspection, NSG Plant (Illinois EPA, 1992)

Next, in the early 1990s, NSG conducted a preliminary site investigation to determine the potential environmental impacts of the former MGP contaminants. The preliminary site investigation showed that chemical compounds associated with past MGP activities may be present in subsurface soils. NSG conducted a follow-up site investigation in 1999 to compile and evaluate previously-collected data, evaluate the nature and extent of impacts, and obtain additional data to assess potential health risks at the MGP property. NSG evaluated most of the former MGP parcel excluding the paved portions (Pershing Road and South Harbor Place), completing eight test trenches and four soil borings (which were converted into temporary piezometers). Soil samples were analyzed for volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and total organic carbon (TOC). Groundwater samples were analyzed for VOCs, PAHs, metals, and cyanide. NSG issued several reports summarizing the site investigations, including:

- Preliminary Site Investigation South Plant MGP, Waukegan, IL (Barr Engineering, April 1993)
- Site Investigation Report, Former South Plant MGP (Barr Engineering, June 2002)

Figure 3: Aerial view of South Plant MGP (1937)



Most of the soil samples showed contaminant impacts in the upper 3 feet of the soil column. Impacts from both tar-like and petroleum compounds were suspected to be present in soil and groundwater, with suspected petroleum-like material found at or near the water table.

Between 2002 and 2006, NGS conducted additional investigations on its MGP property and on surrounding properties. These investigations were completed for specific objectives, and are summarized below:

June – Sept. 2002	NGS conducted sampling activities to further delineate the lateral and vertical extent of source material on the MGP property. Analytical results indicated that soil and groundwater samples had high levels of PAHs and benzene, toluene, ethylbenzene, and xylene (BTEX). Source material was observed and characterized as tar-saturated soil and DNAPL. (Supplemental site Investigation Report (Feb. 2003))
July 2003	NSG performed further definition of the extent of suspected source material (based on visual characterization) at the former MGP property. COPCs in soil above the water table included BTEX, PAHs, arsenic, and lead. NSG subsequently proposed to remove the top 3.5 feet of soil across the entire MGP parcel and to remove source material in some locations to the water table (to about 7 feet below ground surface (bgs)). (Report to Illinois EPA, November 2003)
June – Aug. 2003	NSG took samples to delineate the extent of groundwater impacts on the WPD property. Three areas on the WPD property exhibited tar-like DNAPL or tar-saturated soil. These impacts were observed between 6 and 16 feet bgs.
Feb. - March 2004	NSG advanced soil borings and probes on the Akzo property to characterize soils deeper than 10 feet bgs and found MGP- and petroleum-like odors in most locations. (Report to Illinois EPA, March 2004)
May 2004	NSG further sampled groundwater under the WPD property, identifying areas characterized as having tar-like DNAPL or tar-saturated soil on the southeast corner of the boat parking lot and the northwest corner of the visitor parking lot. These impacts were observed between 6 and 22 feet bgs. (Report to Illinois EPA, July 2005)
May 2005	NSG conducted a ground-penetrating radar survey to determine whether former MGP structures were beneath Pershing Road and identified potential subsurface features and anomalies. (Report to Illinois EPA, July 2005)
May – Aug. 2005	NSG completed groundwater investigation activities on the MGP and WPD properties. The objective was to obtain groundwater data for both properties during a single sampling event. Additional groundwater monitoring wells were installed, bringing the total to 60 (42 on the MGP and 18 on the WPD properties) to date. Nine 6-inch diameter vertical DNAPL recovery wells were

also installed on the former MGP and WPD property to the east. WPD property wells installed to the east are located in the boat parking lot, the maintenance building parking area, and the Administration building parking lot. (Report to Illinois EPA, August 2007)

Aug. 2005 — NSG conducted a DNAPL investigation on the MGP and WPD properties and installed additional groundwater monitoring wells and took soil samples for forensic analysis. Results indicated that petroleum hydrocarbons are present, but the majority of impacts on the WPD property are MGP-related.

Dec. 2005 — NSG collected five soil gas samples from a depth of approximately 4.7 to 5 feet bgs in the vicinity of the WPD maintenance building. Evaluation of the soil gas results using the Johnson and Ettinger Model (EPA 1991) indicated a low risk potential for vapor intrusion (VI) to indoor air within the WPD maintenance building. (Report to Illinois EPA, June 2006)

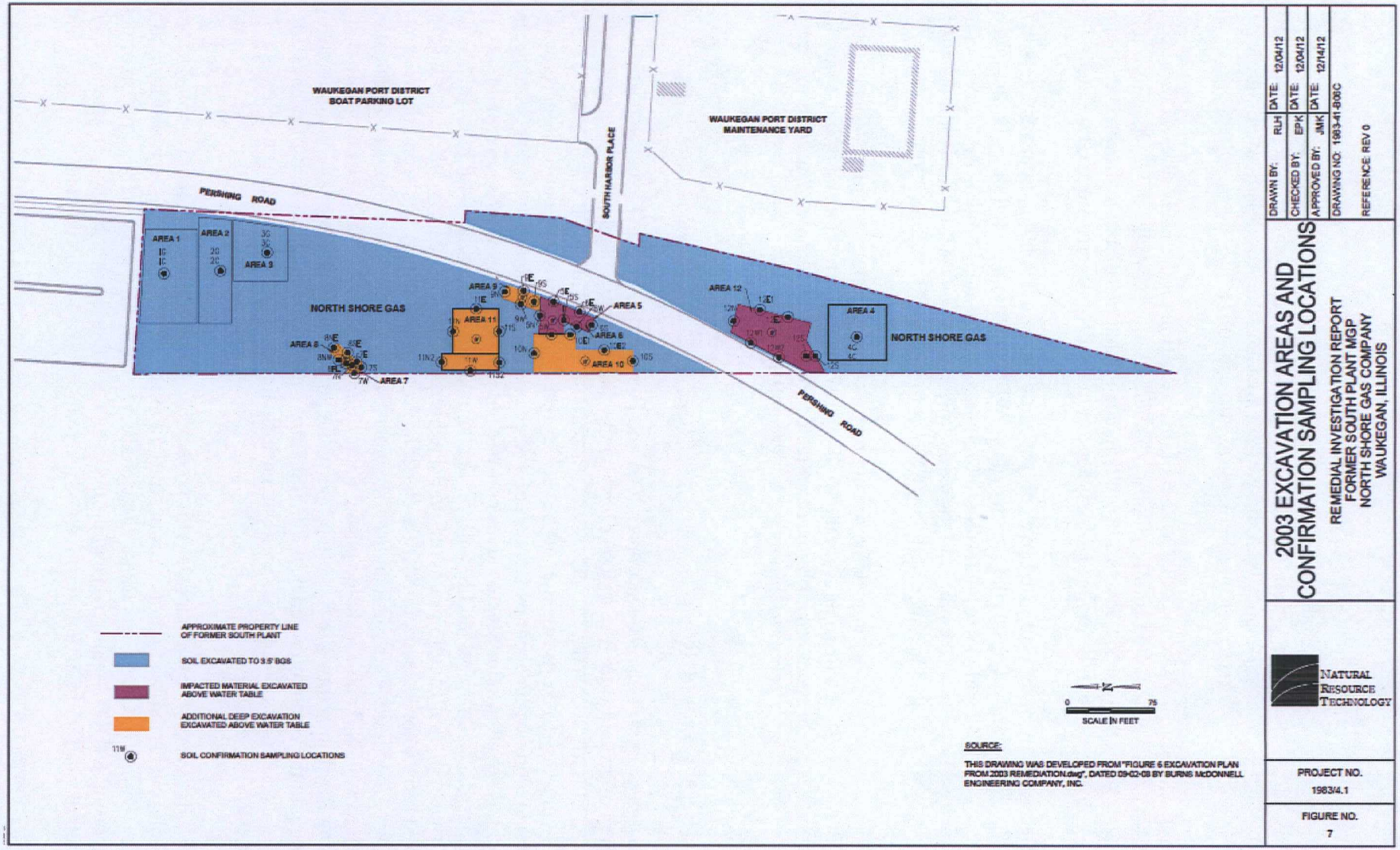
Sept. 2006 — NSG completed a second round of groundwater sampling to again obtain water quality data from the MGP and WPD properties during a single sampling event. Samples were collected from 67 of the now 87 monitoring wells. (Report to Illinois EPA, September 2007).

Early Response Actions

Source Excavation: Between December 2003 and February 2004, NSG excavated soil down to the depth of groundwater (3.5 to 7 feet bgs) on the former South Plant MGP property and disposed of it off-site as part of a focused remediation effort. This work was performed under the State's voluntary SRP. Excavation of the top 3.5 feet of soil across the entire property was completed along with deeper excavation of suspected source material areas in certain areas. Material removed from excavated areas consisted of fill, soil, suspected source material (characterized as tar-impacted fill/soil), piping, and debris. After successful removal of suspected source material, confirmation sampling indicated impacted material above the water table was removed satisfactorily, except under the Pershing Road right-of-way and along the west property boundary (see Figure 4). NSG then installed a plastic liner in the excavations and backfilled them with clean soil. NSG also installed plastic liners along the sidewalls of excavations next to Pershing Road and along the western property line to help prevent residual contaminants from moving into the clean imported backfill. NSG disposed of about 19,223 tons of excavated material as nonhazardous special waste at a nearby licensed landfill. (Report to Illinois EPA, March 2005)

DNAPL Recovery: NSG began DNAPL recovery from 19 vertical extraction wells located on the former MGP and WPD properties in April 2006 and its DNAPL recovery efforts continue to this day. During recovery operations, the DNAPL is pumped from the wells into Department of Transportation (DOT)-approved steel drums, which are then sealed, labeled, manifested, and transported to a facility in Houston, Texas, where the DNAPL is blended as fuel to be used by

Figure 4: Previous response action at NSG Former South Plant MGP (2003 – 2004)



local cement kilns. From April 2006 to May 2007, NSG pumped DNAPL from the wells at approximate 3-week intervals, moving to six-week intervals from May 2007 to the present. As of January 2015, approximately 1,370 gallons of DNAPL have been recovered. The DNAPL recovery wells located in the WPD Administration building parking lot and boat parking lot have accounted for almost 80 percent of the DNAPL recovered to-date.

Enforcement Activities

In July 2007, EPA and NSG entered into an Administrative Order on Consent (AOC) that required NSG to conduct a Remedial Investigation/Feasibility Study (RI/FS) at both the South Plant and the North Plant former MGP sites in Waukegan (Docket No. V-W-07-C-877). Integrys Business Support, LLC (Integrys), which was formed in 2007 with the merger of NSG and other area utilities, performed the RI/FS under the AOC, with EPA oversight. EPA approved the RI report on January 22, 2014 and the Focused FS (FFS) report that addresses the DNAPL contamination on April 9, 2015. EPA placed both reports and supporting documentation into the site Administrative Record (see Appendix 2). In June 2015, Wisconsin Energy Corporation (WEC) acquired Integrys, forming the WEC Energy Group.

2.3 Community Participation Activities

EPA relies on public input so that the remedy selected for each Superfund site meets the needs and concerns of the local community. After issuing the Proposed Plan on April 29, 2015, EPA mailed fact sheets to interested parties in the area, informing them about EPA's preferred alternative to address DNAPL contamination at the site. The fact sheet described the preferred alternative, along with the basis for the Agency's proposal, and the opportunity to provide comments, if any, during the comment period from May 6, 2015 to June 5, 2015. In addition, an open house and public meeting about EPA's preferred alternative was held on May 20, 2015 in the Lilac Cottage facility at Bowen Park, 1911 Sheridan Road in Waukegan.

EPA received several verbal, written, and electronic comments during the 30-day comment period. Substantive comments are addressed in the Responsiveness Summary, which is Part 3 of this document.

EPA maintains the South Plant MGP site Administrative Record at two public repositories: the EPA Region 5 Records Center at Room 711, 77 West Jackson Boulevard (7th Floor), Chicago, Illinois; and the Waukegan Public Library, 128 N. County Seat, Waukegan, Illinois.

2.4 Scope and Role of Response Action

This ROD is an interim remedial action to recover DNAPL contamination that is the primary source of groundwater contamination at the site. Once the remedy is installed and the action completed, EPA will work to select a final remedy to address site groundwater and soil contaminants as well as potential soil vapor intrusion risks.

2.5 Site Characteristics

Physical Characteristics

The NSG Former South Plant MGP site is located in Waukegan, Lake County, Illinois along the western shore of Lake Michigan (see Figure 1). The ground surface around the site consists of grassy vegetation, buildings, and asphalt-paved parking lots and roads. The site is not located within a 100-year floodplain. The population of Waukegan is approximately 89,000, based on 2010 U.S. Census Bureau data. The surrounding area is generally flat, with a mean elevation of approximately 597 feet above sea level. The climate is typically continental, with some modification by Lake Michigan. Average monthly temperatures range from about 21°F in January to about 73°F in July.

