Proposed Plan **Date: May 16, 2016**

Town of Pines Superfund Alternative Site
Town of Pines, Porter County, Indiana

INTRODUCTION

The purpose of this Proposed Plan is to: (1) present background information about the Town of Pines Superfund Alternative Site (the Pines Site); (2) describe the various cleanup alternatives considered for addressing the contamination at the Pines site (3) identify U.S. Environmental Protection Agency's (EPA's) preferred cleanup alternative and explain the reasons for that preference; and (4) solicit public review of and comment on the various alternatives evaluated.

This document is issued by EPA, the lead agency for site activities, to meet the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) § 117(a) and the National Contingency Plan (NCP) § 300.430(f)(2). The Indiana Department of Environmental Management (IDEM) is the support agency. In developing this Proposed Plan, EPA has reviewed and considered information in the Administrative Record that provides additional detailed information about the site conditions. EPA will select a final remedy for the Pines site after reviewing and considering all information submitted during the 60-day[1] public comment period. EPA may modify the preferred alternative or select another response action presented in this Proposed Plan based on new information or public comments.

The public is encouraged to comment on this Proposed Plan. EPA will be accepting comments for 60 days from the issuance of this Proposed Plan. Members of the public are also encouraged to attend and participate in a public meeting at the Clarion Hotel at 5820 Franklin Street, Michigan City, Indiana on June 8, 2016, at 6:30 pm.

The Pines Site is located in and around Town of Pines, Indiana in Porter County, Indiana. It is just south of the Indiana Dunes National Lakeshore (IDNL) and a few miles west of Michigan City, Indiana. The Pines Site includes:

- a closed landfill referred to as Yard 520 (where coal ash was previously disposed),
- numerous locations in and around the Town of Pines (where coal ash was used as landscaping fill, road beds, and road surfaces), and
- a portion of the surficial aquifer[2] in and around the Town of Pines.

The cleanup plan proposed in this document is based on the findings from a Remedial Investigation and Feasibility Study (RI/FS) conducted in accordance with an Administrative

[1] The NCP, at 300.340 (f)(3)(i)(C), requires EPA provide a public comment period of not less than 30 calendar days. If a timely request is submitted, the public comment period is to be extended an additional 30 days. A timely request for an extended public comment period has been submitted, therefore, an extended 60-day public comment period is being provided.

[2] An aquifer refers to a body of water located in the spaces below ground. Surficial, in this case, refers to the uppermost (closest to the ground surface) aquifer.

Order on Consent (herein referred to as "AOC II") between EPA and Northern Indiana Public Service Company (NIPSCO), Brown, Inc., Ddalt Corp., and Bulk Transport Corp. (collectively referred to herein as "the Respondents"). The Respondents conducted RI/FS activities under the oversight of EPA and IDEM. Documents generated under the RI/FS are available in the Administrative Record (AR) and include a Remedial Investigation (RI) Report, a Human Health Risk Assessment, an Ecological Risk Assessment, and a Feasibility Study (FS) Report.

Upon review of the AR documents, EPA finds that exposures to contaminants within Yard 520 are currently effectively controlled due to compliance with IDEM's post-closure requirements put in place by the Respondents prior to the completion of this investigation. No additional remedial action is being proposed for Yard 520.

EPA is proposing the following soils cleanup plan for the coal ash fill in the area of the Pines site:

- continued investigation of properties to identify unacceptable risks due to placement of coal ash,
- subsequent excavation and off-site disposal of the coal ash, and
- repair of property with clean backfill.

EPA is proposing the following groundwater cleanup plan that includes:

- phytoremediation[3] of a portion of the surficial groundwater aquifer east of Yard 520,
- long-term groundwater monitoring to demonstrate the effectiveness of the remedy, and
- land use controls to legally restrict the installation of new drinking water wells in the areas where coal ash-derived contamination is present.

The final cleanup plan will be announced in local newspaper notices and presented in an EPA document called a Record of Decision (ROD). The final cleanup plan could differ from this Proposed Plan, depending on information or comments EPA receives during the public comment period; therefore, the public is encouraged to review and comment on all of the cleanup alternatives presented in this Proposed Plan.

Section 300.430(f) of the NCP requires EPA to issue this Proposed Plan for public comment. This Proposed Plan summarizes information that can be found in greater detail in the RI and FS Reports and other documents contained in the Administrative Record for this site. EPA and IDEM encourage the public to review these documents to gain a more comprehensive understanding of the site and Superfund activities that have been conducted at the site to date.

The supporting documents related to the proposed cleanup activities in this Proposed Plan can be found online or at either of the following locations:

- https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0508071

[3] Phytoremediation is the use of plants to remove contaminants.

- Michigan City Public Library (Reference Desk)
  100 E. 4th Street
  Michigan City, IN 46360
  (219) 873-3044

- EPA Records Center
  Region 5
  77 W. Jackson Blvd., 7th floor
  Chicago, IL 60604
  (312) 353-1063
  (Call for appointment)

THE PINES SITE BACKGROUND

The Pines Site Early History

Between 2000 and 2003, IDEM and EPA responded to homeowners' complaints of bad taste in the water from their private wells by conducting sampling in a portion of the Town of Pines. Some of these samples contained boron and molybdenum at concentrations above EPA's Removal Action Levels (RALs). These elevated concentrations in groundwater were suspected to be derived from the coal ash disposed of in Yard 520 and used as fill material throughout surrounding areas[4].

Yard 520 was owned by Ddalt, Corp. and operated by Brown, Inc. Materials accepted by Brown for disposal at Yard 520 were primarily[5] coal ash materials generated from the combustion of coal at NIPSCO's Michigan City Generating Station. In addition, at least one other company was involved in the transport of the coal ash to Yard 520: Bulk Transport Corp.

Yard 520 consists of two separate areas:

- The South area (a "Type III" landfill) which was constructed with a liner, spans approximately 10.5 acres, contains roughly 300,000 cubic yards of waste material and stopped receiving waste materials in the early 2000s.
- The North area (a "Type II" landfill) which was not constructed with a liner, spans approximately 27 acres, contains approximately 750,000 cubic yards of waste material, and stopped receiving waste materials in the mid-1980s.

For the purposes of this proposed plan, all further references to Yard 520 refer specifically to the North area as it is the source of the groundwater contamination associated with the landfill. A 2-foot thick compacted clay cap was installed on most of the North area in the mid-1990s, and in 2005 and 2006, the cap was extended to cover all wastes.

[4] Most of the concerning coal ash fill material was put in place in the 1970's.
[5] Less than 5 percent of the materials disposed of in this landfill consisted of construction and demolition waste as well as wastes generated from the steel making process.

Yard 520 is currently being managed under IDEM's post-closure requirements for landfills. This includes monitoring and maintaining the compacted clay cap and conducting semi-annual groundwater and surface water monitoring. As part of the post-closure process, IDEM approved an October 2013 report evaluating the landfill cap. This report determined that the compacted clay cap was adequately restricting infiltration of precipitation into the landfill.

2003 AOC I to Address Drinking Water

In response to the boron and molybdenum concentrations above the EPA RALs found in drinking water wells in the early 2000's, EPA reached a January 24, 2003 legal agreement with the Respondents (referred to as "AOC I") that required the Respondents to extend municipal water service from Michigan City to a portion of the residences in the Town of Pines. Under an April 5, 2004 amendment to AOC I, the Respondents agreed to extend municipal water service to a larger area serviced by private wells and to provide bottled water service to all residences within the designated investigation area that did not receive municipal water service.

During the municipal water service extension (MWSE), it was discovered that coal ash materials were used extensively throughout the Town of Pines. Road bed and some road surfaces were found to have coal ash and coal ash was found to have been used extensively as fill material, including landscaping fill.

2004 AOC II to Conduct RI/FS

In April 2004, EPA and the Respondents reached the legal agreement (AOC II) to conduct the RI/FS at the Pines Site under the Superfund Alternative Approach. The objectives of the RI were to determine the nature and extent of the contamination and to determine if additional cleanup measures are needed to protect the public and the environment from coal ash-related exposures. An RI report was issued on March 5, 2010, and a human health and an ecological risk assessment were issued in July 2012.

EPA held periodic public meetings about the progress of the Pines Site RI/FS, including meetings in January 2003, April 2004, April 2005, June 2007, March 2010, and September 2015. In April 2005, the Respondents reached an agreement for a technical assistance plan with the community group People in Need of Environmental Safety (P.I.N.E.S.). The agreement provides a mechanism for the Respondents to provide funding for P.I.N.E.S. to hire independent technical advisors to help interpret site related information and documents.

2016 Removal AOC to Address Coal Ash Fill

Sampling conducted later in the Remedial Investigation identified that fly ash (a type of coal ash) was used as landscaping fill in and around the Town of Pines, and some fill areas have concentrations of contaminants that present an unacceptable exposure risk to human health. Some contaminant concentrations are above Removal Management Levels. As a result, in March 2016, NIPSCO and EPA signed an Administrative Settlement Agreement and Order on Consent ("removal AOC") for NIPSCO to conduct time-critical removal work. Under the removal AOC,

NIPSCO agrees to identify areas where filled areas present unacceptable exposure risks, remove the coal ash materials, dispose of them properly off-site, and repair the property using clean fill materials. This proposed cleanup plan anticipates that this removal work will be incorporated into the final site cleanup plan.

THE PINES SITE CHARACTERISTICS

The Pines Site Location

The site "Area of Investigation" is illustrated in Figure 1 (also Figure 1 in the FS report) and Figure 2 (also Figure 2 in the FS report) below. The area is primarily in the Town of Pines, Porter County, Indiana, a predominantly residential area of several hundred homes. It is located immediately west of Michigan City, Indiana and approximately 4,500 feet (ft) south of the southern shore of Lake Michigan. The Indiana Dunes National Lakeshore (IDNL), managed by the National Park Service (NPS), is located between Lake Michigan and the Town of Pines. A small portion of the IDNL is included within the Area of Investigation.

Hydrology, Geology, and Hydrogeology

Groundwater is present beneath the Pines Site in the shallow surficial aquifer made up primarily of wind-blown sands associated with the current and former shores of Lake Michigan. The base of the surficial aquifer is formed by a clay confining unit. The surficial aquifer is thickest beneath upland dune areas, is thinner beneath low-lying wetlands areas between the dunes (such as the Great Marsh in the IDNL), and pinches out completely to the south against the silts and clays of the Valparaiso Moraine and/or lacustrine sediments of Glacial Lake Chicago. Regionally, groundwater is also present in deeper, confined aquifers in the area. The investigation focused primarily on the shallow, surficial groundwater aquifer because the coal ash has only affected this aquifer.

