UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

# INTERIM RECORD OF DECISION

## Ottawa Township Flat Glass Superfund Site

La Salle County, Illinois

Selected Remedial Alternative for the "Source Areas and Groundwater South of the Illinois River" Operable Unit (OU 3)

September 2010

Cover photo credit: Pilkington North America, Inc. (Hull and Associates, Inc.)

This aerial photo shows the northern portion of the Ottawa Township Flat Glass site, formerly known as the "Libbey-Owens-Ford (LOF) Plants 5 & 7" site, in La Salle County, Illinois. North is at the top of the frame. The flat glass manufacturing facility, now owned by Pilkington North America, Inc. (PNA), is located in the center of the image (PNA-owned property is outlined in red). The Village of Naplate is located immediately north of the plant. U.S. Silica's sand quarries can be seen to the west and north of the facility and the Illinois River is south of the plant. A site feature known as the "Original Sand Pond" (OSP) is shown outlined in yellow on the PNA property. The OSP is an area where flat glass manufacturing process wastes containing arsenic were stored and/or disposed of by LOF and other past site operators prior to 1970.

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## DECLARATION

Selected Remedial Alternative for the
**"Source Areas and Groundwater South of the Illinois River" Operable Unit (OU 3)**

### Site Name and Location

Ottawa Township Flat Glass (OTFG) site, La Salle County, Illinois

CERCLIS identification number: ILD005468616

The "Source Areas and Groundwater South of Illinois River" operable unit (OU) is the third of four operable units at the OTFG site.

The OTFG site is also known as the "Libbey-Owens-Ford Plants 5&7" site.

### Statement of Basis and Purpose

This decision document presents the selected interim remedial action for the "Source Areas and Groundwater South of the Illinois River" operable unit (OU 3) of the OTFG site in La Salle County, Illinois. The U.S. Environmental Protection Agency (EPA) [1] chose the remedy in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. This decision is based on the Administrative Record for the OTFG site.

### Assessment of the Site

The response action selected in this Interim Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from the actual or threatened release of hazardous substances, pollutants, or contaminants into the environment.

### Description of the Selected Remedy

EPA selects the following interim remedial action tasks for OU 3 of the OTFG site:

- Conduct drainage pathway modifications around Quarry 1 and Quarry 2 to redirect storm water flow away from the quarries;
- Place institutional controls on certain area properties to prevent future redevelopment for residential use and/or to prevent future potable use of contaminated groundwater;

[1] See State Concurrence section, below.

- Provide municipal water to properties with private wells penetrating the contaminated portion of the St. Peter Sandstone aquifer (and provide delivered bottled water until the municipal water line extension is complete); and
- Monitor groundwater quality over time.

Note: This ROD does not address the "Source Areas and Groundwater North of the Illinois River" operable unit (OU 4) of the OTFG site, nor is it a final remedy for OU 3. EPA will address OU 4 and finalize the remedy for OU 3 in a subsequent ROD for the OTFG site.

**Future Use Considerations**

Implementation of the selected interim remedial action will require use-restrictions (in the form of institutional controls) to be placed on certain area properties, which will restrict the future use of arsenic-contaminated groundwater as a potential drinking water source and/or prevent the redevelopment of the land for residential use. The use-restrictions will likely remain for a long period of time. Thus, the interim remedial action will not allow for unlimited use or unlimited exposure at OU 3.

**Statutory Determinations**

EPA has determined that for OU 3, an interim remedial action is necessary to protect public health or welfare or the environment until a final cleanup approach is selected. This interim action: is protective of human health and the environment in the short term and is intended to provide adequate protection until a final ROD is signed; complies with or waives those federal and state requirements that are applicable or relevant and appropriate for this limited-scope action; and is cost effective.

This action is an interim solution only, and is not intended to utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable for OU 3. Because this action does not constitute the final remedy for OU 3, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal component will be fully addressed by the final response action. Subsequent actions will fully address the potential health threats posed by the site.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, EPA will conduct a review to ensure that the remedy continues to provide adequate protection of human health and the environment every five years after commencement of the remedial action. Because this is an Interim ROD, review of this site and remedy will be ongoing as EPA continues to develop remedial alternatives for the remaining contamination on-site.

**ROD Data Certification Checklist**

EPA has included the following information in the Decision Summary section of this Interim ROD; more detailed site information is included in the Administrative Record for OU 3 (see page viii):

- The chemical of concern (see page 17);
- Baseline risks represented by the chemical of concern (see pages 22-23);
- Cleanup level established for the chemical of concern and the basis for this level (see page 24);
- How source materials constituting principal threats are addressed (see page 34);
- Potential land use that will be available at the site as a result of the selected remedy (see page 16);
- Estimated capital and operation and maintenance costs for the remedy, including present worth and discount rates (see page 36); and
- Key factor(s) that led to selection of the interim remedial action for OU 3 (see page 32-33).