Cultural and Natural Resource Features

Illinois Department of Conservation's Natural Heritage Database lists no federal or state threatened and endangered species or pristine natural areas located on the site. The U.S. Fish and Wildlife Service (FWS) did identify the federally endangered Piping Plover, a migratory bird, as having a critical habitat approximately 0.5 miles northeast of the site. The North and South Harbor marinas, located adjacent and east of the site, are used by recreational boaters during the boating season from about April 1 to November 1. Large commercial freighters use the North Harbor as well. Beach Park is located adjacent to the North Harbor Marina and North Beach Park is located about 0.5 miles northeast of the site along Lake Michigan

Surface Water Hydrology

The South Harbor Marina and Lake Michigan are located about 600 feet east of the South Plant MGP property. The Waukegan River, located approximately 1,000 feet south of the South Plant MGP, flows east past the Akzo parcel into Lake Michigan and drains a 12 square mile watershed area. The watershed is highly urbanized, containing only 13 percent undisturbed land, and lack of a natural floodplain area has limited expansion of flow in the Waukegan River, causing erosion to occur in the channel itself. Currently, few storm water detention basins exist and bank erosion in the area is a direct cause of sedimentation into Lake Michigan. Erosion in the channel releases urban contaminants that affect the water and sediment quality in the river and at its mouth. However, it is unlikely the river influences Lake Michigan currents for any more than the briefest periods during large storm events.

Site Geology

The shallow groundwater in the Waukegan area is generally limited to sand and gravel horizons in unconsolidated soil and in fractured bedrock aquifers. The unconsolidated materials in the site area consist primarily of clay with isolated lenses of sand and are not considered productive aquifers. Recharge to the aquifers is primarily by precipitation and infiltration.

The geology encountered beneath the site is composed of a sand/silty sand layer from the surface to an average depth of 15 feet underlain by a clay layer.

The following stratigraphic units are found at the site:

- Fill – Primarily sand with lesser amounts of gravel, slag, and wood fragments. Thickness ranges from 2 feet on the west side of the site to 20 feet adjacent to Waukegan Harbor. In paved areas, the fill includes approximately 3 inches of asphalt and up to 8 inches of sub-base.
- Sand Unit – Primarily natural fine-grained silty sand of alluvial origin. The top of the sand unit was encountered from 1 to 4 feet bgs, with an average thickness of approximately 14 feet.
- Clay Unit – Primarily very stiff to hard, low plasticity silty clay. Top of clay was encountered at depths ranging from 14 to 18 feet bgs across the majority of the site but was present as shallow as 4.5 to 6 feet bgs in the vicinity of the Waukegan River.

The sand unit is the main water-bearing unit at the site. Shallow groundwater is encountered at about 7 feet bgs and groundwater contours indicate an easterly flow toward Lake Michigan. Subsequent groundwater flow measurements beginning in November 2009 continue to indicate this easterly flow direction (see Figure 5).

No municipal or private drinking water wells are located at the site or within a one-mile radius of the site. The City of Waukegan obtains its municipal water supply from Lake Michigan. By ordinance, water wells in the county are not permitted in areas where a public water supply is available. In cases where a public water supply is not available, potable water wells may only be permitted after approval from the county health department.

Nature and Extent of DNAPL Contamination

When it was operating, the former South Plant MGP facility generated various by-products and wastes, such as coal tar, ammonia, cyanide, ammonium sulfate, sulfur, wastewater sludges, ash, and tar/oil emulsions. These materials contain PAHs such as naphthalene and benzo(a)pyrene; petroleum hydrocarbons such as benzene, toluene, ethylbenzene, and xylene (BTEX); metals such as arsenic and lead; cyanide; and phenolic compounds. Varying levels of these contaminants have been found in the site soil, groundwater, and adjacent surface water and sediment samples.

The remedial investigation (RI) found that DNAPL was a continuing source of contamination to the groundwater and that two distinct zones of DNAPL impacts were present at the site. The first zone was a 150-ft wide DNAPL plume that radiates from the north side of the former MGP facility, following a localized depression in the confining clay layer and extending to the northeast under South Harbor Place Drive into the southwest corner of the WPD parking lot. The second zone of DNAPL impact radiates to the southeast of the former MGP where the plume is approximately 200 feet wide, underneath the WPD maintenance building and the Akzo facility to a localized depression in the confining clay layer located west of the WPD Administration Building, where the plume is approximately 425 feet wide. NSG calculated in the FFS report that the overall areal extent of the DNAPL plume is 278,600 square feet (roughly 6 acres), with an estimated total volume of 527,000 gallons of tar-like material (see Figure 6).

Contaminants of Concern (COCs)

As noted above, the site DNAPL is a continuing source of contamination to area groundwater. Primary COCs in the site groundwater contaminant plume include PAHs such as naphthalene and benzo(a)pyrene; BTEX compounds; and metals such as arsenic and lead.

Conceptual Site Model

A conceptual site model (CSM) in the approved RI Report provides a graphic representation on the results of the investigation (see Figure 7). Among other things, the CSM depicted the

Figure 5: Groundwater Flow

presence of DNAPL just below the upper aquifer. The groundwater currently exceeds screening levels for COCs, with the DNAPL the primary contributor of contamination in that media.

2.6 Current and Potential Future Land and Resource Uses

The MGP property is currently zoned as commercial/recreational, while the WPD, Akzo, EJ&E, and City of Waukegan parcels are zoned general industrial. The city's Lakefront Downtown

Master Plan (July 2003) calls for the MGP site area to be developed into mixed-use property with marina-related services, retail, residential, and open space. This master plan has not been implemented at this time. In spring 2015, the Canadian National Railway, as owners of the adjacent EJ & E railroad track, petitioned the federal government to abandon the tracks running along the site. Part of the proposal would transfer ownership of the abandoned track bed to the city. If approved, removal of the railroad tracks and transferring ownership to the city could potentially open greater options on redeveloping land presently occupied by the tracks.

2.7 Summary of Site Risks

The CSM provides a graphical representation on the source(s) of contamination found at the site, the various exposure pathways the source(s) can take, and actual/potential receptors found at the site (see Figure 6). Specifically, the RI found that DNAPL was a continuing source of contamination to the groundwater and that the overall areal extent of the DNAPL is about 6 acres containing an estimated total volume of 527,000 gallons of tar-like material.

As part of the RI report, Integrys conducted a Baseline Risk Assessment (BLRA), which evaluated the potential for human health and ecological risks associated with site contaminants. Primary contaminants of concern (COCs) in the site groundwater contaminant plume included PAHs such as naphthalene and benzo(a)pyrene; BTEX compounds; and metals such as arsenic and lead. The human health risk assessment (HHRA) component of the BLRA addressed potential risks to people from contaminated soil and groundwater in the terrestrial (upland) portion of the site, along with potential exposures to contaminants in the surface water and sediments at the site (at the marina, beach, and in Lake Michigan). However, the ecological risk assessment (ERA) only focused on the water bodies adjacent to the site because EPA determined that the site itself did not contain terrestrial habitat requiring an ecological risk evaluation.

Human Health Risk Assessment

Carcinogens: For carcinogenic compounds, risk is given as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen. Values are expressed as "excess lifetime cancer risk" (ELCR) because the risk would be in addition to the risk of developing cancer from other causes such as smoking or exposure to too much sun. ELCRs are often expressed in scientific notation (e.g., $1x10^{-6}$); an ELCR of $1x10^{-6}$ indicates that an individual experiencing the reasonable maximum chemical exposure estimate has an extra 1 in 1 million chance of developing cancer as a result of site-related exposure. The chance of an individual developing cancer from all other causes has been estimated to be as high as 1 in 3. EPA's target risk range for site-related exposures is $1x10^{-4}$ to $1x10^{-6}$ ELCR.

ELCR is calculated using the following equation: ELCR = CDI x SF

where: ELCR = a unitless probability (e.g., 2×10^{-5})

CDI = chronic daily chemical intake averaged over 70 years (mg/kg-day)

SF = cancer slope factor, expressed as $(mg/kg\text{-}day)^{-1}$.

Figure 6: Conceptual Site Model

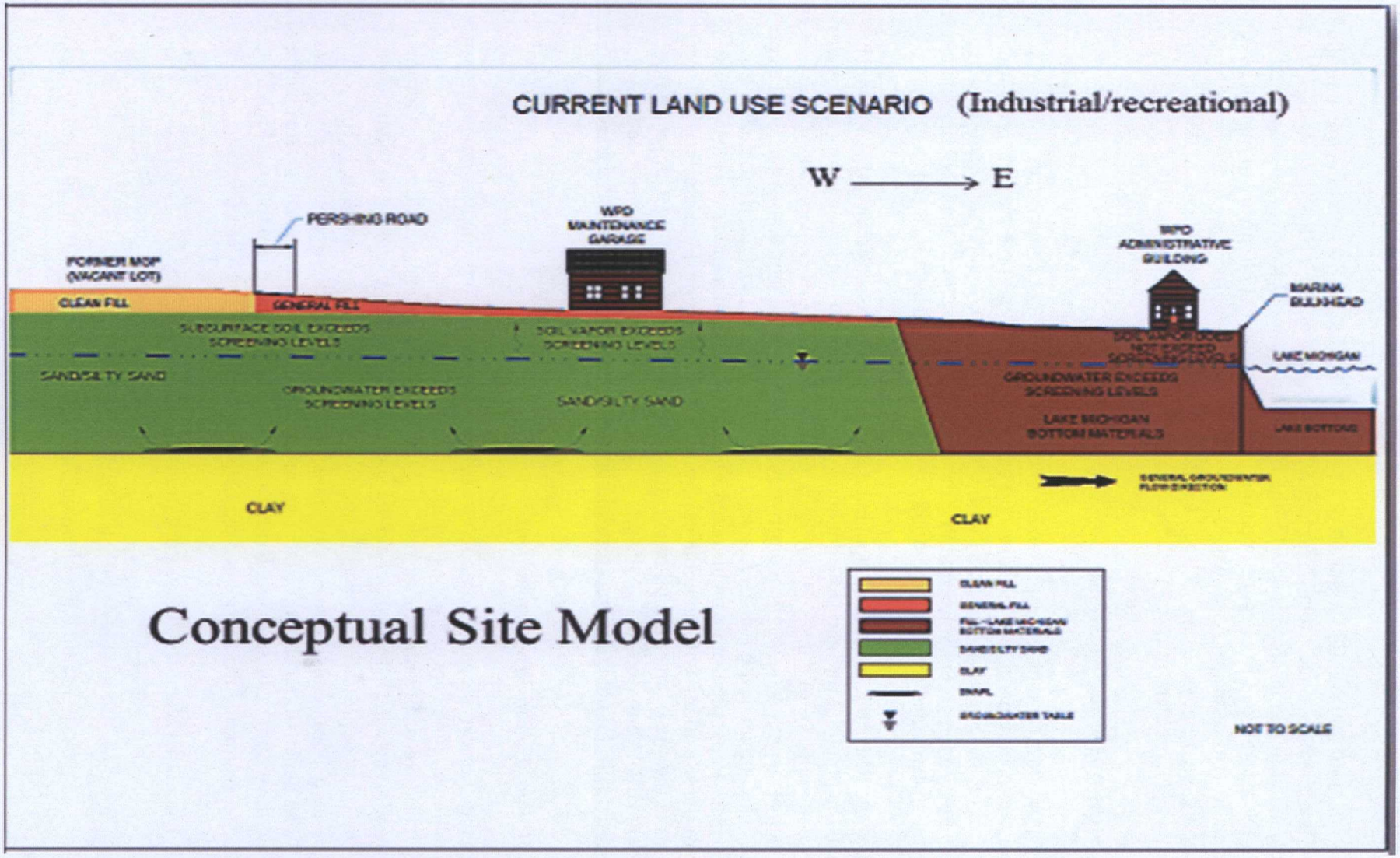
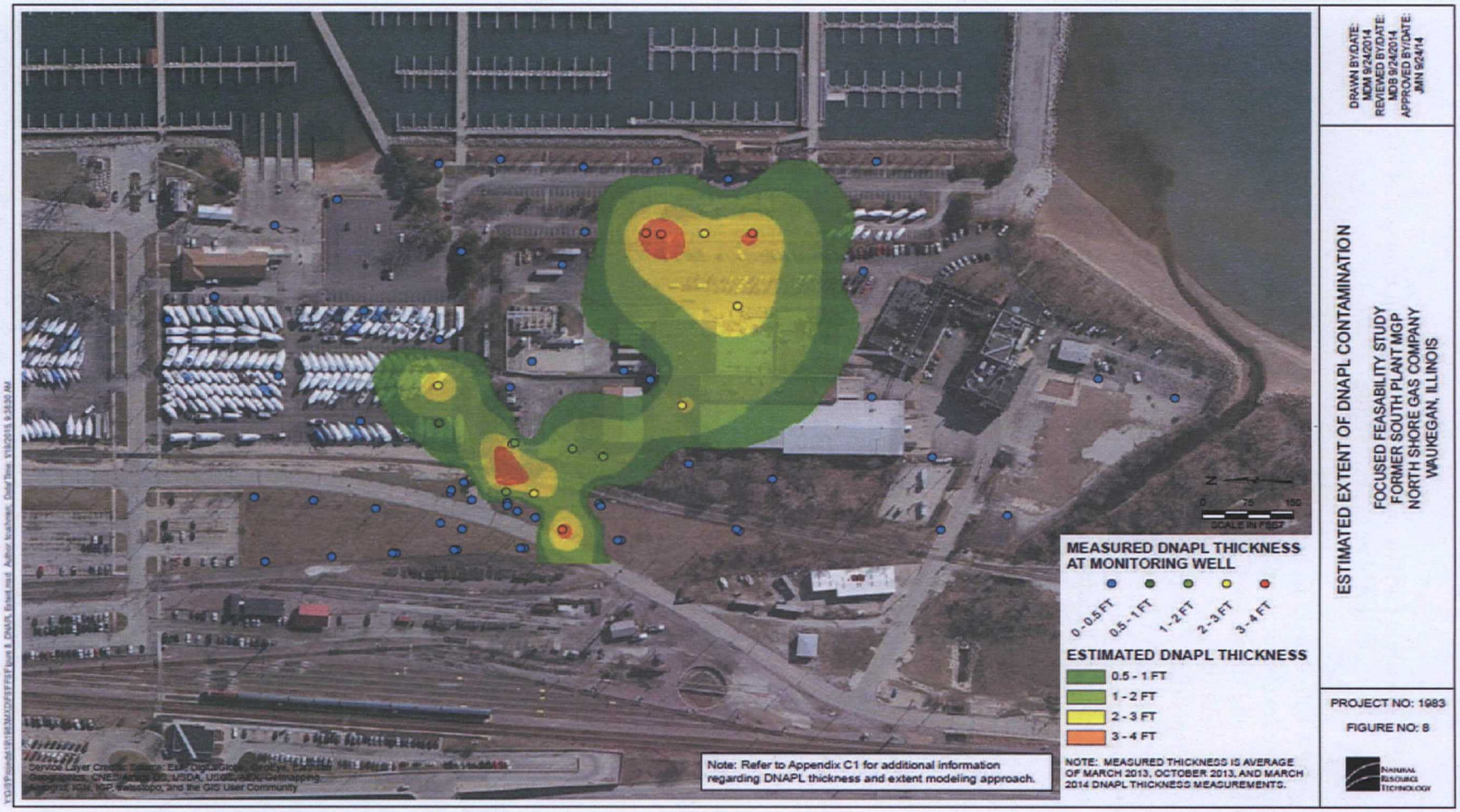


Figure 7: Extent of DNAPL Contamination



A COC is considered to present a current and/or future potential unacceptable risk if the calculated ELCR is greater than EPA's target risk range.