Groundwater characteristics in this shallow, surficial aquifer are typical of such aquifers. Groundwater in this aquifer occurs at depths ranging from near the ground surface (in wetland areas) to approximately 25 feet beneath upland dune areas. Groundwater flow is generally from the upland areas to Brown Ditch and its tributaries and wetlands located in the low-lying areas, including within the IDNL. In general, during both wet and dry periods, groundwater discharges to the Brown Ditch system (including associated tributaries and wetlands) throughout the Pines Site. A groundwater contour map is shown on Figure 3 (Figure 6 from the FS report). While there might be a few instances where this gradient is variable, these conditions are short-term and local and do not affect the overall groundwater flow.

Groundwater levels fluctuate approximately one to two feet seasonally, with water levels lower in the summer and fall, and higher in the winter and spring. Based on data collected during and after the RI, the hydraulic gradients and directions of groundwater flow do not change seasonally.

The hydraulic conductivity[6] of the surficial aquifer was tested during the RI (slug testing), and estimated values ranged from approximately 5 to 50 feet/day, with a geometric mean of 14.7 feet/day. This is consistent with the fine sands of the surficial aquifer. An average linear groundwater velocity of approximately 0.5 feet/day was calculated.

Nature and Extent of Contamination

All contamination associated with the site is from coal ash. In most of the site reports, coal ash is also referred to as coal combustion byproducts or CCBs. There are three types of coal ash relevant to the Pines Site based on how and where they are generated in the coal combustion process:

- Bottom ash settles to the bottom of the combustion chamber.
- Boiler slag accumulates on surfaces within the boiler and tends to be collected with the bottom ash.
- Fly ash is also generated in the combustion chamber, but it is lighter and finer than the bottom ash and boiler slag and so is transported in the flue gas. Some fly ash is captured by air pollution controls (e.g., electrostatic precipitators, baghouses, or mechanical collectors) and collected for off-site disposal.

Contaminant levels in fly ash are significantly higher than levels found in bottom ash and boiler slag. As such, fly ash is the primary source of the contaminants of concern associated with this site.

Yard 520

Coal ash is present in Yard 520 and is believed to be the primary source of groundwater contamination discussed below.

Fill Materials

During the excavation work associated with the MWSE, suspected coal ash was observed in roadbeds and other areas in certain portions of the Pines Site, including residential yards. Some of these fill materials pose an unacceptable risk and will be mitigated as a result of an ongoing removal action being conducted under the March 2016 removal AOC, which is proposed to be incorporated into the final cleanup plan in this Proposed Plan.

The majority of the coal ash observed during the MWSE is not the same as the coal ash present in Yard 520 nor the coal ash used as landscaping fill in residential yards in and around the Pines Site. The material observed during the MWSE included a large percentage of coarse grained material (larger than silt and clay), and the sidewalls of the trenches stayed upright during the utility work. In contrast, the material in Yard 520 was observed to be predominantly very fine grained, soupy or muddy, and would not stay upright on an open face. Based on descriptions from Brown Inc., the material brought to Yard 520 was a wet slurry which needed

[6] Hydraulic conductivity is a measure of the rate at which groundwater travels in the aquifer.

draining/dewatering. The observed differences indicated that the coal material in Yard 520 is primarily fly ash, while the suspected coal ash material along roadways consists primarily of bottom ash and/or boiler slag.

These different coal ash materials have different physical and chemical characteristics. Fly ash generally has higher concentrations of the contaminants of concern (COCs) for this site than do bottom ash or boiler slag, which has been demonstrated in comparisons of samples collected from Yard 520 and samples collected during the MWSE.

It was initially assumed that the types of coal ash used as landscaping fill were the same as those found along roadways during the MWSE. However, late RI investigative work revealed that the chemistry of the landscaping fill indicates it is primarily fly ash. This sampling, which involved compositing samples from discrete depths within some property quadrants, demonstrated that arsenic and thallium (Tl) concentrations were above removal management levels (RMLs).

Contaminant	RML	Highest Composited Quadrant Sample Result
Arsenic	67 ppm	888 ppm
Thallium	2.3 ppm	12.1 ppm

The full extent of coal ash fill materials in and around the Town of Pines is still not known. However, the investigation associated with the current removal action has revealed that several previously unidentified properties also contain coal ash fill materials. For these reasons, this plan proposes incorporation of the sampling and, where appropriate, abatement of additional properties in and around the Town of Pines not addressed by the removal action into the final remedial cleanup plan. These provisions would include the same process as prescribed by the approved removal work plan for residential soils which can be found in the Administrative Record for this site.

Groundwater

The groundwater contamination associated with this site above human health levels of concern is limited to very small areas of the surficial aquifer. Site background groundwater includes many minerals, typical of most natural fresh waters in the world. These include major ions such as calcium (Ca), magnesium (Mg), sodium (Na), silicon (Si), bicarbonate (HCO_3), sulfate (SO_4), chloride (Cl), and minor and trace elements such as aluminum (Al), barium (Ba), boron, manganese (Mn), strontium (Sr), and nitrate (NO_3). Based on RI sampling, background concentrations of boron and molybdenum in the surficial aquifer may be as high as 0.119 milligrams per liter (mg/L) and 0.012 mg/L, respectively. Background concentrations were determined by sampling monitoring wells upgradient of the site (i.e., wells not affected by the site-related contamination).

Coal ash-derived constituents in groundwater include boron, sulfate, calcium, magnesium, strontium, and molybdenum. Arsenic also appears to migrate from coal ash to groundwater but

data indicates that it has not transported any significant distance with the groundwater. Iron (Fe) and manganese may also have the potential to migrate from coal ash to groundwater, but their mobility in groundwater is controlled by redox conditions. Boron, molybdenum, sulfate, arsenic, iron, and manganese were present at concentrations above acceptable human health risk-based levels in one groundwater sample. Other constituents detected included selenium, chloride, and nitrate, but these are not likely to be coal ash-derived.

Migration of contaminants from coal ash to groundwater appears to occur where large volumes of coal ash is present, such as at Yard 520, and areas where suspected coal ash extends significantly beyond roadways. The relationship between the presence of suspected coal ash and boron in groundwater is shown in Figure 8 of the FS report.

Figure 5 is a map showing the monitoring wells associated with the Pines Site.

In at least one monitoring well location (MW111), elevated coal ash-derived groundwater contamination occurs in an area of known road sub-base and underlying road fill combined. Possible larger accumulations of coal ash adjacent to this well (to the east of Illinois Avenue) may also contribute to concentrations in groundwater, as well as locations upgradient of MW111 that have been found to have as much as seven feet of fill material.

Concentrations of boron, sulfate, calcium, magnesium, strontium, and molybdenum are elevated (i.e., above background levels,) at and immediately downgradient from Yard 520, but only three wells outside of the landfill's monitoring well network had coal ash-derived constituents above human health risk-based levels. This includes an area downgradient and to the east (MW122 with elevated boron), an area the north and east not affected by groundwater from Yard 520 (MW 106 with elevated molybdenum), and an area to the east not affected by groundwater from Yard 520 (MW111 with elevated arsenic).

Groundwater migrating from Yard 520 flows into Brown Ditch and its related tributaries and wetlands in the immediate vicinity of Yard 520, and the hydrogeologic studies performed as part of the RI have demonstrated that groundwater does not flow from Yard 520 to the south. The groundwater contamination in MW111 appears to be localized and not migrating to adjacent areas.

Coal ash-derived constituents in groundwater do not extend northward into the IDNL. Coal ash-derived constituents in groundwater do not appear to extend to areas where private water wells are located outside the area currently supplied by municipal drinking water.

Groundwater in the surficial aquifer beneath the Pines Site shows evidence of other possible sources of impact, including septic system discharges, road salt, and a municipal solid waste (MSW) landfill (i.e., a landfill other than Yard 520). Elevated concentrations of a number of non-coal ash-derived constituents, such as sodium, chloride, nitrate, ammonia (NH_4), and bacteriological parameters, were detected in many samples. In particular, the results of groundwater sampling from wells directly south of Yard 520 and Brown Ditch have shown possible MSW landfill impacts. The RI/FS attributes concentrations of boron in monitoring wells in this area to MSW landfill impacts, but the boron concentrations do not exceed Preliminary

Remediation Goals (PRGs). Iron and manganese are elevated in a number of wells, including from one background well (MW113), for reasons unrelated to coal ash. Natural levels of iron and manganese are common in groundwater in many areas of the country, including in northern Indiana, and are commonly the cause of unpleasant taste and appearance of well water.

For five years after completion of the RI sampling, the Respondents continued to sample a subset of monitoring wells to identify whether coal ash-derived constituents in groundwater are migrating farther northward. The data gathered during this monitoring demonstrates that the extent of coal ash-derived constituents in groundwater has not expanded northward. In fact, concentrations have decreased in some of the wells. For example, boron concentrations at MW101 and MW105 have decreased significantly since their maximum concentrations measured during the RI (from 1.79 mg/L to 0.322 mg/L in MW101 and from 2.02 mg/L to 0.0342 mg/L in MW105). MW110 and MW123 are the northernmost wells, located north of West Dunes Highway and upgradient from the IDNL. The concentration of boron in these wells has consistently remained low, indicating that coal ash-related constituents have not migrated to the IDNL. Furthermore, the hydraulic gradients in the Pines Site determined during the greater than 10 year period that such RI/FS data was gathered, indicate that coal ash contamination from the Pines Site migrates in a consistent pathway and does not migrate towards the IDNL. Table 8 of the FS report includes a summary of boron data from both pre and post-RI sampling, and the post-RI groundwater data are included in Appendix B3 of the FS Report. Also, Section 4.6.1 of the FS Report provides an updated and expanded discussion of the post-RI monitoring results.

In the spring of 2015, EPA required that the Respondents offer to sample and analyze all remaining private drinking water wells in the Pines Site at residences continuing to receive bottled water service provided by the Respondents under AOC I amended. The primary purpose of this sampling was to determine whether any coal ash-derived contaminants were present at levels exceeding the applicable drinking water standards. Additional constituents were also included in the analysis that could serve as indicators of other impacts to drinking water quality (e.g. septic systems). None of the samples from these private wells were found to have coal ash-derived contaminants above applicable drinking water standards. Other potential impacts were identified in certain wells, and the data were provided to well owners. However, these other impacts are not subject to this CERCLA action and will not be addressed in this proposed plan.