**State Concurrence**

EPA provided Illinois EPA an opportunity to participate at the OTFG site and sought the State's concurrence on this Interim ROD. Illinois EPA has not established a formal position regarding the remedy set forth in this Interim ROD.

Approved by: Richard C Karl 9-29-10

Richard C. Karl
Director
Superfund Division

Date

U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD
FOR
OTTAWA TOWNSHIP FLAT GLASS SITE
OPERABLE UNIT 3 - SOURCE AREAS AND GROUNDWATER SOUTH OF THE ILLINOIS RIVER
NAPLATE, LASALLE COUNTY, ILLINOIS

AUGUST 31, 2010

| NO. | DATE | AUTHOR | RECIPIENT | TITLE/DESCRIPTION |
|---|---|---|---|---|
| 1 | 04/00/08 | Hull & Associates, Inc. | Pilkington North America, Inc. | Work Plan for Residential Soils Excavation Operable Unit 1 for the Ottawa Township Flat Glass Site |
| 2 | 06/06/08 | Karl, R., U.S. EPA | Fleener, C., Pilkington North America, Inc. | Letter re: U.S. EPA's Approval of RI Reports for Residential Soils and Illinois River Sediment Operable Units and of the Work Plan for Residential Soils Excavation for the Ottawa Township Flat Glass Site |
| 3 | 08/00/08 | Hull & Associates, Inc. | Pilkington North America, Inc. | Remedial Investigation and Baseline Human Health and Ecological Risk Assessment of Operable |
| Units 3 | | | | & 4 for the Ottawa Town-ship Flat Glass Site |
| 4 | 12/00/08 | Hull & Associates, Inc. | Pilkington North America Inc. | Summary Report for Resi-dential Soils Excavation Operable Unit 1 for the Ottawa Township Flat Glass Site |
| 5 | 06/00/09 | Hull & Associates, Inc. | Pilkington North America, Inc. | Feasibility Study for Operable Unit 3: Source Areas and Groundwater South Side for the Ottawa Township Flat Glass Site |
| 6 | 08/00/09 | U.S. EPA | Public | Proposed Plan Fact Sheet: Interim Clean Up for Polluted Undergroundwater Supply |

| | | | | |
|---|---|---|---|---|
| 7 | 09/15/09 | Fleener, C., Pilkington North America, Inc. | Adler, K., U.S. EPA | Letter re: comments to U.S. EPA Record of De-cision for Operable Unit 3 at the Ottawa Township Flat Glass site |
| 8 | 09/23/09 | Albarracin, R., IL EPA | U.S EPA | Letter re: ARARs Review on on Feasibility Study for Operable Unit 3: Source Areas and groundwater - South Side |

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ARAR | Applicable or Relevant and Appropriate Requirement |
| CDI | Chronic daily intake |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act (Superfund) |
| CFR | Code of Federal Regulations |
| COC | Chemical of concern |
| COPC | Chemical of potential concern |
| CTE | Central tendency exposure |
| ELCR | Excess lifetime cancer risk |
| EPA | U.S. Environmental Protection Agency |
| HHRA | Human health risk assessment |
| HI | Hazard Index |
| IC | Institutional control |
| IAC | Illinois Administrative Code |
| Illinois EPA | Illinois Environmental Protection Agency |
| IRIS | Integrated Risk Information System |
| L | Liter |
| LOF | Libbey-Owens-Ford |
| MCL | Maximum contaminant level |
| mg/kg | Milligrams per kilogram (parts per million) |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NPL | National Priorities List |
| OTFG | Ottawa Township Flat Glass site |
| OU | Operable unit |
| PNA | Pilkington North America, Inc. |
| POTW | Publicly-owned treatment works |
| ppb | Parts per billion (µg/kg or µg/L) |
| ppm | Parts per million (mg/kg or mg/L) |
| PRP | Potentially responsible party |
| RAO | Remedial action objective |
| RCRA | Resource Conservation and Recovery Act |
| RfD | Reference dose |
| RI | Remedial Investigation |
| RME | Reasonable maximum exposure |
| ROD | Record of Decision |
| SF | Slope factor |
| TACO | Tiered Approach to Cleanup Objectives (Illinois Administrative Code) |
| UE | Unlimited exposure |
| USACE | United States Army Corps of Engineers |
| UU | Unlimited use |
| µg/kg | Micrograms per kilogram (parts per billion) |
| µg/L | Micrograms per liter (parts per billion) |
| $yd^3$ | Cubic yards |

# DECISION SUMMARY

"Source Areas and Groundwater South of the Illinois River" Operable Unit (OU 3) of the

## Ottawa Township Flat Glass Site

La Salle County, Illinois

## I. Site Location and Description

The Ottawa Township Flat Glass (OTFG) site is located in and around the Village of Naplate, in La Salle County, Illinois, about 60 miles southwest of downtown Chicago. The OTFG site is owned by Pilkington North American, Inc. (PNA); it is also known as the "Libbey-Owens-Ford Plants 5&7" site. The site includes PNA parcels on the north and south sides of the Illinois River, but does not include the areas used for manufacturing, manufacturing support and other operations or the undeveloped land designated as Parcels 4 and 5 (see Figure 4).