Non-carcinogens: EPA calculates a hazard quotient (HQ) for each COC. The HQ is the ratio of the estimated exposure level to a chemical compound over a specified period of time to a reference dose of the same substance that may cause deleterious health effects over the same exposure period. The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ<1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely.

An HI is generated by adding the HQs for all chemicals of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI<1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An HI>1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows: $HQ = CDI/RfD$

where: CDI = Chronic daily intake
RfD = reference dose

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, sub-chronic, or short-term).

The area around the South Plant MGP site is currently zoned for industrial, commercial, and recreational uses, with the potential for residential use if the city's master plan is implemented. Thus, human health risks at the site were assessed for both commercial/industrial (current) and residential (future) receptors. Each scenario was evaluated against potential exposure pathways, as summarized in the following table:

Receptor	Exposure Pathways
Industrial or commercial worker	Incidental ingestion, dermal contact, vapor intrusion, and inhalation of DNAPL-affected soil (as a result of soil disturbance)
Construction worker	Incidental ingestion/dermal contact/inhalation of DNAPL-affected soils (as a result of soil disturbance), and groundwater, surface water, and sediment via dermal contact and inhalation
Recreational visitor	Incidental ingestion of surface water and sediment/dermal contact with surface water and sediment potentially impacted by DNAPL

Resident (future use)	Incidental soil ingestion/dermal contact/inhalation (including vapor intrusion from DNAPL-impacted subsurface soil and groundwater)

Human Health Risk Characterization

DNAPL is primarily a source of contamination in site soil, groundwater, and soil gas rather than a direct health risk itself. Thus, a comprehensive human health risk assessment specific to DNAPL was not completed. The BLRA did evaluate exposure pathways to DNAPL as part of the evaluation of potential health risks due to COCs in soil, groundwater, and soil vapor. A summary of some of these exposure pathways is included below:

Groundwater: Exposure to groundwater in construction excavations in each area of the site could potentially be associated with unacceptable risks because DNAPL is present near or below the water table in one or more wells. However, only construction workers having direct exposure to groundwater or inhaling vapors in excavations at or below the water table (as shallow as 3–5 feet bgs but typically averaging between 6.5 to 8.5 feet bgs) would be at potential risk. The potential for exposure of construction workers to groundwater in excavations is likely limited due to safety considerations other than those related to DNAPL exposure. However, because exposure to groundwater containing DNAPL or associated vapors is assumed to present unacceptable risks to construction workers, appropriate steps should be taken to prevent such exposure.

Surface Soil: There are very few areas of the site where surface soils are both exposed and where residual DNAPL-like contaminants are present. Most surface soils are either clean soil that have been imported after remediation was completed or are located below pavement preventing human exposure. There are some areas on the Akzo property where surface soils are not under pavement (areas with ornamental trees), but these areas are not near the former MGP parcel and are not expected to have been impacted by the former MGP activities.

Soil Vapor: The potential vapor intrusion exposure pathway was evaluated using soil vapor samples taken at depths ranging from 3.5 to 5 feet bgs, with sub-slab samples taken at 1 foot bgs.

Potential impacts were found and are associated with dissolved chemical levels in groundwater rather than the DNAPL itself.

Conclusions from the HHRA

The following conclusions were made in the HHRA:

- DNAPL is a continuing source of groundwater contamination. The groundwater does not meet drinking-water standards in any of the areas evaluated, and it should not be used for that purpose. Estimated risks would exceed the risk management range under a residential tap water scenario for all areas.
- Because of the presence of DNAPL in one or more wells on each site parcel, construction worker exposures to subsurface soils, groundwater, and soil vapor on

each property should be assumed to be associated with the potential for unacceptable risks if intrusive construction activities occur in the future.

- Potential vapor intrusion risks are present (under the residential or industrial scenarios) at the Akzo and WPD parcels. Health risks for the Akzo area are within the risk management range for current (industrial) use. For future residential use, ELCRs were within or at the high end of the risk management range but HQ values were greater than 1. For the WPD area, risks were at the upper end of the risk management range for current industrial use, and above the risk management range for future potential residential use.

Ecological Risk Assessment

The BLRA evaluated the ecological risks at the site and concluded that the upland area does not support habitat for ecological receptors due to the developed nature of the properties, consistent with the commercial/industrial zoning of the land. The screening level ecological risk assessment (SLERA) also concluded that the nature and concentration of the COCs detected in surface water and sediment in the marina, city beach, and open-water environment is not expected to pose an ecological concern. Potential ecological risks associated with DNAPL that could discharge into the marina will be addressed through upland DNAPL management.

2.8 Remedial Action Objectives

Remedial Action Objectives (RAOs) are cleanup goals specific to media for protecting human health and/or the environment. RAOs are based on unacceptable risks, anticipated current and future land use, objectives of the action and expectations and statutory requirements. The following RAO was developed to protect the public and environment from potential health risks posed by DNAPL at the site:

- Reduce the mass and mobility of recoverable DNAPL to the extent practicable.

Cleanup levels

Cleanup levels for DNAPL have not been established since it's a source of contamination, not a media. However, EPA estimates that about 95 percent of the DNAPL may be recoverable.

2.9 Description of Alternatives

The DNAPL remedial alternatives evaluated in the FFS are summarized below:

- D1 - No Action
- D2 - Institutional Controls (Figure 8)
- D3 - Vertical Engineered Barrier (Figure 9)
- D4 - Horizontal Well DNAPL Recovery (Figure 10)
- D5 – Physically-Enhanced DNAPL Recovery (Figure 11)
- D6 – Chemically-Enhanced DNAPL Recovery (Figure 12)
- D7 – Thermally-Enhanced DNAPL Recovery (Figure 13)

The following is a description of the DNAPL remedial alternatives:

DI – No Action

Under the No Action alternative, EPA would take no further actions to address potential exposure to the tar-like DNAPL at the site or to address the DNAPL as a continual source of groundwater and potential surface water contamination. The No Action alternative is included in the list of DNAPL alternatives evaluated in the FFS to be consistent with the NCP and it is used as a baseline for comparisons to the other DNAPL alternatives. Because no actions would be taken to reduce the mass or mobility of the DNAPL and thus site contamination above health-based limits would be left onsite, EPA would need to conduct a five year review (FYR) at the site every 5 years for as long as contaminants remain above health-based limits at the site.

D2 – Institutional Controls

Under Alternative D2, EPA would place institutional controls (ICs) on the site to minimize exposure to DNAPL. ICs would consist of both administrative and legal controls. Since the primary mechanism for human exposure to DNAPL would be through consumption of groundwater contaminated by DNAPL, Alternative D2 would place ICs on the site parcels to restrict the use of groundwater as a drinking water source until drinking water standards are met. The ICs would also require worker cautions as well as health and safety planning to protect potential future construction workers from exposure to DNAPL compounds in the groundwater.

Groundwater ICs would best be a combination of a local ordinance enacted by the Waukegan City Council creating a restricted groundwater use zone that prohibits the use of DNAPL-impacted groundwater as a potable water supply and the placement of a Uniform Environmental Covenant (under 765 ILCS Chapter 22) on the site parcels to provide additional assurances that the IC will continue to be enforced in the event of property transfer or changes in future land use. An IC Implementation Plan would be developed to detail groundwater-use restrictions and document procedures for effectively implementing the ICs. Because no actions would be taken to reduce the mass or mobility of the DNAPL and thus site contamination above health-based limits would be left onsite, EPA would need to conduct a FYR at the site every 5 years for as long as contaminants remain above health-based limits at the site.

D3 – Vertical Engineered Barrier

Under Alternative D3, EPA would install a low-permeability vertical engineered barrier around the DNAPL plume. Vertical barriers are typically constructed with soil-bentonite ("slurry wall"), high-density polyethylene (HDPE), or steel sheet piles. The vertical engineered barrier would be keyed into the underlying confining clay layer a minimum of 3 feet. The confining clay layer would limit downward migration of DNAPL and the low permeability vertical engineered barrier would limit the lateral migration of DNAPL. The engineered barrier would contain both the groundwater and DNAPL, thereby reducing mobility of DNAPL compounds in partial accordance with the RAO. Because no additional actions would be taken to reduce the mass of the DNAPL and thus site contamination above health-based limits would be left onsite, EPA would need to conduct a FYR at the site every 5 years for as long as contaminants remain above health-based limits at the site.

D4 – Horizontal Well DNAPL Recovery

NSG is currently operating a network of vertical DNAPL recovery wells at the site. However, these wells have removed a limited volume of DNAPL since initial operations began in 2006. Under Alternative D4, a network of horizontal recovery wells would be installed above the clay-confining layer at site locations that are within and downgradient of accumulated DNAPL. DNAPL would pass through the horizontal well screen and flow via gravity within the sloped horizontal well to a collection sump. The DNAPL would then be pumped into collection containers for off-site treatment and disposal.

Compared to the existing vertical DNAPL recovery wells, the horizontal DNAPL recovery wells will have a significantly greater screened interval within the DNAPL bearing zone and will thus be much more effective at recovering DNAPL, although it is estimated that DNAPL recovery would occur over a 30-year period before the mass and mobility is reduced to the extent practicable.

Three primary horizontal well installation methods were evaluated as part of Alternative D4 – traditional trench, one-pass trench, and horizontal directional drilling. The preferred method would be developed during the remedial design phase. Each is briefly described below:

Traditional trench installation would involve an excavator cutting narrow trenches to a depth of approximately 20 feet bgs in the DNAPL areas, placing the horizontal wells into the excavations, placing washed stone over the wells to protect the pipe and locally increase hydraulic conductivity, and then backfilling the excavations with clean soil or fill. This method would require saw cutting of and removal of pavement along well alignments and the use of trench boxes or a slurry wall to prevent collapse of the sandy soil during installation. While potentially implementable at this site, traditional trench installation is better suited for a site with more cohesive soil, a depth of excavation shallower than groundwater, minimal surface improvements (e.g., pavement), and minimal subsurface utility crossings.

The **one-pass trenching** technique uses a specialized trenching machine that simultaneously removes soil, installs perforated pipe, and places granular backfill into the excavation. The simultaneous installation avoids the need for trench stabilization. One-pass trenching can achieve depths up to 30 feet bgs. Similar to the traditional trench method, the one-pass method requires saw cutting and removal of pavement along the proposed trench alignment. Also similar to the traditional trench method, the one-pass method typically includes backfilling the trench with washed stone. While potentially implementable at this site, one-pass trenching is better suited for sites with minimal surface improvements (e.g., pavement) and minimal subsurface utility crossings.

Horizontal directional drilling (HDD) is a trenchless horizontal well installation method. The equipment and procedures are intended to minimize temporary operational disruption, surface damage, and restoration. Surface impacts are limited to two work areas, one on the entry side and one on the exit side. Horizontal and vertical control of the HDD drill bit between the entry and exit side is performed using magnetic steering tools in conjunction with a surface monitoring system. The locator provides information to the operator to allow real-time path corrections to

follow the planned bore path. Some systems directly transmit the location information to a display on the drill rig to automatically control the drill path.

Some unique advantages of horizontal drilling include: minimal site preparation and restoration costs because disturbance is limited to entry and exit points; comparatively easy utility crossings; and reduced soil management and disposal volumes. Some unique disadvantages include: limited effectiveness in drilling through stone and cobbles and reliance on the permeability of the surrounding soil rather than installation of a high permeability granular backfill. Due to the discrete land disturbance associated with pipe installation using HDD, installation does not allow backfill around the pipe. Therefore, the pipe will be in direct contact with the subsurface soil and subject to potential pipe clogging, particularly if installed in soil containing a significant fraction of fine material. There is also some uncertainty regarding the effectiveness of a horizontal well system due to possible stratification of subsurface soil; whereas trenching overcomes stratified soil layers by cutting through the soil profile.