SCOPE AND ROLE OF PROPOSED CLEANUP ACTION

The remedy recommended by this proposed plan would address the small areas of groundwater contamination and would address any remaining contaminated fill materials placed throughout the site area that are not identified and addressed by the current Removal action.

SUMMARY OF PINES SITE RISKS

Human Health Risk Assessment

The Human Health Risk Assessment identified no unacceptable direct contact risk from the Yard 520 closed landfill source materials. Continued maintenance of the IDEM closure requirements will provide adequate human health protection into the future.

Currently, there is no unacceptable human exposure to groundwater contaminated by coal-ash derived constituents. The area groundwater has high levels of naturally occurring constituents, such as iron, and manganese and has likely been impacted by local septic systems and a nearby municipal landfill. There are three small areas of groundwater with site-related contaminants that exceed acceptable human health drinking water standards, were exposure to occur. One area, in and around MW106, is located north and east of Yard 520 in an area already provided with municipal water. A second area, in and around MW122, is located just east and downgradient of Yard 520 in an undeveloped wetland. The third area is further east of and not affected by groundwater from Yard 520 and is also in an undeveloped wetland area. The groundwater in the two undeveloped wetland areas presents an unacceptable future human health risk, should it be used for drinking.

There are various areas of the Town of Pines site that have fill with concentrations of contaminants that present an unacceptable risk to residential, recreational, and commercial/industrial receptors, as well as utility workers, if exposures were to occur. These areas present an unacceptable future human health risk and potentially an unacceptable current human health risk if the fill materials are at the surface or being disturbed at depth.

Ecological Risk Assessment

A Screening Ecological Risk Assessment (SERA) was conducted to evaluate the potential risks to ecological receptors posed by coal ash-derived constituents of potential ecological concern (COPECs) in environmental media within the Pines Site.

Potential ecological receptors and habitats within the Pines Site were characterized through assessment of available maps, historical information, existing field data, literature results, media concentrations, available biological inventories, regulatory agency information regarding sensitive species and habitats (e.g., threatened and endangered species), etc. A reconnaissance was conducted as part of the SERA to identify local biota and habitats to focus the ERA on areas of potential ecological habitat within the Pines Site and to provide context for the development of the site model. This assessment identified several potential aquatic exposure areas (Brown Ditch, open water pond habitats, and wetland areas associated with Brown Ditch), as well as terrestrial exposure areas where suspected coal ash or coal ash-derived constituents may be present.

The SERA was conducted using the maximum detected concentrations of constituents in sediment, surface water, and suspected coal ash samples collected from within the Pines Site. COPECs were selected based on comparison of media concentrations against established criteria or screening benchmarks, referred to as ecological screening values (ESVs), and an evaluation of consistency with background. COPECs were further evaluated in food web models designed to assess potential risks to wildlife receptors in aquatic and terrestrial habitats.

The IDNL is considered a significant regional ecological resource, so the evaluation of potential risks to receptors in the IDNL is discussed separately from the other aquatic exposure areas in the SERA.

Based on the results of the SERA, the available data indicate no or low potential for ecological risk to aquatic and terrestrial receptors within the Area of Investigation.

Conclusion

It is EPA's current judgment that the Preferred Alternatives identified in this Proposed Plan or other active measures considered in the Proposed Plan are necessary to protect public health or welfare or the environment from actual or threatened releases of pollutants or contaminants from this site that may present an imminent and substantial endangerment to public health or welfare.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are goals for protecting human health and the environment from risks associated with current or potential future exposures.

Based on the results of the HHRA as summarized above, there is future risk from exposure to site-related contaminants in groundwater immediately east of Yard 520. This is a small area of groundwater contamination close to, but above drinking water standards.

> **RAO 1:** Protect humans from unacceptable exposure to site-related COCs in groundwater.

The surficial aquifer in the Pines Site where suspected coal ash-contamination has been identified is classified as "drinking water class." The MWSE has been sufficient to protect residents from exposure to unacceptable levels of coal ash-derived constituents in groundwater and only a small area within the MWSE area has the potential for drinking water risk.

> **RAO 2:** Restore groundwater to drinking water standards and/or background levels (whichever is higher)[7] for site related COCs within a timeframe that is reasonable.

The following RAO is based on consideration of the PRGs for solid media.

> **RAO 3:** Protect humans from exposure to unacceptable concentrations of site-related COCs in contaminated fill areas.

PRELIMINARY REMEDIATION GOALS

The preliminary remediation goals (PRGs) are target clean-up concentrations that have been selected for coal ash-derived COCs. The PRGs are used during the analysis and selection of remedial alternatives in the FS and will serve as the basis for the remediation goals (RGs) selected in the final remedy selection. Appendix J of the FS report presents the derivation of the PRGs. The PRGs proposed in the FS comply with ARARs and support the RAOs described

[7] EPA cannot require the cleanup of material below background levels.

above. The PRGs are used to estimate the extent of soil and groundwater requiring remedial action, and to assess the effectiveness of the alternatives being evaluated.

PRGs for coal ash/coal ash-derived COCs in soil

Based on RAO 3, the PRGs for contaminants in coal ash fill present in soil at or near the ground surface are to be based on concentrations corresponding to EPA's target risk range or background concentrations, whichever is higher.

In making cleanup decisions, EPA assesses both cancer risks and non-cancer hazards. The likelihood of any kind of cancer resulting from exposure to carcinogens at a Superfund site is generally expressed as an upper bound of incremental probability, such as a "1 in 10,000 chance" (expressed in scientific notation as 1×10^{-4} or simply 10^{-4}). In other words, for every 10,000 people exposed to the Site contaminants under reasonable maximum exposure conditions, one extra cancer may occur as a result of Site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risk of cancer individuals face from other causes such as smoking or too much sun. The risk of cancer from other causes has been estimated to be as high as one in three.

The potential for non-cancer health effects is evaluated by comparing an exposure level over a specified time period (such as a lifetime) with a "reference dose" derived for a similar exposure period. A reference dose represents a level that is not expected to cause any harmful effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An $HQ < 1$ indicates that the dose from an individual contaminant is less than the reference dose, so non-cancer health effects are unlikely. The hazard index (HI) is generated by adding the HQs for all COCs that affect the same target organ (such as the liver). An $HI < 1$ indicates that, based on the sum of all HQs from different contaminants and exposure routes, non-cancer health effects from all contaminants are unlikely. An $HI > 1$ indicates that Site-related exposures may present a risk to human health. EPA's acceptable risk range is defined as a cancer risk range of 10^{-6} to 10^{-4} and an $HI < 1$. Generally, remedial action at a Site is warranted if cancer risks exceed 10^{-4} and/or if non-cancer hazards exceed an HI of 1.

The results of the soil testing conducted to date demonstrate that arsenic is the primary constituent requiring cleanup of soils. EPA proposes a PRG of 30.1 ppm for arsenic, which is the background threshold value (i.e., the upper level of the range of naturally occurring arsenic in the soil in this area). The range of concentrations representing EPA's acceptable cancer risk range of 10^{-6} to 10^{-4} is 0.8 ppm to 80 ppm, respectively. Based on IDEM guidance, the PRG would be set at the 10^{-5} cancer risk level, which is an arsenic concentration of 8 ppm. However, because the range of these values is lower or similar to the range of background levels, EPA is proposing to establish a PRG based on the upper end of the range of background values.

EPA proposes a PRG of 1.9 ppm for thallium. Similarly, the hazard quotient of 1 for thallium is associated with a concentration of 1.1 ppm; however, this too is below background concentrations. As a result, the proposed PRG for thallium is based on the background threshold value of 1.9 ppm.

EPA proposes a PRG of 400 ppm for lead which is based on the resulting soil concentration using default inputs for EPA's Integrated Exposure Uptake Biokinetic Model [8] to achieve a threshold of no more than a 5% chance of a child's blood lead level exceeding 10 µg/dL. It is also the Regional Screening Level (RSL) default value.

EPA proposes a PRG of 0.43 ppm for hexavalent chromium which is based on the human health risk-based concentration representing the 10^{-6} level for cancer risk.

PRGs for coal ash-derived COCs in groundwater

EPA's Safe Drinking Water Act maximum contaminant level (MCL) for arsenic in is 0.010 mg/l. This standard is considered relevant and appropriate for groundwater in the Pines Site so this is where EPA proposes to set the PRG.

There is no MCL for boron or molybdenum. However, EPA has established Regional Screening Levels (RSLs) based on the concentrations resulting in HQs of one. EPA proposes to set the PRG for boron and molybdenum at the RSLs:

- Boron = 4.0 mg/l
- Molybdenum = 0.1 mg/l

SUMMARY OF REMEDIAL ALTERNATIVES

The following is a summary of the array of remedial cleanup alternatives considered for selection. These are described in more detail in the FS report. The no action alternative was evaluated for each media, as required by the NCP, as it provides a basis of comparison. The evaluation of no action is based on the current baseline conditions, which include actions already taken by the Respondents in response to the potential threats posed by coal ash-derived contamination in the Pines Site (provision of municipal water and capping of the landfill).

Yard 520

Exposures from the Yard 520 landfill are controlled with the existing cap and usage restrictions conducted in accordance with IDEM's post-closure requirements. EPA is proposing no additional remedial action for Yard 520.

Soil Remedial Alternatives

The following soil remedial alternatives were evaluated.

1) Soil Alternative 1 – No Action

[8] https://www.epa.gov/superfund/lead-superfund-sites-software-and-users-manuals

No remedial activities would be implemented under this alternative. Inclusion of this alternative is required by the NCP and serves as a baseline against which all other alternatives are compared.

- Estimated Capital Cost[9] - $0
- Estimated 30-Year[10] Operation and Maintenance (O&M) Cost - $0
- Estimated Present Worth Cost - $0
- Estimated Construction Timeframe - Not Applicable (N/A)
- Estimated Time to Achieve RAOs – RAOs would not be met.

2) Soil Alternative 2 – Land Use Controls

This alternative includes implementation of land use controls in the form of restrictive covenants that would prohibit digging or other soil disturbances where coal ash-derived contaminants are present at concentrations above the PRGs.

- Estimated Capital Cost - $10,000
- Estimated 30-Year O&M Cost - $10,000
- Estimated Present Worth Cost - $13,000
- Estimated Construction Timeframe - N/A[11]
- Estimated Time to Achieve RAOs – RAOs would not be met on properties where contamination is at the surface. RAOs for other properties would be met in approximately one year.

3) Soil Alternative 3 – Excavation & Off-Site Disposal

This alternative includes outreach to gain access to all properties not addressed by the removal action and testing to determine if the properties are contaminated. Contaminated materials would be excavated and disposed of off-site. Sampling would be conducted at surface soil (0 - 6 inches below ground surface), near-surface soil (6 - 18 inches below ground surface), and/or subsurface soil (18 - 36 inches below ground surface). Soil with coal ash-derived contamination above PRGs would be excavated. Excavated soil would be replaced with clean soil backfill from an offsite source and graded to match the surrounding topography. If concentrations above PRGs extend beyond target excavation depths (36 inches), the soil backfill would serve as a direct-contact barrier, and restrictive covenants would be applied to mitigate potential exposure risks associated with any deeper contamination left in place. Excavated soils would be tested to determine disposal options and then transported via truck to an appropriate off-site disposal facility approved by EPA. It

[9] Supporting documentation for all cost estimates is provided in Appendix D of the FS report.
[10] The Respondents estimated the total O&M costs over a 30 year period so that the total costs for each alternative are more comparable. Typically, these costs are presented as annual costs, but several of the alternatives evaluated would not incur the same O&M costs each year.
[11] No construction is involved in this alternative. It could be implemented very quickly depending on the acceptance of the restrictions from property owners.

is expected that the excavated soils will meet requirements for disposal in a RCRA Subtitle D landfill (i.e., a standard, municipal solid waste landfill).

- Estimated Capital Cost - $7,956,000[12]
- Estimated 30-Year O&M Cost - $0
- Estimated Present Worth Cost - $7,956,000
- Estimated Construction Timeframe – Approximately one year[13]
- Estimated Time to Achieve RAOs - Approximately one year

Groundwater Remedial Alternatives

The following alternatives for groundwater were evaluated:

1) Groundwater Alternative 1 – No Action

No remedial activities would be implemented under this alternative. Inclusion of this alternative is required by the NCP and serves as a baseline against which all other alternatives are compared.

- Estimated Capital Cost - $0
- Estimated 30-Year O&M Cost - $0
- Estimated Present Worth Cost - $0
- Estimated Construction Timeframe - N/A
- Estimated Time to Achieve RAOs – RAOs would not be met.

2) Groundwater Alternative 2 – Land Use Controls

This alternative involves the implementation of a groundwater use restrictive ordinance or restrictive covenants in groundwater above cleanup levels, primarily the small areas east and north of Yard 520. This alternative would prohibit the use or installation of private drinking water wells on specific properties or within a designated groundwater management area. Groundwater is currently not used as a source of drinking water in these areas, and these restrictions would mitigate future use of the groundwater in this area as a drinking water source.

- Estimated Capital Cost - $697,000
- Estimated 30-Year O&M Cost - $644,000
- Estimated Present Worth Cost - $868,000
- Estimated Construction Timeframe - N/A

[12] This estimate is based on abatement of the 13 properties identified at the time of the writing of the FS report with elevated levels of coal ash-derived soil contamination about EPA's PRGs.

[13] EPA expects most of the applicable properties will be addressed by the concurrent removal action within one year. Additional properties identified subsequent to the removal action will be addressed on a case by case basis but actual time spent removing and replacing soil in a yard could be several days to several weeks.

- Estimated Time to Achieve RAOs – The groundwater restoration RAO would not be met. The RAO to prevent exposure to contaminated groundwater would be met in approximately one year.

3) Groundwater Alternative 3 – Long-Term Monitoring

This alternative includes the land use controls described in Groundwater Alternative 2 and adds long-term groundwater monitoring north and east of Yard 520. This remedial action would provide continued assessment of groundwater conditions to evaluate the protectiveness and appropriateness of response actions completed previously (MWSE and Yard 520 Closure). Selected monitoring wells within the MWSE Area and east of Yard 520 would be included, in addition to the wells monitored as part of the on-going groundwater monitoring conducted under the approved Post-Closure Plan for Yard 520. Additionally, this alternative includes monitoring upgradient of the IDNL to identify any future potential impacts to this area before they might occur.

- Estimated Capital Cost - $872,000[14]
- Estimated 30-Year O&M Cost - $3,930,000
- Estimated Present Worth Cost - $2,477,000
- Estimated Construction Timeframe - 0 - 6 months[15]
- Estimated Time to Achieve RAOs - The groundwater restoration RAO would not be met. The RAO to prevent exposure to contaminated groundwater would be met in approximately one year.[16]

4) Groundwater Alternative 4 – Phytoremediation

This alternative includes the land use controls and long-term monitoring described in Groundwater Alternatives 2 and 3. In addition, this alternative includes phytoremediation which uses specific plant species to intercept groundwater flow and remove contaminants via fixation, transpiration, and other processes. Appropriate plant species (most likely trees) are planted and maintained. Routine harvesting and disposal of biomass (such as leaves) may also be needed to control the potential reintroduction of retained contaminants. The layout evaluated is shown on Figure 19 of the FS report and focuses primarily on groundwater flowing to the east from the landfill towards monitoring well MW122, which is the only well outside of the landfill monitoring network consistently showing elevated levels of boron and the only area where site-related groundwater contamination has recently been migrating from Yard 520.

- Estimated Capital Cost - $1,305,000

[14] The cost estimates provided in the FS report and in this proposed plan include all facets of each alternative. In this instance, the estimated costs include both the costs of long-term monitoring and land use controls.
[15] Most monitoring wells needed are already installed such that sampling could begin right away. The installation of additional wells is expected to take several months.
[16] If natural processes are found to be reducing concentrations of coal ash-derived groundwater contamination, compliance with RAOs may eventually be possible with this remedy alone. However, there is insufficient evidence to make this determination at this time.

- Estimated 30-Year O&M Cost - $6,086,000
- Estimated Present Worth Cost - $3,660,000
- Estimated Construction Timeframe - 2-3 years before plants reach maturity
- Estimated Time to Achieve RAOs - The RAO to prevent exposure to contaminated groundwater would be met in approximately one year. The RAO to restore groundwater would be eventually be met, though it could take 20 or more years to achieve.[17]

5) Groundwater Alternative 5 – Barrier Wall

This alternative includes the land use controls and long-term monitoring described in Groundwater Alternatives 2 and 3. It also includes installation of a barrier wall (slurry wall) along the east side of the North Area of Yard 520, as shown on Figure 20 of the FS report. The slurry wall would be keyed (connected together to prevent groundwater flow) into the existing barrier wall of the South Area of Yard 520 and would be extended to the underlying low-permeability clay confining unit to control potential flow under the wall. Groundwater recovery from within the walled area would be performed via a french drain, as needed to control the potential for accumulation of groundwater behind the wall. The groundwater recovery system would be designed to control groundwater flow and mitigate the potential for inducing flow around the north end of the barrier wall. Recovered groundwater would be treated using an appropriate treatment process (adsorption/ion exchange, precipitation/flocculation, or reverse osmosis/membrane filtration). Treated water would then be discharged to groundwater or the surface/wetland in accordance with the appropriate permit requirements.

- Estimated Capital Cost - $7,004,000
- Estimated 30-Year O&M Cost - $21,549,000
- Estimated Present Worth Cost - $14,700,000
- Estimated Construction Timeframe - Approximately 1 year
- Estimated Time to Achieve RAOs – The RAO to prevent exposure to contaminated groundwater would be met in approximately one year. The RAO to restore groundwater would be eventually be met, though it could take 20 or more years to achieve.[18]

EVALUATION CRITERIA

This section summarizes the detailed analysis of the remedial alternatives. The NCP requires each alternative be evaluated under nine criteria found at 40 CFR 300.430(e)(9).

The nine evaluation criteria are further categorized into three groups: threshold criteria (2), balancing criteria (5), and modifying criteria (2).

[17] It is difficult to estimate this until the phytoremediation plants have reached maturity and the rate at which boron is migrating to this area at that time is known.
[18] Compliance with RAOs could happen very quickly, but it is not possible to estimate this until the rate of coal ash-derived contaminants continuing to leave the landfill is measured.

Threshold Criteria:

The two threshold criteria must be met for an alternative to be eligible for selection. If either of the threshold criteria is not met by an alternative, that alternative cannot be selected as the remedy. They are:

- Overall protection of human health and the environment

  Under this criterion, alternatives are evaluated to assess their adequacy in protecting human health and the environment from unacceptable risk posed by constituents at a site by eliminating, reducing, or controlling exposure levels. The overall assessment of protection draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

  Evaluation of the overall protectiveness of an alternative focuses on the degree to which an alternative eliminates, reduces, or controls site risks. This evaluation also allows for consideration of whether carrying out the alternative poses any unacceptable impacts.

- Compliance with ARARs

  This criterion assesses whether each alternative would attain compliance with applicable or relevant and appropriate requirements of federal and state environmental laws or if a waiver of the requirement is justified. ARARs are further characterized as chemical-specific, location-specific, and action-specific.

Balancing Criteria

The five primary balancing criteria weigh major tradeoffs among alternatives.

- Long-term effectiveness/permanence

  Under this criterion, the long-term effectiveness and permanence of the remedy after implementation is evaluated. The degree of certainty associated with the alternative's ability to prove successful is also included in this assessment. Factors considered in this assessment are the magnitude of residual risk remaining from untreated material and the adequacy and reliability of controls (e.g., containment systems, institutional controls).

- Reduction of toxicity, mobility, and volume through treatment

  This criterion is used to assess the remedy's ability to reduce the toxicity, mobility, and/or volume of contaminants through treatment or recycling. In addition, the quantities of contaminants that are permanently destroyed, immobilized, or otherwise treated are also evaluated. The degree to which the treatment may be irreversible and the nature and amount of treatment residuals (waste) are also considered.

The assessment of this criterion addresses the preference for selection of remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of COCs.

- Short-term effectiveness

This criterion is used to examine the effectiveness of alternatives in protecting the public, remediation workers, and the environment during construction and/or implementation of the remedy until the RAOs are achieved. The duration of remedial activities (i.e., the timeframe until remedial objectives are achieved) is also considered.

- Implementability

This criterion is used to evaluate the technical and administrative feasibility of implementing an alternative. The availability of personnel and equipment to implement the remedy is considered, as is the need for permits and the likelihood of obtaining regulatory approvals. Occupant acceptance is also considered.