EPA would need to conduct a FYR at the site every five years for as long as contaminants remain above health-based limits at the site.

D5 – Physically-Enhanced DNAPL Recovery

Under Alternative D5, EPA would physically enhance DNAPL recovery efforts through the use of simultaneous groundwater extraction and injection. Groundwater injection will locally increase hydraulic gradients, thereby increasing the rate of DNAPL migration toward recovery wells. Alternative D5 would involve installation of both injection and extraction wells, as well as a phase-separation and groundwater treatment facility. It is estimated that DNAPL recovery would occur over a 8-year period before the mass and mobility is reduced to the extent practicable.

Physically-enhanced recovery can be performed using a variety of methods and can be implemented using horizontal or vertical wells. Two primary approaches, separate-phase extraction and multi-phase extraction, are described below:

Separate-phase extraction would use dedicated DNAPL and dedicated groundwater extraction pumps in a single vertical well. A low-flow DNAPL recovery pump would be placed at the bottom of the well in the DNAPL zone and a standard groundwater pump would be installed above the DNAPL-bearing interval. The groundwater pump would extract a limited volume of DNAPL, which would be removed by a phase-separation unit. The collected DNAPL would be sent off site for treatment and disposal and extracted groundwater would be treated on site prior to re-injection into the ground. Alternatively, extraction could occur in separate but collocated wells. Separate-phase extraction is most applicable to sites with relatively thick accumulations of DNAPL, such as at this site.

Multi-phase extraction would use a single pump in each well to simultaneously remove DNAPL and groundwater. The DNAPL/water mixture would be run through a phase-separator to collect DNAPL for off-site treatment and disposal and extracted groundwater would be treated on site prior to re-injection into the ground. Because the DNAPL would be emulsified in the extracted water, phase separation would be comparatively more challenging and may result in a

higher percentage of water remaining in the separated DNAPL. The increased water content will make DNAPL treatment more challenging. Multi-phase extraction is most applicable for sites with relatively thin accumulations of DNAPL, which is not typical at this site.

EPA would need to conduct a FYR at the site every five years as long as contaminants above health-based limits remain at the site.

D6 – Chemically-Enhanced DNAPL Recovery

Under Alternative D6, EPA would enhance DNAPL recovery using injection of chemical surfactants. The mobilized DNAPL would be recovered using the extraction techniques similar to those described in Alternative D5. Therefore, implementation of Option D6 will involve installation of both injection and extraction wells, as well as a phase-separation and groundwater treatment facility. It is estimated that DNAPL recovery would occur over a 4-year period before the mass and mobility is reduced to the extent practicable.

Typically, chemically enhanced DNAPL recovery is performed using surfactants and there are several varieties available for the remediation and oil recovery markets. Surfactant injections are often amended with electrolytes, polymers, co-solvents, or oxidants to further increase surfactant effectiveness. Laboratory bench-scale studies are critical to select the proper type and concentration of surfactant and amendment.

Surfactants are only effective at enhancing the recoverability when in direct contact with DNAPL. As a result, having an accurate understanding of the DNAPL plume and the subsurface geology and geochemistry is critical to determining injection zones, well spacing, chemical volume, and other criteria. Application can be performed using either horizontal or vertical wells and DNAPL recovery can either be performed in the same well used for chemical injection or in a separate, downgradient recovery well. Introducing chemicals to the subsurface that may not be recovered is a concern with this alternative.

EPA would need to conduct a FYR at the site every five years as long as contaminants above health-based limits remain at the site.

D7 – Thermally-Enhanced Recovery

Under Alternative D7, EPA would increase the temperature of the subsurface to enhance DNAPL recovery or even to thermally destroy the DNAPL in place. It is estimated that DNAPL recovery would occur over a 4-year period before the mass and mobility is reduced to the extent practicable.

Typical thermal treatment technologies include steam-enhanced extraction, electric resistance heating (ERH), and conductive heating. Each type of thermal treatment technology, as it applies to recovery of DNAPL, is summarized below:

Steam-enhanced extraction would use steam injected under pressure into the DNAPL zone through injection wells, which increases the subsurface temperature and causes the DNAPL to mobilize and be displaced. The DNAPL can then be recovered using multi-phase extraction wells. The more volatile DNAPL constituents, e.g., BTEX and naphthalene, would also be

volatilized by the increased subsurface temperatures. This method primarily relies on conductive and convective heat transfer to increase subsurface temperatures. As a result, this technology is best suited for soil with moderate to high permeability and limited subsurface obstructions, as is the case for this site. The maximum subsurface temperature is limited by the temperature of the injected steam (about 100 degrees Celsius).

EPA would need to conduct a FYR at the site every five years as long as contaminants above health-based limits remain at the site.

2.10 Comparative Analysis of Alternatives

EPA uses nine criteria to evaluate remedial alternatives before selecting a remedy (see Table 1).

Table 1: The Nine Criteria

EVALUATION CRSITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Threshold Criteria
1. **Overall Protection of Human Health and the Environment** determines whether an alternative eliminates, reduces, or controls threats to the public health and the environment through engineering controls, treatment, or ICs.
2. **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)** evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirement that pertain to the site, or whether a waiver is justified.
Balancing Criteria
3. **Long-term Effectiveness and Performance** considers the ability of an alternative to maintain protection of human health and the environment over time.
4. **Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment** evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
5. **Short-term Effectiveness** considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
6. **Implementability** considers the technical and administrative feasibility of implementing the alternative, including factors such as relative availability of goods and services.
7. **Cost** includes estimated capital and annual operation and maintenance costs, as well as present worth cost. Present worth cost is the total of an alternative over time in today's dollar value. Cost estimates are expected to be accurate within a range of +50% to -30%.
Modifying Criteria
8. **State Acceptance** considers whether the State agrees with EPA's analyses and recommendations, as described in the RI/FS and the Proposed Plan.

9. **Community Acceptance** considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

Comparative analysis of DNAPL Remedial Alternatives

Below is the narrative evaluating the relative performance of each alternative described above against the nine criteria, noting how each compares to the other alternatives under consideration. A more detailed analysis of the DNAPL alternatives is found in the FFS. For convenience, Table 2 provides a summary of the comparison of the DNAPL remedial alternatives.

1. Overall Protection of Human Health and the Environment

Alternative D1 (No Action) would not be protective of human health and the environment as the DNAPL would remain mostly unabated as a source of groundwater contamination.

Alternative D2 would be protective of human health by using ICs to prevent consumption of contaminated groundwater at the site. While the current concentrations of COCs detected in surface water and sediments do not presently pose an ecological concern, the lack of engineering controls may change this assessment as DNAPL-contaminated groundwater migrates to the lake.

Alternative D3 would be protective of human health and the environment because it would contain the DNAPL in place and prevent further migration of DNAPL-contaminated groundwater towards the lake.

Alternatives D4, D5, D6, and D7 would be protective of human health and the environment because DNAPL would be recovered over time and prevent further migration of DNAPL-contaminated groundwater towards the lake.

2. Compliance with ARARs

The list of ARARs for DNAPL remediation was provided in the Proposed Plan and is included in this document as Table 5. There are no ARARs that directly apply to implementation of Alternatives D1 and D2. However, neither Alternative D1 nor D2 would result in compliance with chemical-specific groundwater ARARs.

Alternatives D3, D4, D5, D6, and D7 would meet all potential ARARs that would apply to the various technologies.

3. Long-Term Effectiveness and Permanence

Alternative D1 has no ability to maintain effective protectiveness of human health and the environment over time.

Alternative D2 would meet the long-term effectiveness and permanence criterion if effective and enforceable ICs are placed on the site and the DNAPL does not migrate. It is uncertain if the

DNAPL would be contained on site permanently which could result in a future unacceptable discharge to the lake.

Alternative D3 would meet the long-term effectiveness criterion for human health and the environment. Vertical engineered barriers are a well-established, long-term remedy used to contain DNAPL at former MGP sites and can provide protection in excess of 30 years.

Alternatives D4, D5, D6, and D7 would meet the long-term effectiveness and permanence criterion because a large volume of DNAPL would be permanently removed from the environment and treated. Permanent removal and treatment provides for greater long-term effectiveness and permanence than Alternative D3, which is a containment-only remedy.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives D1 and D2 do not treat DNAPL to reduce the toxicity, mobility, and volume of contamination. Alternative D3 reduces the mobility of DNAPL by containing it in place, but provides no treatment.

Alternatives D4, D5, D6, and D7 will reduce the toxicity, mobility, and volume of DNAPL through treatment, but to varying degrees. Alternatives D5, D6, and D7 are more aggressive treatment methods and are expected to remove more DNAPL from the ground in comparison to Alternative D4.

5. Short-Term Effectiveness

Alternatives D1 and D2 provide no short term risks to workers or the public while being implemented. However, it is estimated that at least 6 months would be required to obtain necessary permissions to place ICs on the site under Alternative D2.

Alternative D3 would present some short-term risks during implementation and operation and maintenance. It is estimated that 12 months would be required to install the vertical engineered barrier and groundwater gradient control system, which would immediately limit the off-site migration of DNAPL. There is a risk that the community could be exposed to a minimal amount of MGP-residuals during construction via air emissions from exposed contaminated soil, while workers would need to wear standard protective equipment during remedy construction and operation and maintenance (O&M). It is expected that the short-term risks would be effectively managed with health and safety measures.

Alternative D4 would present some short-term risks. It is estimated that 6 months would be required to install the horizontal recovery well and sump system. It is estimated that DNAPL recovery would occur over a 30-year period before the mass and mobility is reduced to the extent practicable. The community could be exposed to a minimal amount of MGP-residuals during construction via air emissions from exposed contaminated soil or DNAPL, while workers would need to wear standard protective equipment during remedy construction and O&M. It is expected that the short-term risks would be effectively managed with health and safety measures.

Alternative D5 would present some short-term risks. It is estimated that 12 months will be required to install the horizontal recovery wells, groundwater injection and extraction wells, install the treatment plant and necessary recovery/power lines. It is estimated that DNAPL recovery would occur over an 8-year period before the mass and mobility is reduced to the extent practicable. The community could be exposed to a minimal amount of MGP-residuals during construction via air emissions from exposed contaminated soil or DNAPL, while workers would need to wear standard protective equipment during remedy construction and O&M. It is expected that the short-term risks would be effectively managed with health and safety measures.

Alternative D6 would present some short-term risks. It is estimated that 12 months will be required to install the horizontal recovery wells, groundwater injection and extraction wells, install the treatment plant, surfactant injection system, and necessary recovery/power lines. It is estimated that DNAPL recovery would occur over a 4-year period before the mass and mobility is reduced to the extent practicable. The community could be exposed to a minimal amount of MGP-residuals during construction via air emissions from exposed contaminated soil or DNAPL, while workers would need to wear standard protective equipment during remedy construction and O&M. It is expected that the short-term risks would be effectively managed with health and safety measures.

Alternative D7 would present some short-term risks. It is estimated that up to 12 months would be required to install the thermally-enhanced recovery systems. It is estimated that DNAPL recovery would occur over a 4-year period before the mass and mobility is reduced to the extent practicable. The community may be exposed to minimal amounts of contaminants due to an increased rate of diffusion of contaminants due to increased subsurface temperatures. This risk would be minimized by not heating underneath occupied buildings and implementing vapor controls. The community could also be exposed to a minimal amount of MGP-residuals during construction via air emissions from exposed contaminated soil or DNAPL, while workers would need to wear standard protective equipment during remedy construction and O&M. It is expected that the short-term risks would be effectively managed with health and safety measures.

6. Implementability

Alternatives D1 and D2 are readily implementable. Coordination with the various property owners is likely to present some administrative challenges for placement of ICs.

Alternative D3 is implementable as vertical barrier walls are easily installed and materials are readily available. Installation will be challenging at this site due to extensive utility crossings, working adjacent to the railroad, and the need to coordinate with property owners.

Alternative D4 would be implementable as recovery trench alignments and HDD construction methods could be used to minimize or avoid utility and property owner conflicts.

Alternatives D5 and D6 would be implementable, but challenging. Recovery trench alignments and proposed construction methods could be selected to minimize or avoid utility and property owner conflicts. However, pump controls, power, and piping will require connection to a treatment plant proposed to be placed on the MGP parcel. This connection would be completed

through directionally drilled borings under the railroad tracks, and trenching through the Akzo and WPD properties to the wells. Coordination of directional drilling under the railroad tracks and trenching through the Akzo and WPD properties are technically implementable, but could be an administrative challenge.

Alternative D7 would be implementable, but even more challenging than Alternatives D5 and D6. Thermally-enhanced extraction is technically implementable; however, there are many implementation challenges. Installation and operation of the thermal system would require careful coordination and access agreements with Akzo and WPD to allow electrode and recovery infrastructure to be installed on these properties. Typically, the electrodes need to be located on a 15-20-foot spacing, so there is limited flexibility to accommodate access restrictions within a desired treatment zone. The limited flexibility to adjust well locations is particularly relevant to active roadways, railroads, and industrial buildings.

7. Cost

The present worth cost of each alternative, using a 7 percent discount rate, is shown in Table 3. The No Action alternative (D1) had cost associated with conducting five-year reviews.

8. State Acceptance

Illinois EPA has indicated that it will concur with the selected remedy.

9. Community Acceptance

The community has not objected to the selected remedy, as evidenced by comments received during the public comment period. Some commenters indicated support for the selected remedy, while others indicated that construction should proceed without delay so that redevelopment efforts at the site can move forward (see Responsiveness Summary).