- Cost

To evaluate this criterion, a detailed cost estimate is prepared for each alternative. The estimate includes both the capital and operational, maintenance, and monitoring costs for each alternative for reference and comparison.

The accuracy of the cost estimates provided for each alternative are between -30% and +50%. Additionally, the costs are presented in terms of "present worth," which allows the cost of remedial alternatives to be compared on an equal basis. A discount rate of 7% was applied to the annual cost estimates for operation, maintenance, and monitoring activities extending beyond one year. The cost estimates are summarized in Table 21 of the FS report, and supporting documentation for the costs is presented in Appendix D of the FS report. A remedy is considered cost effective if its costs are proportional to its overall effectiveness.

Modifying Criteria

The two modifying criteria are fully evaluated after the FS and proposed plan public comment period, though EPA tries to factor these into its selection of a proposed remedy to the extent these criteria are known. The two modifying criteria include:

- State acceptance

This criterion takes into consideration whether the state or support agency involved agrees with, opposes, or has no comment on the alternative. This criterion is addressed following state input on the FS and proposed plan.

- Community acceptance

This criterion includes an evaluation of whether the community supports, has reservations about, or opposes the alternative. This criterion is addressed following community input on the FS and proposed plan.

EVALUATION OF RETAINED REMEDIAL ALTERNATIVES

Individual Analysis of the Remedial Alternatives

Each of the nine evaluation criteria are discussed below with respect to the alternatives under consideration for this remedial action.

Soil Alternative 1 – No Action

Overall Protection of Human Health and the Environment

Soil Alternative 1 is not protective of human health and the environment at specific properties where coal ash-derived contaminants have been identified above the PRGs.

Compliance with ARARs

There are no ARARs that apply to the in place soil contamination.

Long-Term Effectiveness and Permanence

No remedial action is taken as part of this alternative; therefore, it would have no long-term effectiveness or permanence.

Reduction of Toxicity, Mobility, and Volume through Treatment

The No Action alternative will provide no reduction in the toxicity, mobility, or volume of coal ash-derived contaminants.

Short-Term Effectiveness

No action/construction is necessary for Soil Alternative 1, and as such, no additional risks to the community, workers, or the environment would result from implementation of this alternative.

Implementability

There are no constraints on implementation of Soil Alternative 1.

Costs

No actions are proposed; therefore, there are no costs associated with implementation of Soil Alternative 1.

Soil Alternative 2 – Land Use Controls

Overall Protection of Human Health and the Environment

Soil Alternative 2 would be protective of human health and the environment on properties where coal ash-derived contaminants are only present in concentrations above PRGs in soil already under a barrier, as it provides administrative controls to mitigate potential direct-contact exposure.

Soil Alternative 2 would not be protective on properties where coal ash-derived contaminants are present at concentrations above PRGs at depths where exposure could reasonably be expected to occur.

Compliance with ARARs

There are no ARARs that apply to the in place soil contamination.

Long-Term Effectiveness and Permanence

Soil Alternative 2 is effective and permanent in the long-term, provided that the institutional controls are maintained and enforced in the long term.

Reduction of Toxicity, Mobility, and Volume through Treatment

Soil Alternative 2 includes no treatment of contaminants and does not reduce toxicity, mobility, or volume of coal ash-derived COCs through treatment.

Short-Term Effectiveness

No additional action/construction is necessary for Soil Alternative 2, and as such, no short-term additional risk is posed to the community, workers, or the environment as a result of implementing this alternative. Soil Alternative 2 is effective immediately upon implementation.

Implementability

This alternative requires cooperation and acceptance of restrictive covenants by property owners and local government entities, where applicable. Negotiations with individual property owners could be difficult.

Costs

Costs for implementation of this alternative are dependent on the number of properties that are identified with concentrations of coal ash-related COCs above the PRGs and have existing barriers in place (e.g., an existing paved driveway). For preliminary assessment purposes, the cost associated with implementation at a single property, with an assumed “average” level of effort, was estimated. The estimated present-worth cost per typical property is $13,000. This

estimate includes nominal costs, which may include answering property-use questions or providing other, similar support, over a 30-year period. Compliance inspections and enforcement costs and maintenance costs are not included.

Soil Alternative 3 – Excavation & Off-Site Disposal

Overall Protection of Human Health and the Environment

Soil Alternative 3 is protective of human health and the environment as it eliminates or controls potential exposure to concentrations of coal ash-derived concentrations in soil above the PRGs.

Compliance with ARARs

Soil Alternative 3 complies with ARARs associated with the off-site disposal of contaminated soil.

Long-Term Effectiveness and Permanence

Soil Alternative 3 is effective and permanent. Contamination is identified and removed in residential yards to a depth of 36 inches. Where the soil cover and/or restrictive covenants are applied for contamination greater than 36 inches, this alternative is effective and permanent, provided that the institutional controls are maintained and enforced.

Reduction of Toxicity, Mobility, and Volume through Treatment

Soil Alternative 3 provides no reduction in contaminant toxicity, mobility, or volume through treatment. There is no practicable treatment of contaminants in coal ash-derived contaminated materials.

Short-Term Effectiveness

Soil Alternative 3 is effective in the short-term due to the relatively short duration of excavation and off-site disposal activities. Short-term risks to workers and the community would be increased during the remediation period due to the use of heavy equipment (excavators, loaders), increased truck traffic, and temporary access restrictions on properties. These risks are moderate and will be mitigated through the use of dust suppression, traffic management, and other health and safety controls. Risk reduction at remediated properties is immediate upon completion of yard cleanups.

Implementability

Soil Alterative 3 is easily implemented as soil excavation, offsite disposal of the excavated material, and backfill with clean material is straightforward. Securing the necessary access agreements and possible restrictive covenants on private properties could be challenging. The presence of mature trees, shallow utilities, septic systems, or other buried or surficial features may be a limiting factor. In some cases, materials may have to be left in place on a temporary or

permanent basis; however, no contaminated soils would be left in place such that the potential for direct contact exposure remains.

Costs

Costs for implementation of this alternative are dependent on the number of properties that are identified with concentrations of coal ash-derived contaminants above the PRGs, the depth of PRG exceedances, and property characteristics, such as current/anticipated use and degree of development. A cost estimate of $156 per cubic yard of soil removed was developed for the FS report. Based upon the volume of soil estimated for removal and the estimated unit cost this alternative is estimated to cost $5,569,000 to $11,934,000.

Groundwater Alternative 1 – No Action

Overall Protection of Human Health and the Environment

Because prior actions taken have eliminated exposure pathways, Groundwater Alternative 1 is currently protective of human health and the environment. However, the No Action alternative does not provide protection to human health and the environment for future risk of using the remaining contaminated groundwater.

Compliance with ARARs

The No Action alternative will not provide compliance with ARARs for the remaining areas of contaminated groundwater. Chemical-specific ARARs (Safe Drinking Water Act Maximum Contaminant Levels) would not be met throughout the Pines Site groundwater.

Long-Term Effectiveness and Permanence

The No Action alternative will have no effect on existing groundwater conditions and not be long-term effective or permanent.

Reduction of Toxicity, Mobility, and Volume through Treatment

The No Action alternative will provide no reduction in the toxicity, mobility, or volume of coal ash-derived contaminants through treatment.

Short-Term Effectiveness

No action/construction is necessary for Groundwater Alternative 1, and as such, no risks to the community, workers, or the environment would result from implementation of this alternative. As no action is taken, there are no short-term benefits associated with this alternative.

Implementability

There are no constraints on implementation of Groundwater Alternative 1.

Cost

There are no costs associated with this alternative.

Groundwater Alternative 2 – Land Use Controls

Overall Protection of Human Health and the Environment

Groundwater Alternative 2 provides administrative control over potential future exposure to coal ash-derived contaminants in groundwater where those concentrations in groundwater are above PRGs (e.g. near MW106, MW111, and MW122). Therefore, Groundwater Alternative 2 is protective of human health and the environment.

Compliance with ARARs

Alternative 2 would not provide compliance with ARARs for the remaining areas of contaminated groundwater. Chemical-specific ARARs (Safe Drinking Water Act Maximum Contaminant Levels) would not be met throughout the Pines Site groundwater.

Long-Term Effectiveness and Permanence

With diligent monitoring and enforcement, Groundwater Alternative 2 would be effective in restricting potential future groundwater use in areas where coal ash-derived contaminant concentrations in groundwater are above PRGs.

Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative would provide no reduction in the toxicity, mobility, or volume of coal ash-derived contaminants through treatment.

Short-Term Effectiveness

No action/construction is necessary for Groundwater Alternative 2, and as such, no risks to the community, workers, or the environment would result from implementation of this alternative. Protectiveness of this alternative is immediate upon implementation of the land use controls.

Implementability

This alternative requires implementation of a groundwater ordinance from the Town of Pines and/or other jurisdictional authority(ies) over the areas in which coal ash-derived contaminant concentrations in groundwater are above PRGs. If an ordinance cannot be implemented by the applicable jurisdictional authority(ies), restrictive covenants on privately and/or publicly owned properties, or property acquisition and application of restrictive covenants may be required to implement Groundwater Alternative 2. Negotiations with individual property owners could be difficult.

Cost

The estimated cost for Groundwater Alternative 2 is $7,000 per property, exclusive of any payment to property owners. If property acquisition is required to facilitate a groundwater-use restriction in the area east of Yard 520, the total estimated cost for Alternative 2 is $315,000 (14 acres at $22,500 per acre, including purchase and transaction fees[19]). The estimated present-worth cost for this alternative, assuming administrative groundwater-use controls on 30 properties and acquisition of the property east of Yard 520, is $868,000. This estimate is based on a 30-year operational (monitoring) time period.

Groundwater Alternative 3 – Long-Term Monitoring

Overall Protection of Human Health and the Environment

Groundwater Alternative 3 provides administrative control over potential future exposure to coal ash-derived contaminants in groundwater where those concentrations in groundwater are above PRGs (e.g., near MW106, MW111, and MW122). In addition, Alternative 3 would provide continued assessment of groundwater conditions and groundwater quality changes that may warrant changes in monitoring strategy or other actions. Groundwater Alternative 3 is protective of human health and the environment.

Compliance with ARARs

Alternative 3 would not provide compliance with ARARs for the remaining areas of contaminated groundwater. Chemical-specific ARARs (Safe Drinking Water Act Maximum Contaminant Levels) would not be met throughout the Pines Site groundwater.

Long-Term Effectiveness and Permanence

With diligent monitoring and enforcement, Groundwater Alternative 3 would be effective in restricting potential future groundwater use in areas where coal ash-derived contaminant concentrations in groundwater are above PRGs. Long-term monitoring and reporting provide for continued assessment of the effectiveness of this alternative.

Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative would provide no reduction in the toxicity, mobility, or volume of coal ash-derived contaminants through treatment.

Short-Term Effectiveness

No significant action/construction is necessary for Groundwater Alternative 3, and as such, no risks to the community, workers, or the environment would result from implementation of this alternative.

[19] These costs are estimates only and are not based on assessed property values.

Protectiveness of the land-use control component of this alternative is immediate upon implementation of the land use controls.

Implementability

Groundwater Alternative 3 includes monitoring groundwater within an existing well network, with the possible installation of a limited number of additional monitoring wells. Access agreements would be required for continued access to wells and other monitoring locations (for monitoring and maintenance). Additionally, a component of this alternative consists of implementing a groundwater ordinance or restrictive covenants on privately and/or publicly owned properties or property acquisition and application of restrictive covenants (see Groundwater Alternative 2).

Cost

The estimated present-worth cost for this alternative is $2,477,000. This estimate is based on a 30-year operational time period.

Groundwater Alternative 4 – Phytoremediation

Overall Protection of Human Health and the Environment

Groundwater Alternative 4 intercepts groundwater from Yard 520, removing boron via phytoextraction, and provides long-term monitoring of groundwater conditions to evaluate the effectiveness of the remedial actions. In addition, Groundwater Alternative 4 provides administrative controls over potential future exposure to coal ash-derived contaminants in groundwater where concentrations are above PRGs (e.g. near MW106, MW111, and MW122). Groundwater Alternative 4 is protective of human health and the environment.

Compliance with ARARs

Alternative 4 would comply with ARARs. Specifically, it would provide compliance with Chemical-specific ARARs (Safe Drinking Water Act Maximum Contaminant Levels) for the remaining areas of contaminated groundwater.

Implementation of this alternative would likely require modification of existing wetlands plant ecology and construction/grading within wetlands. Construction activities under this alternative would be conducted in a manner to mitigate potential impacts to fish and wildlife and minimize harm to the wetlands. This alternative would require adherence to the substantive requirements of the permitting process for location- and action-specific ARARs associated with wetlands (refer to Tables 5 and 6 in the FS report). It also would need to comply with the action-specific ARARs associated with the excavation, trenching, and disposal of soil for plant installation and biomass disposal.

Long-Term Effectiveness and Permanence

The phytoremediation component of Groundwater Alternative 4 would reduce concentrations of coal ash-derived contaminants in groundwater effectively and permanently.

Reduction of Toxicity, Mobility, and Volume through Treatment

Groundwater Alternative 4 reduces the mobility and volume of coal ash-derived contaminants in groundwater by concentrating contaminants in the plant biomass. Preliminary mass-reduction estimates were made based on the published performance of specific plant species, as discussed in Appendix H of the FS report.

Short-Term Effectiveness

Groundwater Alternative 4 is effective in the short-term due to the relatively short duration of planting activities. Short-term risks to workers and the community would be increased during the remediation period due to the use of some equipment and some increased truck traffic. Maintenance of the plants would present no/minor short-term risks, and would be mitigated through the use of standard health and safety practices.

Protectiveness of the land-use control component of this alternative is immediate upon implementation of the land use controls.

Implementability

The phytoremdiation portion of Alternative 4 could be implemented with standard, readily available planting practices. Seasonality inherent to the Pines Site may affect the health of young plant populations. Supplemental plantings may be required. Alternative 4 would require meeting the substantive requirements of the permitting process to modify existing wetlands and may require wetland mitigation.

The implementability considerations for the monitoring and land use controls components of Alternative 4 are discussed above.

Cost

The estimated present-worth cost for this alternative is $3,660,000. This estimate is based on a 30-year operational time period.

Groundwater Alternative 5 – Barrier Wall

Overall Protection of Human Health and the Environment

Groundwater Alternative 5 provides protection against potential migration of coal ash-derived constituents in groundwater from Yard 520 to the area east of Yard 520 or toward Brown Ditch via the treatment system. Additionally Groundwater Alternative 5 provides administrative

control over potential future exposure to coal ash-derived contaminants in groundwater where those concentrations in groundwater are above PRGs (e.g., near MW106, MW111, and MW122). Groundwater Alternative 5 is protective of human health and the environment.

Compliance with ARARs

Alternative 5 would comply with ARARs. It would provide compliance with chemical-specific ARARs (Safe Drinking Water Act Maximum Contaminant Levels) for the remaining areas of contaminated groundwater.

Implementation of a barrier wall would require construction/grading within wetlands. Construction activities would be conducted in a manner to mitigate impacts to fish and wildlife and minimize harm to the wetlands. This alternative would require adherence to the substantive requirements of the permitting process for location- and action-specific ARARs associated with wetlands (refer to Tables 5 and 6 of the FS report).

Groundwater recovered as a component of this alternative would be treated and managed in accordance with action-specific ARARs (refer to Table 6 in the FS report). However, treatment of boron in recovered groundwater would not be efficient (possibly as low as 25% or 45% removal efficiency – as referenced in the FS report), which may limit options for the ultimate disposition of the water. Treatability testing would be necessary to determine site-specific removal efficiencies and compliance with ARARs.

The barrier wall alternative would require off-site disposal of excess coal ash removed from the landfill during construction as well as residuals from groundwater treatment (e.g., flocculent material). This Alternative would comply with action-specific ARARs for the transportation and off-site disposal of this waste.

Finally, implementation of this alternative would require partial removal of the Yard 520 cap, which would be done in accordance with location- and action-specific ARARs associated with closure requirement of Yard 520 (refer to Section 3 of the FS report).

Long-Term Effectiveness and Permanence

A barrier wall would be a permanent remedy. It would effectively reduce the migration of coal ash-derived contaminants from Yard 520 and reduce concentrations of coal ash-derived contaminants in groundwater effectively and permanently.

Reduction of Toxicity, Mobility, and Volume through Treatment

Recovered groundwater would be treated using an appropriate treatment process (adsorption/ion exchange, precipitation/flocculation, or reverse osmosis/membrane filtration), which would reduce the mobility of groundwater contaminants through treatment.

Short-Term Effectiveness

Short-term risks during implementation of Groundwater Alternative 5 would include construction activities and increased potential for mobilization of coal ash-derived contaminants during construction (cap removal and grading/excavating activities). These risks could be managed with appropriate health and safety procedures.

Implementability

This alternative would be moderately difficult to implement due to the construction effort in proximity to the existing landfill and wetland areas. Activities associated with the construction would cause limited disruption to residents in the Town of Pines. Available water treatment technologies for boron are not efficient, therefore, if discharge criteria cannot be met, this alternative would not meet implementability requirements. Additionally, the presence of naturally-occurring inorganics (e.g., iron, manganese, arsenic) could likely impact system maintenance and operations cost for any of the treatment technologies.

Cost

The estimated present-worth cost for this alternative is $14,700,000. This estimate is based on a 30-year operational time period.

Comparative Analysis of the Remedial Alternatives

The comparative analysis of the soil and groundwater alternatives is described below and is also presented on Tables 22 and 23 of the FS report, respectively. Based on this analysis, the alternatives were scored with respect to seven of the NCP evaluation criteria. The alternatives were evaluated on the basis of whether they can be reasonably expected to meet the two threshold criteria. For primary balancing and additional criteria, the alternatives were scored on scale of 1 to 5, with lower values representing the less-advantageous alternatives and higher values representing the more-advantageous alternatives. The results of the scoring are provided in Tables 22 and 23 of the FS report and summarized in Section 9.3 of the FS report.

Soil Alternatives

Overall Protection of Human Health and the Environment

Soil Alternative 1, No Action and Soil Alternative 2, Land Use Controls are not fully protective. Soil Alternative 3 (Soil Excavation and Off-Site Disposal) is fully protective.

Compliance with ARARs

There are no ARARS that apply to Soil Alternative 1, No Action and Soil Alternative 2, Land Use Controls. Soil Alternative 3 would comply with location- and action-specific ARARs.

Long-Term Effectiveness and Permanence

Soil Alternative 3 (Excavation and Disposal) would be effective and permanent. Excavation and disposal activities result in full removal of soil from the top three feet of a property with contaminant concentrations above PRGs. Soil Alternative 2 (Land Use Controls) is effective and permanent where a surficial barrier is in place that can reasonably be expected to be maintained in compliance with the restriction terms (e.g., surface soil/landscaping remains in place, pavement is maintained). There is concern that some properties have contamination at the surface; thus, Soil Alternative 2 is not a long-term, effective, and permanent remedy. Further, land use controls are a less long-term, effective, and permanent remedy than removing contamination from properties.

Reduction of Toxicity, Mobility, or Volume through Treatment

None of the soil alternatives provide for treatment of the contaminants. There is no practical, cost-effective treatment for this type of contamination.

Short-term Effectiveness

Soil Alternative 1 (No Action) and Soil Alternative 2 (Land Use Controls) have no negative impact during implementation because only administrative actions would be taken. In contrast, Soil Alterative 3 (Soil Excavation and Off-Site Disposal) would have short-term impacts to workers, residents, and the community during excavation and off-site disposal activities. These potential impacts can be mitigated by implementing a project-specific health and safety plan, keeping excavation areas properly wetted (dust control), planning truck routes to minimize disturbances to the surrounding community, and other construction best-management practices. Risk reduction is immediate upon completion of the cleanup action.

Implementability

Land use controls in Alternative 2 and 3 will provide challenges associated with securing agreements from the local community and/or land owners for implementation, with Alternative 2 requiring more land use controls than Alternative 3. Soil Alternative 3 will have additional implementation challenges associated with excavation restrictions associated with properties that may contain mature trees, septic systems, shallow utilities, and other structures.

Cost

There are no costs associated with Soil Alternative 1 (No Action).

The estimated cost for Soil Alternative 2 is $13,000 present worth per property, with total present worth value at $169,000[20]. The estimated cost for Soil Alternative 3 is $5,569,000 to $11,934,000.

State and Community Acceptance

[20] At this time, 13 properties have been identified as needing these soil clean-up activities.

State and community acceptance will be evaluated more completely after the public comment period. To date, IDEM and community members have indicated a preference for Alternative 3.