2.11 Principal Threat Waste

The DNAPL is a continuing source of groundwater contamination at the site and represents a principal threat waste that needs to be addressed, preferably by treatment, due to its toxicity, mobility, and volume. The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure.

EPA has determined that the statutory preference for treatment as a principal element would be satisfied under Alternatives D4 through D7.

Figure 8: Alternative D2 – Conceptual Limits of Institutional Controls

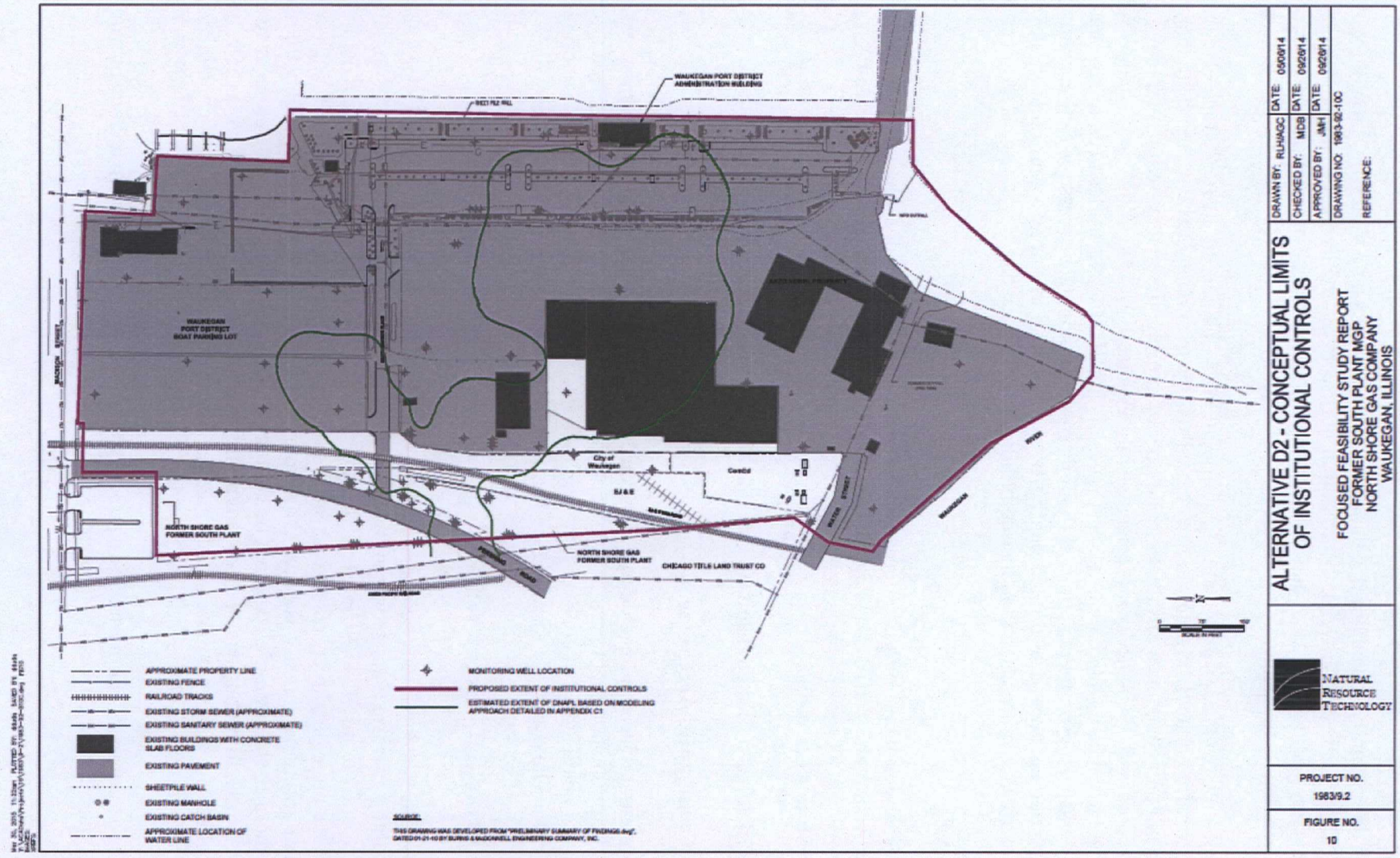


Figure 9: Alternative D3 – Conceptual Vertical Engineered Barrier

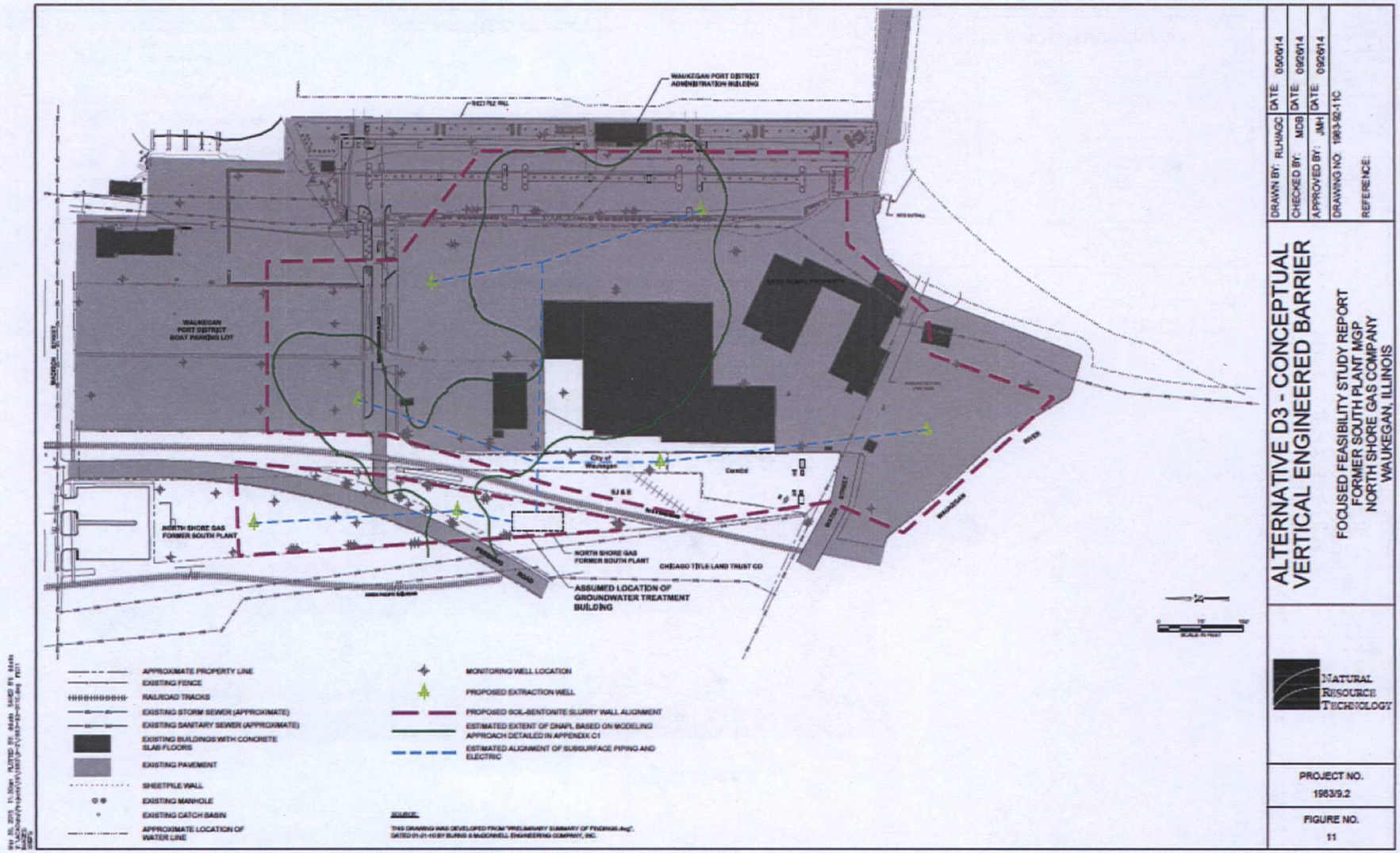


Figure 10: Alternative D4 – Conceptual Horizontal Well DNAPL Recovery System

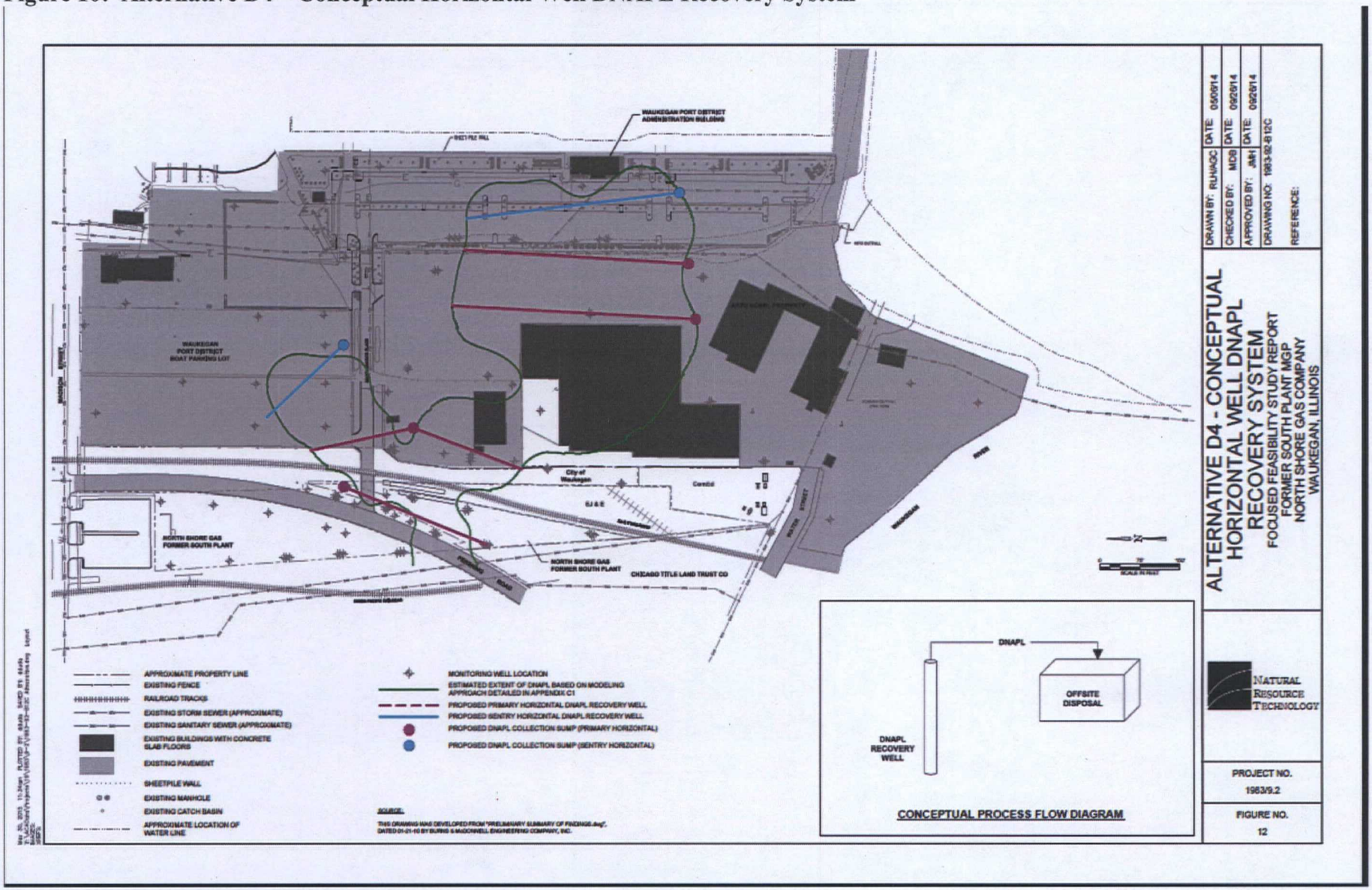


Figure 11: Alternative D5 – Conceptual Physically Enhanced DNAPL Recovery System

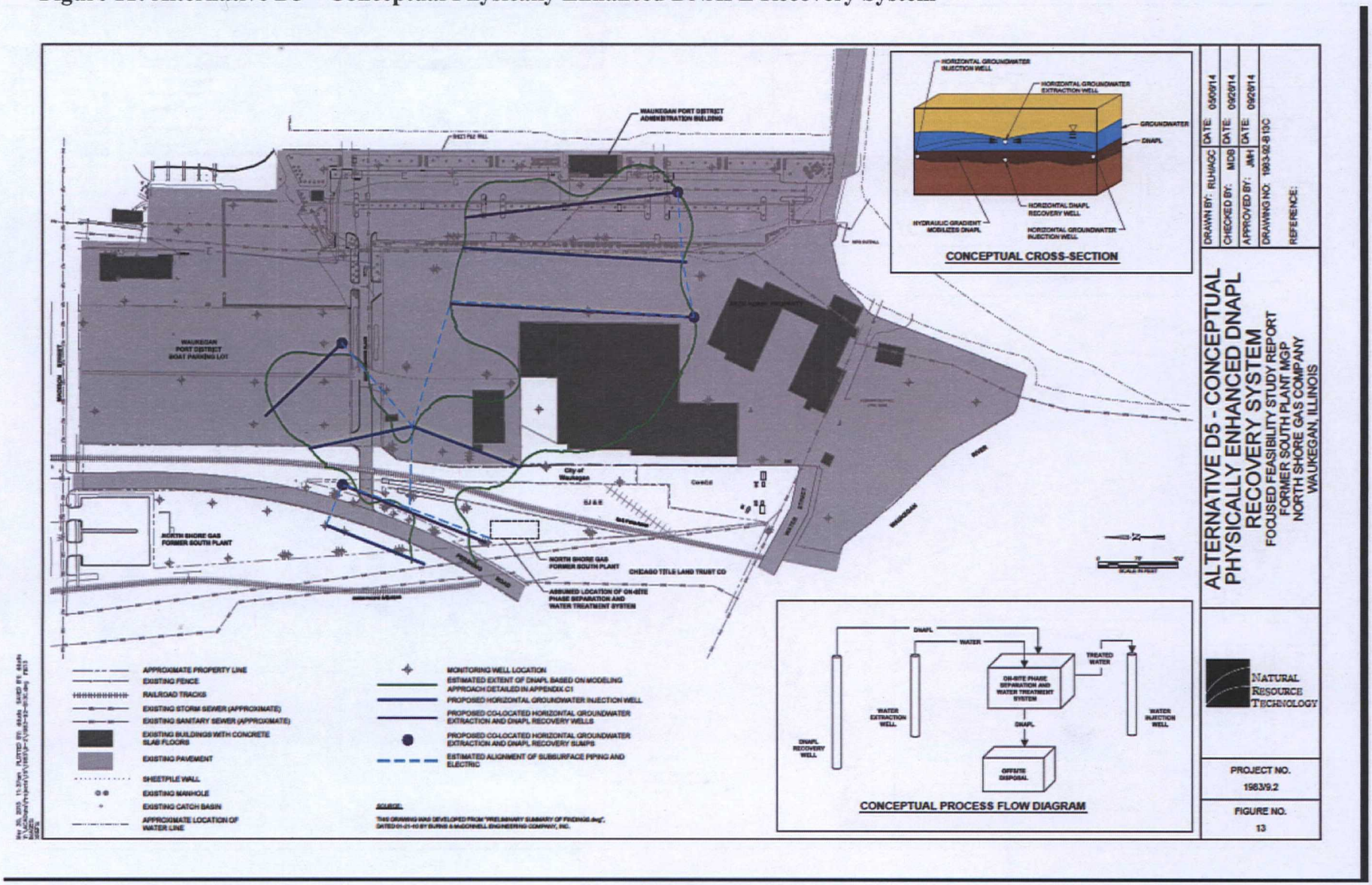


Figure 12: Alternative D6 – Conceptual Chemically Enhanced DNAPL Recovery System

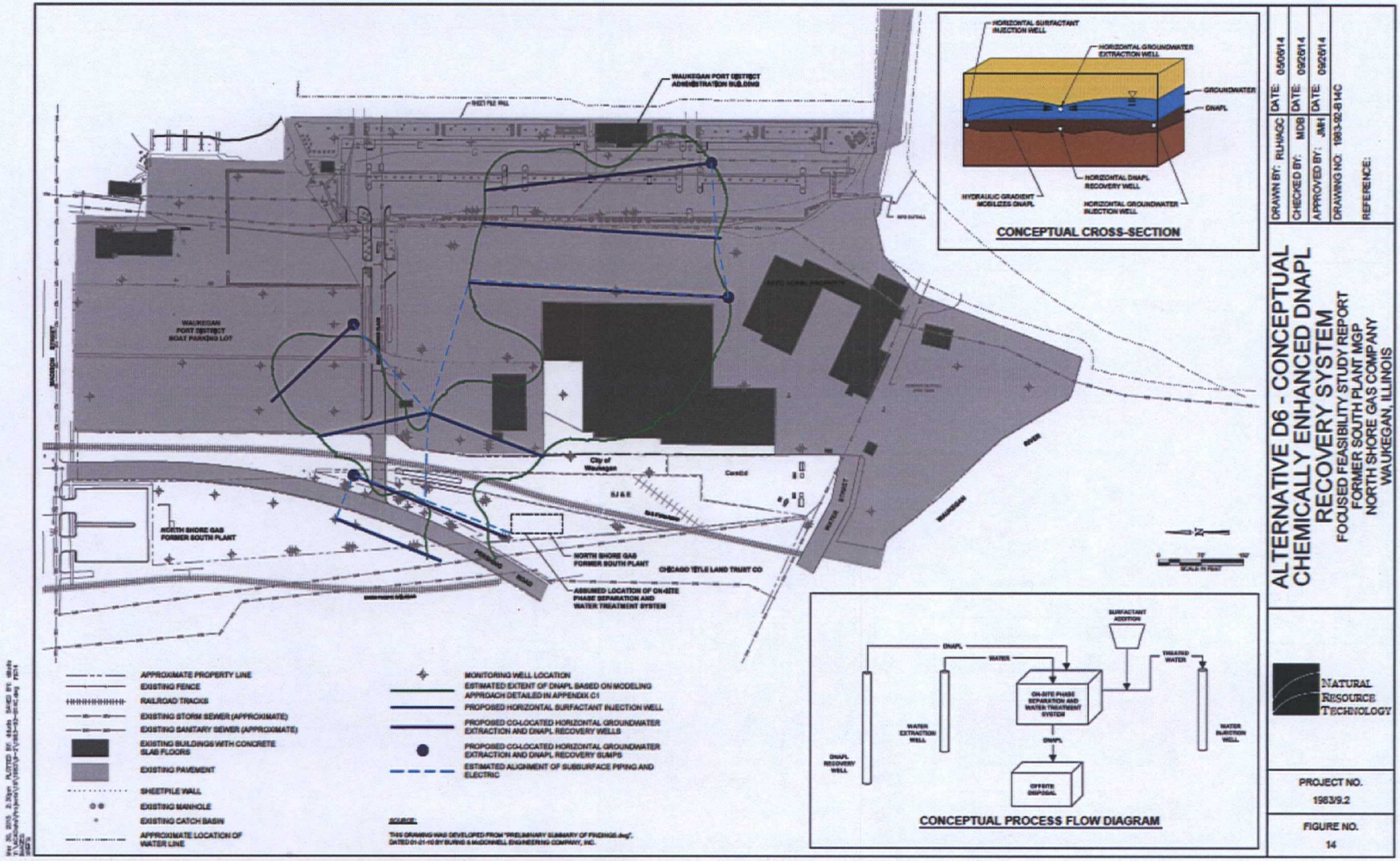


Figure 13: Alternative D7 – Conceptual Thermally Enhanced DNAPL Recovery System

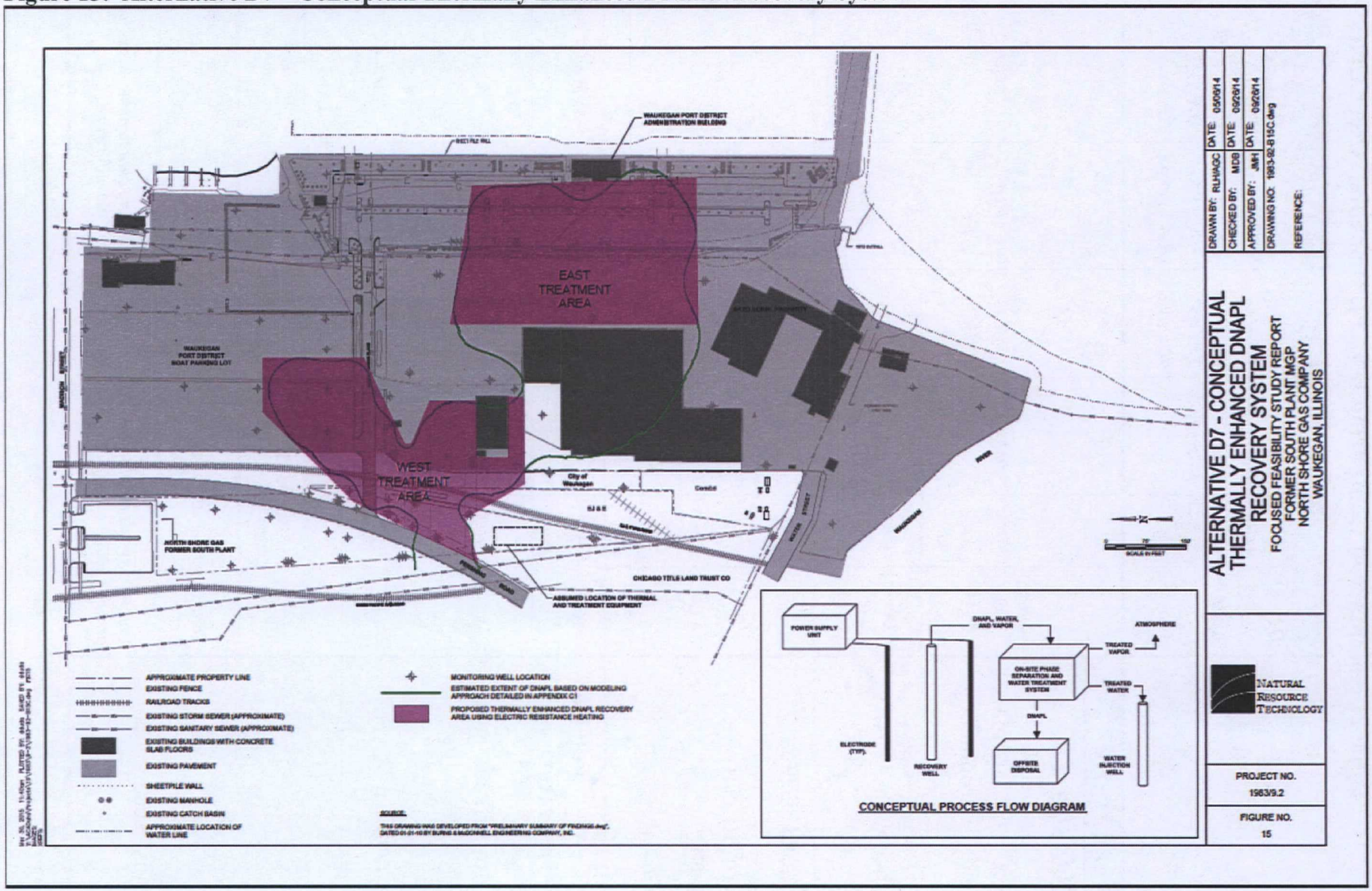


Table 2: Summary of Comparing DNAPL Remedial Alternatives

	DNAPL Remedial Options						
	D1- No Action	*D2 – ICs*	*D3 – Vertical Eng. Barrier*	*D4 – Horizontal Well DNAPL Recovery*	*D5 – Physically Enhanced DNAPL Recovery*	*D6 Chemically Enhanced DNAPL Recovery*	*D7- Thermally Enhanced DNAPL Recovery*
Evaluation Criteria							
Threshold Criteria							
Protection of human Health and Environment	*Does Not Meet*	*Meets*	*Meets*	*Meets*	*Meets*	*Meets*	*Meets*
Compliance with ARARs	*Does not Meet*	*Partially Meets*	*Partially Meets*	*Meets*	*Meets*	*Meets*	*Meets*
Balancing Criteria							
Long-Term Effectiveness and Permanence	*Does Not Meet*	*Partially Meets*	*Meets*	*Meets*	*Meets*	*Meets*	*Meets*
Reduction of Toxicity, Mobility, or Volume Through Treatment	*Does Not Meet*	*Does Not Meet*	*Does Not Meet*	*Meets*	*Meets*	*Meets*	*Meets*
Short-Term Effectiveness	*Meets*	*Meets*	*Meets*	*Meets*	*Meets*	*Meets*	*Meets*
Implementability	*N/A*	*Meets*	*Meets*	*Meets*	*Partially Meets*	*Partially Meets*	*Partially Meets*
Cost	*$50,000*	*$129,000*	*$13.4 million*	*$4.6 million*	*$10.6 million*	*$14.3 million*	*$33.8 million*
State Acceptance	***State concurs with selected remedy (Alternative D5)***						
Community Acceptance	***Community has no objection to selected remedy. Some commenters want cleanup to proceed without delay so redevelopment efforts can move forward.***						

Table 3 – Detailed Costs of Each DNAPL Alternative (using 7% discount rate)

Alternative	Total Capital Cost ($)	Duration of Operation (Years)	Total O&M Cost, No Discount Factor	Total Present Value Cost of O&M	Total Present Value Cost of Alternative
D1 – No Action	$ 0	0	$120,000	$50,000	$50,000
D2 – Institutional Control	$79,000	30	$120,000	$50,000	$129,000
D3 – Vertical Engineered Barrier	$3,684,000	30	$23,000,000	$9,614,000	$13,400,000
D4 – Horizontal Well DNAPL Recovery	$1,839,000	31	$7,000,000	$2,808,000	$4,647,000
D5 – Physically-Enhanced DNAPL Recovery	$4,446,000	8	$8,000,000	$6,130,000	$10,576,000
D6 – Chemically-Enhanced DNAPL Recovery	$8,845,000	4	$6,500,000	$5,490,000	$14,335,000
D7 – Thermally-Enhanced DNAPL Recovery	$26,968,000	4	$8,024,000	$6,800,000	$33,768,000

Table 4: Applicable or Relevant and Appropriate Requirements (ARARs) for DNAPL Remediation

Chemical-Specific ARARs/TBC

STANDARD, REQUIREMENT, CRITERIA, LIMITATION	CITATION	MEDIA	POTENTIAL ARAR / TBC	APPLICABLE REMEDIAL ALTERNATIVES	REQUIREMENT/COMMENTS
ILLINOIS					
Groundwater Quality Standards	415 ILCS 55, 35 Ill. Admin. Code (IAC) 620	Groundwater	Applicable	All	Establishes groundwater quality standards; Class I standards are equivalent to federal Safe Drinking Water Act Maximum Contaminant Levels
FEDERAL					
~ None Identified ~					

Location-Specific ARARs/TBC

STANDARD, REQUIREMENT, CRITERIA, LIMITATION	CITATION	MEDIA	POTENTIAL ARAR / TBC	APPLICABLE REMEDIAL ALTERNATIVES	REQUIREMENT/COMMENTS
ILLINOIS					
Illinois Endangered Species Protection Act	520 ILCS 10/3	Endangered/ threatened Species and habitat	Potentially Applicable	All	Establishes regulations limiting the possession transportation, or removal of endangered animals or plants.
Do Not Disturb Endangered Species	17 IAC 1075	Endangered/ threatened Species and habitat	Potentially Applicable	All	Establishes regulations limiting disturbance of rare and endangered species.
FEDERAL					
Endangered Species Act (ESA)	Species/habitat protection (50 C.F.R. Parts 17 and 402)	Endangered/ threatened Species and habitat	Potentially Applicable	All	Applies if threatened and/or endangered species are present in vicinity of site
Migratory Bird Treaty Act (MBTA)	16 U.S.C. §§703-712	Migratory species	Potentially Applicable	All	Requires protection of international migratory birds by ensuring that site activities do not unnecessarily affect migratory birds.