Groundwater Alternatives

Overall Protection of Human Health and the Environment

All of the groundwater alternatives are currently protective of human health and the environment. Response actions already implemented (MWSE) have eliminated the groundwater exposure pathway. Alternative 1, the No Action Alternative is not protective in the long-term because it does not provide protection against future exposure to contaminated groundwater.

Compliance with ARARs

Groundwater Alternatives 1, 2, and 3 do not comply with ARARs as the groundwater is not restored to drinking water standards. Alternatives 3 and 4 comply with all ARARs.

Long-Term Effectiveness and Permanence

Alternative 1, the No Action Alternative, is not permanent nor protective in the long term. Alternatives 2 and 3 do provide long-term protectiveness but rely on administrative controls to provide protection, therefore, they are not as permanent as Alternatives 4 and 5. Groundwater Alternatives 4 and 5 propose measures to remove coal ash-derived contamination from groundwater. Groundwater Alternative 5 would require long-term operation.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 1, 2, and 3 provide for no reduction in toxicity, mobility, or volume of contaminants through treatment. Groundwater Alternatives 4 (Phytoremediation) and 5 (Barrier Wall) would result in coal ash-derived contaminant treatment to reduce the mobility and volume of the contaminants in the groundwater.

Short-term Effectiveness

Alternatives 1, 2, and 3 would present little/no negative impact to site workers, residents, and the Town of Pines community during implementation.

Alternative 4 would present some minor short term impacts to the community during implementation of the remedy as the vegetation is planted and maintained.

Groundwater Alternative 5 requires construction efforts, including partial removal of the landfill cap and excavation/grading of coal ash materials. These activities would result in increased risk of human exposure to coal ash, airborne particulate matter, increased mobility of coal ash-derived contaminants due to partial cap removal, and general disruption to the residents and infrastructure within the Town of Pines.

Implementability

There are no significant constraints on implementability for Groundwater Alternatives 1 through 3. Implementability considerations for Groundwater Alternatives 4 and 5 include the difficulties associated with construction on the closed landfill in proximity to US Highway 20, on privately-owned properties, in public rights-of-way, and in wetlands as well as the limitations of available technologies to treat boron in recovered groundwater to regulatory criteria (Alternative 5). These implementability issues are more significant with Groundwater Alternative 5 than Alternative 4.

Cost

Groundwater Alternative 1 (No Further Action) is the lowest cost option, with no associated costs. The most costly option is Groundwater Alternative 5 (Barrier Wall), with an estimated present worth cost of $14,700,000. Estimated total present worth costs for Groundwater Alternative 2 is $868,000, for Alternative 3 is $2,477,000, and for Alternative 4 is $3,660,000.

State and Community Acceptance

This will be evaluated more completely after the public comment period. At this time, IDEM has indicated support for selection of Groundwater Alternative 4. The community's acceptance of this alternative will be further evaluated after the public comment period associated with this Proposed Plan.

PREFERRED REMEDIAL ALTERNATIVES

Preferred Remedial Alternative for Soil

EPA is proposing to select Soil Alternative 3 which involves gaining access to residential yards to test for contamination followed by excavation down to 3 feet and off-site disposal of coal ash materials from yards where testing shows coal ash-derived contaminants above the remediation goals (PRGs). Excavated areas will be replaced with clean fill to match the existing grade and other conditions.

This action will also require the use of institutional controls (specifically a local ordinance and/or restrictive covenants) and a visual barrier on top of any contaminated material left at depth (3 feet or more below ground surface). These controls would serve to restrict digging or other disturbance of any coal ash materials left in place at depth.

The full extent of properties requiring soil remediation is unknown. This proposed remedy includes continued investigation to identify contaminated property. Outreach will be conducted to gain access to properties to conduct testing. Property owners may also request sampling.

These sampling and remediation procedures are currently documented in the removal AOC and removal work plan with the removal AOC Respondent (NIPSCO) leading this portion of the site clean-up.

This proposed soil remedial action would be protective of human health and the environment, fully complies with ARARs, and provides the best balance of the modifying evaluation criteria. This remedial action would be cost-effective and would use permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy would not meet the statutory preference for the selection of a remedy that involves treatment as a principal element because no cost-effective practical treatment is available for the contaminated fill materials.

Preferred Remedial Alternative for Groundwater

EPA is proposing to select Groundwater Alternative 4, which involves phytoremediation with long term monitoring and institutional controls. The phytoremediation plants would be located east of Yard 520, in the direction of groundwater flow. Coal ash-derived groundwater contaminants above PRGs have been detected in this area. The plants to be used are expected to be trees and will be selected based on their ability to uptake boron, the coal ash-derived contaminant found in MW122 which exceeds a PRG. The long term monitoring will provide data to measure the effectiveness of phytoremediation and continue to monitor site conditions.

The other wells located outside of the MWSE area and the Yard 520 monitoring network (MW111 and MW 106) show an exceedance of the PRG for arsenic and molybdenum, respectively, other contaminants associated with coal ash. This contamination is localized and not migrating. There are no drinking water wells near MW111 and MW106 is located in the area that has been provided with municipal water. This localized contamination will be monitored as long as the groundwater exceeds the arsenic and molybdenum PRGs. The proposed institutional controls (restrictive covenants prohibiting installation of new drinking water wells in these areas) will prevent human exposure to groundwater in these areas.

The other groundwater remedy retained for detailed evaluation that would be fully protective and would meet ARARs is Alternative 5 - installation of a barrier wall and groundwater pump and treat technologies. This alternative would be difficult to implement due to the disruption of the natural groundwater flow and temporary removal of the landfill cover required for installation and operation. In addition, the remedy may not reliably treat the boron contamination in the groundwater. Further, the estimated cost of Alternative 5 is over three times the estimated cost of the recommended alternative, Alternative 4.

The proposed groundwater remedial action, Alternative 4, would be protective of human health and the environment, complies with ARARs, and provides the best balance of the modifying evaluation criteria. This remedial action would be cost-effective and would use permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy meets the statutory preference for the selection of a remedy that involves treatment as a principal element through the phytoremediation treatment of contaminated groundwater.

IDEM has indicated concurrence with the selection of Groundwater Alternative 4.

Ecological Monitoring

As part of the long-term monitoring strategy for the site, EPA proposes that parameters such as concentrations of coal ash-derived contaminants in surface water, sediments, and, as needed, in local biota be monitored to ensure that ecological habitats are not adversely affected by site contamination. EPA proposes that this strategy be especially focused on protection of the IDNL.

COMMUNITY PARTICIPATION

EPA, in consultation with IDEM, will evaluate public reaction to the preferred cleanup alternatives during the public comment period before deciding on final soil and groundwater cleanup actions. Based on new information or public comments, EPA may modify its preferred alternative or choose another. EPA encourages the public to review and comment on all of the cleanup alternatives.

EPA will respond in writing to all significant comments in a Responsiveness Summary which will be part of the final decision document called the Record of Decision. EPA will announce the selected cleanup alternative in local newspaper advertisements and will place a copy of the Record of Decision online and in a publically accessible local facility.

FIGURES

Figure 1 – Town of Pines Area of Investigation

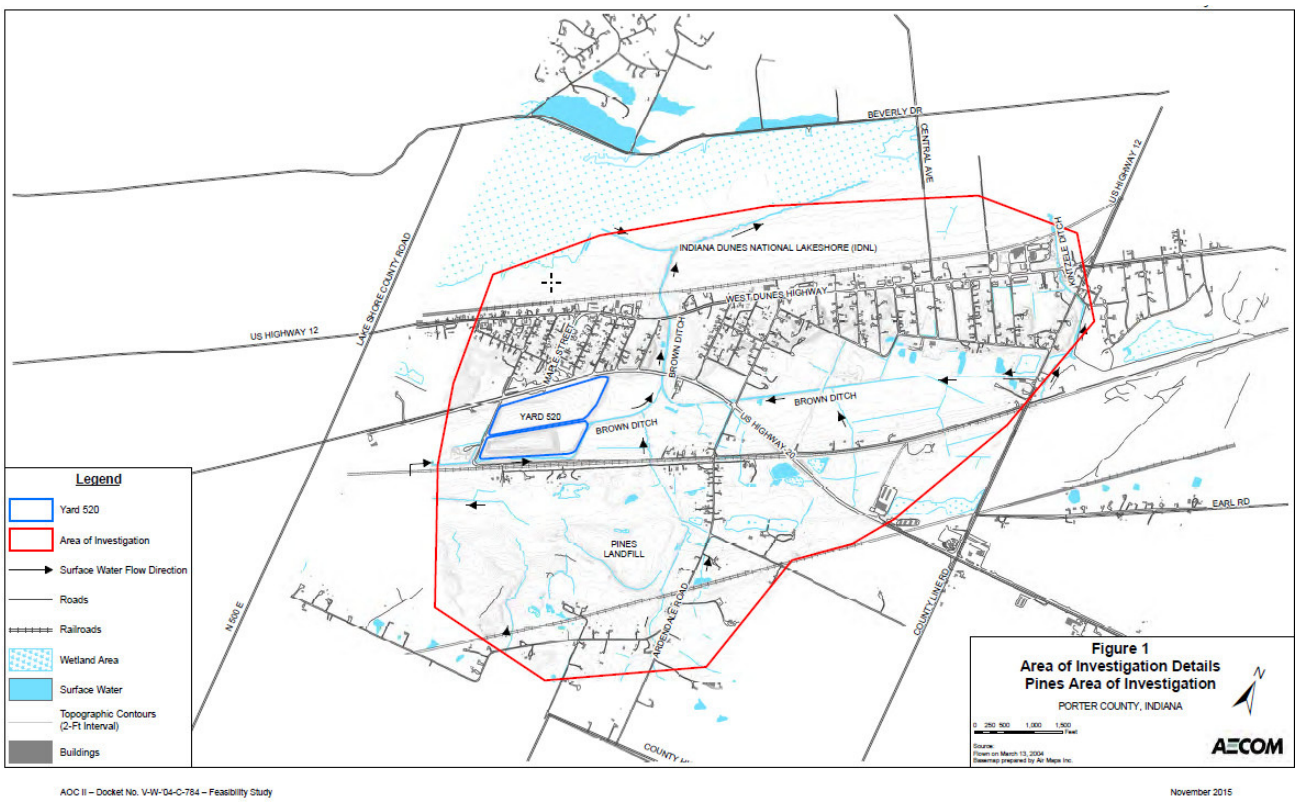

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Figure 2 – USGS Topographic Map Showing the Area of Investigation