Action-Specific ARARs

STANDARD, REQUIREMENT, CRITERIA, LIMITATION	CITATION	MEDIA	POTENTIAL ARAR / TBC	POTENTIALLY APPLICABLE REMEDIAL ALTERNATIVES	REQUIREMENT/COMMENTS
ILLINOIS					
Effluent Standards	415 ILCS 5/13, 35 IAC 304	Surface Waters	Potentially Applicable	Potentially Applicable to Alternatives 3,5,6,7, if remedy involves surface water discharge	Establishes maximum concentrations of various contaminants that may be discharged to the waters of the State
Odors	415 ILCS 5/13, 35 IAC 245	Air	Relevant and Appropriate	Alternatives 3,4,5,6, & 7	Establishes procedures to determine the presence of of nuisance odor
Sound Emissions Standards and Limitations for Property Line Noise Sources	415 ILCS 5/13, 35 IAC 901	Noise	Relevant and Appropriate	Alternatives 3,4,5,6, & 7	Establishes limitations on the frequency and decibel of any property-line-noise-source
Uniform Environmental Covenants Act	765 ILCS 122	Soil and Groundwater	Applicable	Alternative 2	Establishes activity and use limitations means restrictions or obligations on real property resulting from impacts resulting from an environmental response project
Control of Organic Compound Emissions	415 ILCS 5/10, 35 IAC 218	Air	Relevant and Appropriate	Alternatives 3,4,5,6, & 7	Establishes standards and limitations for emissions of organic material and volatile organic material from stationary sources.
National Pollutant Discharge Elimination System (NPDES)	415 ILCS 5/13, 35 IAC 309	Surface Waters	Potentially Applicable	Potentially Applicable to Alternatives 3,5,6,7, if remedy involves surface water discharge	Regulates discharges to navigable waterways; applicable for point source discharges occurring during remedial action
Solid Waste Management	415 ILCS 5/22, 35 IAC 807-832	Solid Waste	Applicable	Alternatives 3,4,5,6, & 7	Applies generally to the storage, transportation and disposal of solid wastes; potential ARAR for management of media containing non-hazardous waste during remedial action
Air Quality Standards	415 ILCS 5/10, 35 IAC 212, 218, 243	Air	Relevant and Appropriate	Alternatives 3,4,5,6, & 7	Establishes air quality standards; potential ARAR for control of emissions or dust from management of contaminated media during remedial action

Table 4: Action-Specific ARARs (Cont'd)

STANDARD, REQUIREMENT, CRITERIA, LIMITATION	CITATION	MEDIA	POTENTIAL ARAR / TBC	POTENTIALLY APPLICABLE REMEDIAL ALTERNATIVES	REQUIREMENT/COMMENTS
Groundwater Protection Standards	415 ILCS 30, 77 IAC 920; 415 ILCS 55, 35 IAC 620	Groundwater	Applicable	Alternatives 3,4,5,6, & 7	ARAR for the design, construction, installation, abandonment and documentation of groundwater monitoring wells
RCRA and Underground Injection Control (UIC) Permit Program	35 IAC 702	Groundwater	Applicable	Alternatives,5,6, & 7	Applies to the procedure for obtaining permits required under the RCRA and UIC programs.
UIC Permit Program	35 IAC 704	Groundwater	Applicable	Alternatives,5,6, & 7	ARAR for the requirements of obtaining a UIC permit.
Procedures for Permit Issuance	35 IAC 705	Groundwater	Applicable	Alternatives,5,6, & 7	Applies to the procedure that IEPA must follow to issue RCRA and UIC permits.
UIC Operating Requirements	35 IAC 730	Groundwater	Applicable	Alternatives,5,6, & 7	ARAR for the technical criteria and standards for the UIC program.
Hazardous Waste Injection Restrictions	35 IAC 738	Groundwater	Applicable	Alternatives,5,6, & 7	Identifies hazardous wastes that are restricted from disposal into Class I injection wells and defines those circumstances under which a waste, otherwise prohibited from injection, may be injected.
		FEDERAL			
Clean Air Act (CAA)	Air Quality Standards (40 C.F.R. § 50)	Air	Relevant and Appropriate	Alternatives 3,4,5,6, & 7	Establishes federal standards for various pollutants from mobile construction/remediation sources
Clean Water Act (CWA) (Section 304)	Water quality standards (40 C.F.R. 21 131)	Surface Water	TBC	Potentially Applicable to Alternatives 3,5,6,7, if remedy involves surface water discharge	Federal WQS are ARARs for point source discharges where state has not adopted standards. Federal WQS are TBC for Wisconsin and Illinois as Wisconsin and Illinois have adopted WQS applicable to point source discharges from remedial action; refer to the Illinois ARARs.
CWA	National Pollutant Discharge Elimination System (NPDES)	Surface Waters	Potentially Applicable	Potentially Applicable to Alternatives 3,5,6,7, if remedy involves surface water discharge	ARAR for any wastewater discharge of treated groundwater during course of remediation; establishes criteria and standards for imposing treatment requirements in permits
RCRA	Municipal Solid Waste Landfills (40 C.F.R. Part 258)	Offsite land disposal non-hazardous waste	Applicable	Alternatives 3,4,5,6, & 7	Applicable to remedial actions that involve generation of non-hazardous waste minimum national criteria for management on non-hazardous waste

2.12 Selected Remedy

EPA selects Alternative D5 – Physically Enhanced DNAPL Recovery, to address the DNAPL contamination at the site (see Figure 7).

Description of the Selected Remedy

The selected remedy consists of the recovery of DNAPL using a co-located horizontal well system. One set of wells will be used to inject water into the ground to locally increase the hydraulic gradient, which will act to push the mobile DNAPL towards the recovery wells. The DNAPL will be collected and shipped off-site for thermal treatment and disposal.

Prior to being re-injected to the horizontal well system, any water collected with recovered DNAPL will be treated on-site to meet Illinois groundwater standards to the extent practicable.

2.13 Statutory Determinations

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the

maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following narrative discusses how the selected remedy meets these statutory requirements.

The selected remedy, Alternative D5 – Physically Enhanced DNAPL Recovery, is not designed to be the final remedial action at the site, but will be protective of human health and environment by removing DNAPL mass from the aquifer, thereby minimizing the potential for DNAPL-contaminated groundwater to migrate to Lake Michigan and the Waukegan River. Further, DNAPL recovery is expected to improve the quality of groundwater and soil vapor, enabling a suitable remedy to be selected for these media in a final ROD. Removal of DNAPL will also reduce potential exposures by future construction workers performing excavations at the site.

Alternative D5 will also comply with location and site-specific ARARs identified in the FFS (see Figure 11). Long-term effectiveness and permanence will be achieved by Alternative D5 by effectively and aggressively removing the recoverable portion of the DNAPL at a relatively short time period (8 years) and sending it off site for thermal treatment. Alternative D5 will be implementable because equipment and supplies are readily available for construction of the remedy. Alternative D5 will be short-term effective because construction time is of a short duration and workers and the community can be protected through standard safety measures. The estimated cost and time to complete remediation of DNAPL contamination at the site is as follows:

Estimated Capital Cost: $4,446,000
Estimated Total Annual O&M Costs: $6,130,000
Estimated Total Present Worth Cost: $10,576,000
Estimated Construction/Implementation Timeframe: 8 years

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review of the remedy's protectiveness will be conducted every five years after initiation of remedial action to ensure that the remedy remains protective of human health and the environment.

2.14 Documentation of Significant Changes

EPA's Proposed Plan for addressing DNAPL contamination at the site was released for public comment, via a fact sheet the Agency issued on May 6, 2015. A 30-day comment period from May 6 to June 5, 2015 was provided to the public to comment on EPA's Preferred Alternative, described in more detail in EPA's Proposed Plan dated April 29, 2015. An open house and public meeting was held in Waukegan, IL on May 20, 2015 to provide additional information and answer questions the public may have on EPA's Preferred Alternative. Electronic, written, and verbal comments were received by the Agency during the comment period and a responsiveness summary has been prepared to respond to these comments. The responsiveness summary is included in this document as Appendix A. EPA has determined that no significant changes to the preferred alternative in the Proposed Plan was necessary or appropriate.

Part 3 – Responsiveness Summary

Overview

In accordance with CERCLA Section 117, 42 U.S.C. Section 9617, EPA released the Proposed Plan and Administrative Record on May 6, 2015 and the public comment period ran through June 5, 2015, to allow interested parties to comment on the Proposed Plan. EPA held an open house/availability session and public meeting regarding the Proposed Plan on May 20, 2015 at the Lilac Cottage facility in Bowen Park, 1911 North Sheridan, Waukegan, Illinois. While 10-15 people attended the open house/availability session, only 2 stayed for the formal public meeting. Representatives from Illinois EPA and the potentially responsible party (Integrys), along with a Waukegan alderman, were among those that attended the meeting. A written transcript from the public meeting and the written comments received in entirety can be found in the Administrative Record.

EPA also participated in a Waukegan Harbor Citizens' Advisory Group (CAG) meeting on May 21, 2015 at the same location and provided an abbreviated version of what the agency presented during the May 20th public meeting. The CAG meeting was attended by the Illinois Department of Natural Resources (IDNR) and the same Waukegan alderman who was present during the public meeting.

This Responsiveness Summary provides both a summary of the public comments EPA received regarding the Proposed Plan and EPA's response to those comments. EPA received a small number of written, electronic, and verbal comments during the public comment period. Copies of comments received are included in the Administrative Record for the site. The Administrative Record index is attached as Appendix 2 to this ROD. EPA, in consultation with Illinois EPA, carefully considered all of the information in the Administrative Record prior to selecting the remedy documented in this ROD. Complete copies of the Proposed Plan, Administrative Record, and other pertinent documents are available at the Waukegan Public Library, 128 N. County Street, Waukegan, Illinois, as well the EPA Region 5 Superfund Division Records Center, 77 West Jackson Boulevard, 7th floor, Chicago, Illinois.

Comments received/EPA Responses

Comment:

"Please explain why the draft RI report submittal was delayed until 12/12 and its approval until 2014. I understand that the North Plant process is ahead in its schedule. Its RI report was approved in 3/12. Both plant investigations started at the same time with an AOC in 2007. I don't believe the public is served well by such a delay. Please explain the reasoning behind allowing Integrys to drag its feet."
Response:

EPA signed Administrative Orders on Consent (AOCs) in July 2007 and in October 2008 with Wisconsin Public Service Corporation, North Shore Gas, and Peoples Gas – recently Integrys and now WEC - to conduct a remedial investigation and feasibility study (RI/FS)

at 20 former MGP sites in Wisconsin and Illinois. These sites include seven sites in Wisconsin, 11 in Chicago, and two sites in Waukegan (South Plant and North Plant). Previously, the site owners addressed some contamination at some sites under the two states' voluntary cleanup programs. Illinois EPA conducted environmental inspections at the Waukegan South Plant MGP site starting in the early 1990s and North Shore Gas performed a response action there in 2003-2004 (with Illinois EPA oversight) to remove over 19,000 tons of contaminated soil from the site.

Under the AOCs, Integrys entered the 20 sites into EPA's Superfund Alternative (SA) site program so that the sites could be more quickly addressed as if they were on the Superfund National Priorities List (NPL), even though they are not actually on the NPL. Addressing the sites under the SA approach saves the time EPA needs to conduct a Superfund Site Inspection, perform a Hazard Ranking System scoring, and propose a site for inclusion on the NPL via the Federal Register and use it to evaluate the MGP sites sooner.