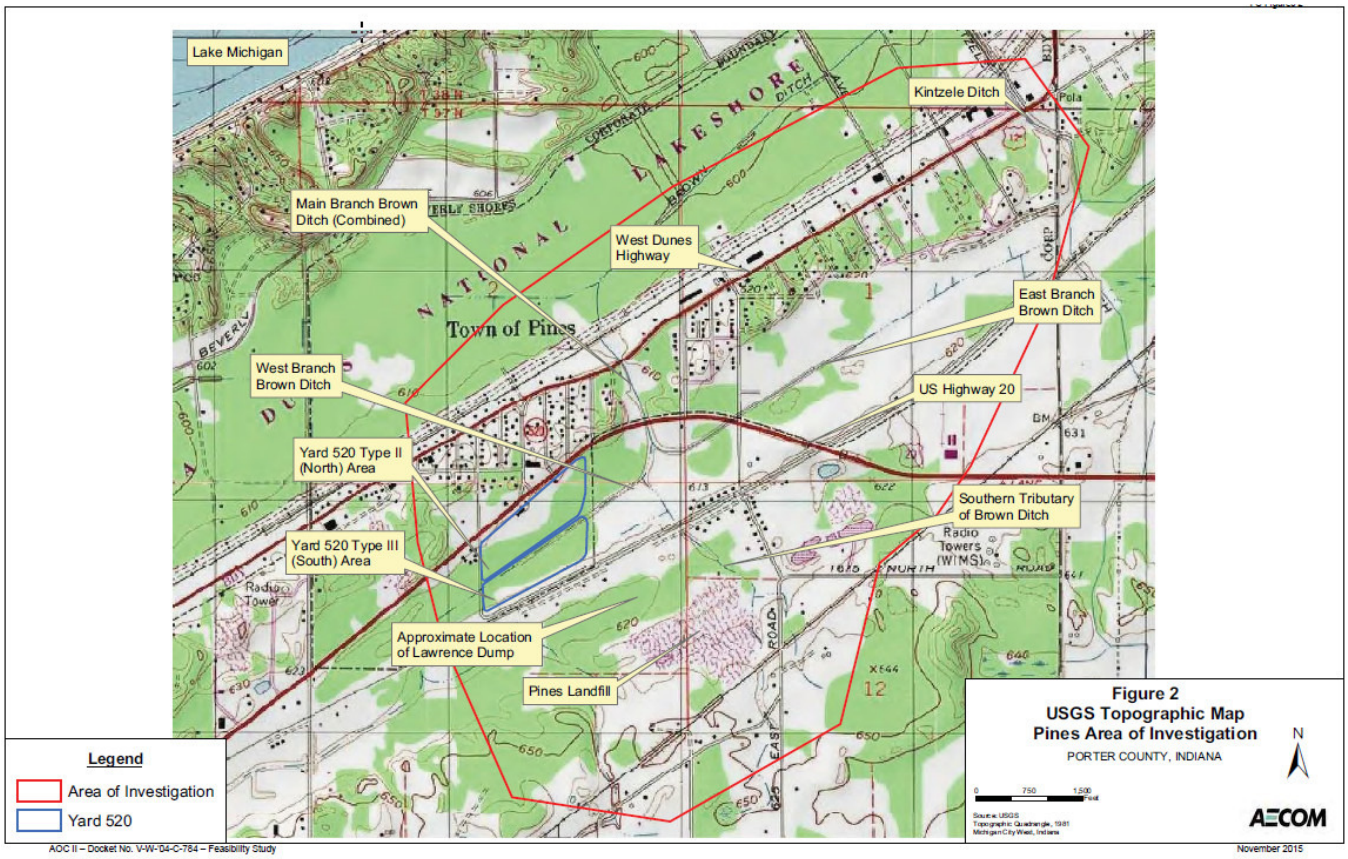

Figure 3 – Groundwater Contour Map for Pines Area of Investigation

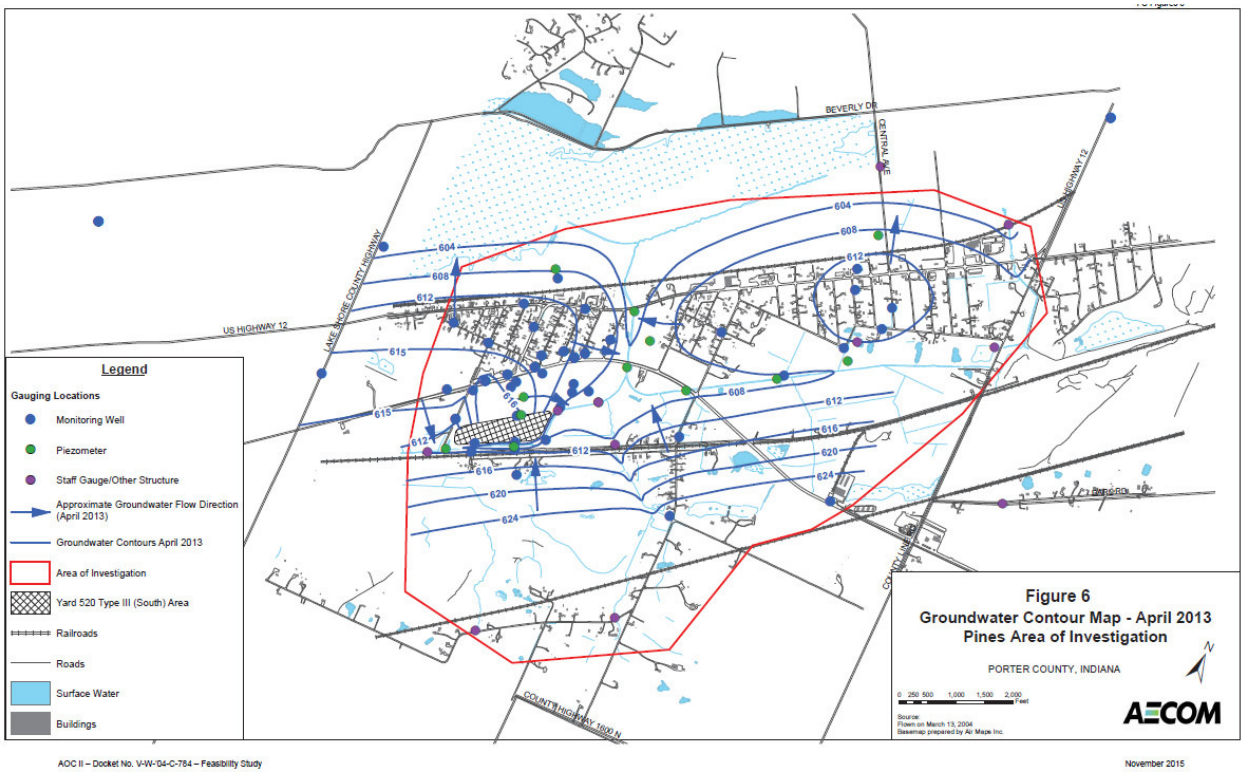

Figure 4 – Area of Investigation and Areas Provided Municipal and Bottled Water

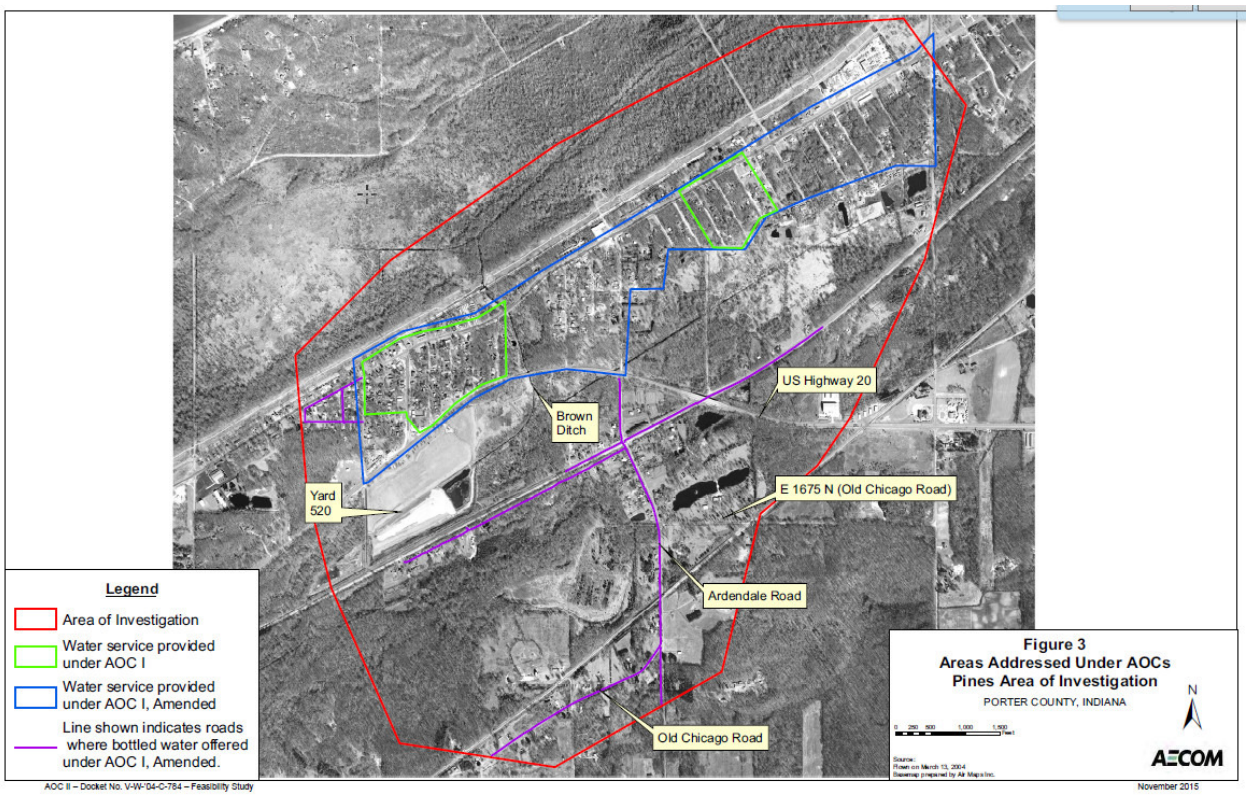

Figure 5 – Map of Monitoring Wells Associated with the Pines Site