An integral part of the MGP site SA approach is addressing the "worst sites first." To this end, Integrys has agreed to conduct removal actions at several MGP sites to address free product found in the soil or in river sediment. Integrys has removed for off-site disposal over a million tons of contaminated soil from the Crawford Station MGP site in south Chicago, dredged river sediment from the Marinette and Two Rivers MGP sites in northeastern Wisconsin, and removed or stabilized in place tons of contaminated soil at the North Plant MGP site in Waukegan (in addition to the South Plant removal work mentioned above). Meanwhile, Integrys' contractors were taking soil, groundwater, and sediment samples at the MGP sites to assess site conditions and provide a guide for conducting the RIs at each site.

After the AOCs were signed, site planning documents and quality assurance documents for all the sites first needed to be written for EPA review and approval. After approval, Integrys began to collect data for the South Plant site RI in 2009 and generally completed all fieldwork by the end of 2011. The draft RI report was submitted to EPA for review in December 2012. EPA and the state provided a number of comments on the draft RI to Integrys, which then had to be rewritten, leading to final approval in January 2014. The time taken was necessary to ensure the RI was done properly and completely. The North Plant site has no RI report drafted as yet, so the South Plant site is ahead of it in terms of schedule.

Because the South Plant RI report noted a complex cleanup environment, EPA decided to focus on removal of the DNAPL at the site before evaluating and selecting a final soil and groundwater cleanup remedy. The DNAPL is considered a principal threat waste, so EPA's attention is currently on the safe, swift, and effective removal of the DNAPL from the site.

Comment:

"Please discuss if the different remedies have different cleanup co-benefits, e.g. would thermal enhanced recovery also reduce soil contamination?"

Response:

The four types of remedies evaluated to address dense, nonaquaeous phase liquid (DNAPL) at South Plant would likely have none to limited effects on soil contamination. The No Action alternative would not address the DNAPL or contaminated soil. Institutional controls alone could be effective at limiting human exposure, but do not treat or further contain any site contamination. The containment remedy evaluated in the Focused FS would contain the NAPL contamination underground, but not provide additional benefit with respect to soil contamination.

For the various DNAPL recovery methods, neither horizontal wells (alone) nor the water flooding method would likely address soil contamination. The surfactant and thermal recovery methods could address soil contamination, but probably not fully. Once the DNAPL remedy is in place, EPA and Integrys will be evaluating soil (and groundwater) remedies in a subsequent FS for South Plant.

Comment:

"Please explain why EPA states that "the public should not come on site" at the North Plant in your fact sheet, while big parts of the South Plant are publicly accessible. What is the difference? Please compare the amount of contamination at both sites and explain what public health threats those pose."

Response:

The North Plant site had MGP-related contaminants exposed at the surface (which were colloquially described as the "Waukegan Tar Pits" at some CAG meetings), which meant that people trespassing on the site might be exposed to PAHs and other contaminants. South Plant is publically accessible because some of the areas are paved or have buildings over them, which create a barrier to exposure. Also, North Shore Gas conducted a soil removal action in 2003-4 to address surface soil contaminants at South Plant. Thus, residual contaminants are not as accessible as they are at North Plant.

MGP contaminants may include polynuclear aromatic hydrocarbons (PAHs), BTEX (benzene, toluene, xylene, ethylbenzene), and heavy metals (arsenic). Some of the contaminants are carcinogenic (e.g. benzene, benzo(a)pyrene) and some are not. Dermal exposure, ingestion, and inhalation of these compounds could have short or long term toxic effects, depending on the intake amounts and duration, or long-term carcinogenic effects, again depending on the intake amounts and duration of exposures.

Comment:

"The turnout at the public meeting was very low. Please highlight what measures you will undertake to enhance public participation. I note here that the CAG on its website did not mention the meeting, nor did they update their website to include the May CAG agenda before the May CAG meeting which I understand you attended. Another opportunity lost."

Response:

EPA has put together an updated plan to involve the Waukegan community in Superfund matters. The plan is available in the information repository at the Waukegan Library. For South Plant, as with OMC, Johns-Manville, and others, EPA issues written updates from time to time and sometimes provides them in English and Spanish in an attempt to reach a wider audience. Spanish language fact sheets may be delivered to area churches for distribution. For South Plant, EPA issued a fact sheet announcing the proposed plan and start of a comment period to those on our site mailing list. EPA also held a daytime open house and an evening public meeting on May 20 as a means to reach a wider audience. All pertinent documents related to this action (e.g., RI report, DNAPL FFS, proposed plan, etc.) were made available in the site repository for public viewing.

EPA is often present at the Waukegan CAG monthly meetings, but we do not run the CAG, set its agenda, distribute its notices, or update its website. We will communicate your concern about the lack of communication about CAG activities to the CAG.

Comment:

"Do whatever is required to clean up the property. However, do not deny access or parking for access to the government lighthouse pier for the shore-bound fishing people who fish from that structure, and the many lakefront visitors who enjoy taking nightly evening strolls out to the lighthouse and back while enjoying an ice cream cone. These are all seasonal traditions in Waukegan. Thank you for asking for comments."

Response:

A work plan for designing and constructing the site remedy will be developed and access issues will be considered prior to actual work. While there is the possibility that access restrictions to the area described above may be necessary, the health and safety of people working at the site and/or using facilities near the site is a key determining factor what, if any, areas of the site will require some form of access control, if any. To this end, EPA will work with the responsible party to ensure the construction work will proceed in a safe and protective manner and limiting impact of the construction work on access to lakefront facilities, to the extent possible.

Comment:

"If using Plan D5 – How will products be moved "off site" and where will it end up?"

Response:

The recovered DNAPL will be transported by truck to a licensed RCRA treatment, storage, and disposal facility in Texas where it will be blended with similarly high-BTU liquids and burned as fuel in a local cement kiln.

Comment:

"What impact does the proposed plan have on any development activity at the harbor in the future?"

Response:

Addressing DNAPL will allow EPA to ultimately decide on a final remedy for the site. The cleaner the site becomes, the less restrictions will be required for future site property redevelopment.

Comment:

"Should a developer show interest in moving forward with the Master Plan developed in 2003 within the next 7 years, which calls for residential/mixed-use development, does this project or does the presence of contaminants preclude this area from any development activity during that time? Why or why not?"

Response:

As a matter of policy, EPA encourages the redevelopment of Superfund sites, which is a benefit to the community and surrounding area. Stakeholder discussions on redeveloping this site, such as recommendations in the city's 2003 Master Plan, may be useful to EPA as it makes a decision on the final cleanup plan.

Any potential site redevelopment before a final remedy is chosen and implemented, would have to be evaluated in coordination with EPA to assure that it would not hamper eventual full site cleanup. It is possible that redevelopment activity would need to be delayed or restructured in order to assure proper site cleanup.

Comment:

The following letter was received by EPA electronically on May 29, 2015:

integrys™

Integrys Business Support, LLC
700 North Adams Street
P.O. Box 19001
Green Bay, WI 54307-9001
www.integrysgroup.com

May 29, 2015

VIA E-MAIL: leon.heriberto@epa.gov

Heriberto León
Superfund Community Involvement Coordinator
US EPA Region 5
77 W. Jackson Blvd. (SI-7J)
Chicago, IL 60604-3590

Subject: North Shore Gas (NSG) South Plant Former MGP Public Comment

Dear Mr. León,

As you are aware, Integrys Business Support (Integrys), in support of North Shore Gas Company (NSG), has been working with the United States Environmental Protection Agency (USEPA) for nearly a decade to investigate the former "South Plant" manufactured gas plant site for the purpose of eventually cleaning it up.

In 2013, we summarized this environmental data and findings in a Remedial Investigation Report which was approved by USEPA in 2014. Based on the findings of the Remedial Investigation Report, Integrys/NSG was directed by USEPA to develop a Focused Feasibility Study to present cleanup options for the Dense Non Aqueous Phase Liquid (DNAPL) impacting the groundwater deep underneath South Plant site. Seven alternatives were presented in this report which was submitted to, and approved by USEPA in 2015. Three of these were the focus of multiple meetings between USEPA and Integrys:

D4 – Install horizontal extraction wells and pump out the DNAPL through these wells
D5 – Physically enhance the DNAPL recovery
D6 – Chemically enhance the DNAPL recovery

These alternatives were evaluated independently in the Focused Feasibility Study; however, the advantages of implementing these alternatives in a methodical manner were presented in the Study's Conclusion. In multiple meetings, Integrys/NSG strongly recommended to USEPA that a selected remedy should **first** start with D4, to remove as much as the DNAPL as practical, before moving to a more aggressive technology such as D5 or D6. Attached is a flowchart illustrating how our proposed staged remedial approach would work. We feel that this more methodical approach is less likely to cause unintended adverse environmental consequences.

Specifically, we have concerns that initiating the cleanup with the USEPA-proposed remedy of D5 (groundwater injection and DNAPL pumping) without first performing significant DNAPL removal (as proposed in D4) may actually exacerbate the situation. Our concern is that injecting groundwater could potentially push the DNAPL beyond its current extents into Lake Michigan and/or divide the one plume into multiple isolated plumes making further DNAPL remediation more difficult.

Given the lack of human exposure to this deep DNAPL, we do not feel the theoretical benefits of D5 outweigh the potential environmental risks of not first starting with D4. These concerns are described in more technical detail in the USEPA-approved Focused Feasibility Study. In addition, design and implementation of D4 is estimated to take one year less than design and implementation of D5, resulting in a more timely startup to DNAPL remediation activities.

Integrys/NSG strongly recommends that USEPA reconsider a more methodical approach as previously discussed. Regardless of USEPA's decision, we will continue our ongoing effort to clean-up the site and improve the natural environment.

If you have any questions, please do not hesitate to contact me at 920-433-2643.

Sincerely,

Brian F. Bartoszek, P.E.
Manager, Environmental Services Department
Integrys Business Support (providing support for North Shore Gas)

Response:

EPA acknowledges the concerns brought forth by Integrys related to immediately using Alternative D5 (the selected remedy) versus a staged approach that initially uses Alternative D4 and then moves forward using enhanced recovery methods. These concerns include pushing the DNAPL plume beyond its current boundaries and the possibility of dividing a single plume into multiple plumes, making remediation more difficult. To address these concerns, Integrys recommends a more methodical approach of starting with a less aggressive approach (Alternative D4) and then possibly moving to a more aggressive alternative (D5 or D6), making the decision to change based on a flowchart developed as part of the Focused FS (FFS).

However, EPA believes the selected remedy (Alternative D5) represents the best balance among the nine criteria. In particular, Alternative D4 alone had been estimated to take 31 years to complete, while Alternative D5 would only take 8 years to complete, a significant reduction in recovery time. Also, the FFS did note that the potential for the DNAPL plume to expand beyond its present boundaries under D5 can be minimized by placing the recovery wells at certain locations in the constructed well network. For these reasons, EPA has selected Alternative D5.

Appendix 1 - Illinois Environmental Protection Agency Concurrence Letter

Appendix 2 - Administrative Record Index

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR THE
NORTH SHORE GAS SOUTH PLANT SITE
WAUKEGAN, LAKE COUNTY, ILLINOIS

ORIGINAL
JANUARY 27, 2014
SEMS ID: 910536

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	910518	1/10/14	Kahler, J., and E. Kovatch, Natural Resource Technology, Inc.	del Rosario, R., U.S. EPA	Final Remedial Investigaiton Report	11353
2	467794	1/22/14	del Rosario, R., U.S. EPA	Prasad, N., Integrys Business Support	U.S. EPA Approval of Remedial Investigaiton Report	1

UPDATE 1
APRIL 14, 2015
SEMS ID: 915339

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	915337	2/25/15	Lake, P., IEPA	del Rosario, R., U.S. EPA	Letter re: Focused Feasibility Study Revision 1	3
2	915333	2/26/15	del Rosario, R., U.S. EPA	Prasad, N., Integrys Business Support	Letter re: Draft Focused Feasibility Study Report Revision 1 (Comments Attached)	6
3	915334	3/30/15	Byker, M., and J. Hagen, Natural Resource Technology, Inc.	del Rosario, R., U.S. EPA	Focused Feasibility Study Report Revision 2 (Cover Letter Attached)	158
4	915338	3/31/15	Lake, P., IEPA	del Rosario, R., U.S. EPA	Letter re: Focused Feasibility Study Revision 2	1
5	915335	4/9/15	Byker, M., Natural Resource Technology, Inc.	del Rosario, R., U.S. EPA	Email re: Revised Pages for NSG South Plant Focused Feasibility Study Report Revision 2	1

6	915336	4/9/15	del Rosario, R., U.S. EPA	Prasad, N., Integerys Business Solutions, LLC	Letter re: Draft Focused Feasibility Study Report Revision 2	1

UPDATE 2
APRIL 30, 2015
SEMS ID: 915350

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	915349	4/28/15	U.S. EPA	Public	Proposed Plan for DNAPL Cleanup	30

UPDATE 3
MAY 11, 2015
SEMS ID: 915359

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	915351	5/1/15	U.S. EPA	Public	Fact Sheet - EPA Proposes Cleanup Plan for Tar Pollution	8
2	915358	5/1/15	U.S. EPA	Public	Public Notice: Accepting Comments on the Cleanup Plan for Tar Pollution	1

UPDATE 4
MAY 12, 2015
SEMS ID: 915361

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	915360	5/6/15	CH2M	Lake County News-Sun	Tearsheet/Public Notice- U.S. EPA Accepting Comments on the Cleanup Plan for Tar Pollution	1

UPDATE 5
MAY 29, 2015
SEMS ID: 915372

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	915371	5/20/15	Jensen Litigation Solutions	U.S. EPA	Transcript of Public Meeting for Proposed Cleanup Plan	52