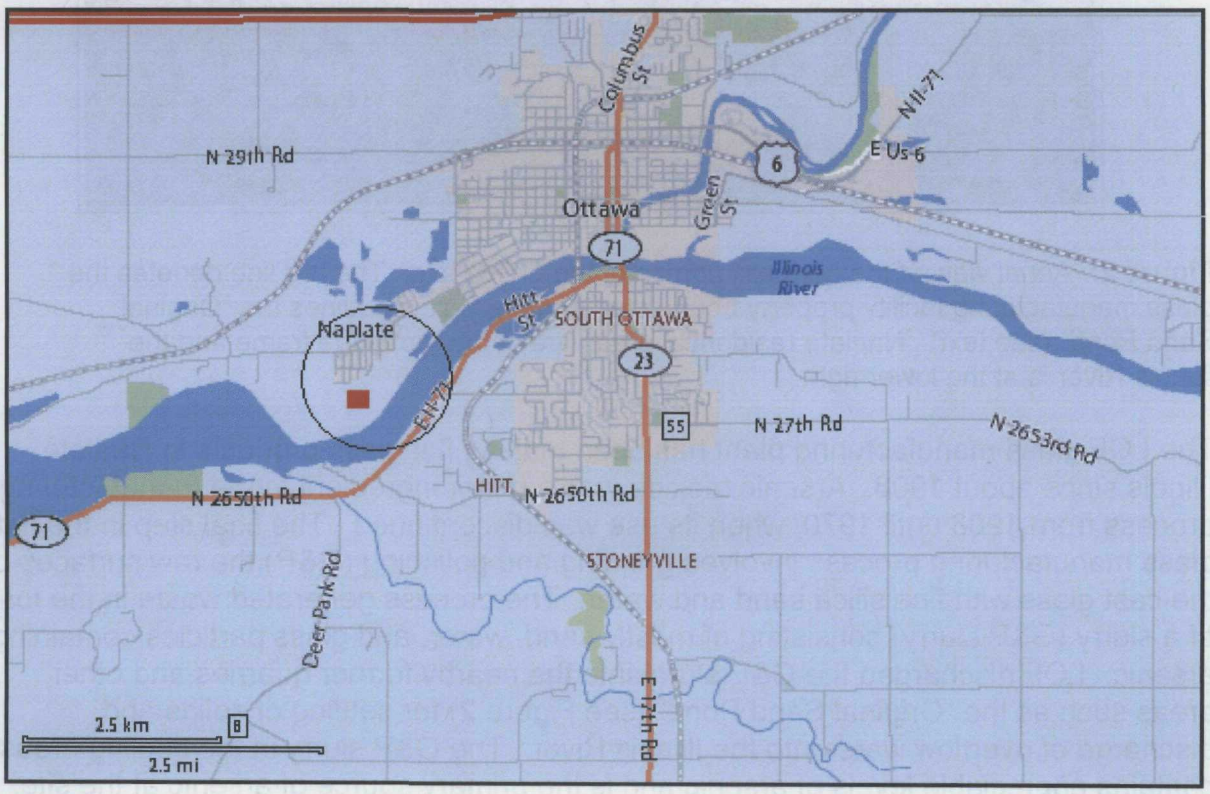


**Figure 1:** Site location map

The OTFG site CERCLIS identification number is ILD005468616.

**Figure 2:** Aerial view of the northern portion of the OTFG site. The red line denotes the glass manufacturing facility property boundaries and the yellow outlines the "Original Sand Pond" (see text). Naplate residential areas are at the top of the frame and the Illinois River is at the lower right.

The LOF glass manufacturing plant has been making flat glass products in Naplate, Illinois since about 1908. Arsenic trioxide was a minor ingredient in the manufacturing process from 1908 until 1970, when its use was discontinued. The final step in the flat glass manufacturing process involved grinding and polishing (G&P) the raw surfaces of the cast glass with fine silica sand and water. The process generated waste in the form of a slurry (G&P slurry) consisting of mostly sand, water, and glass particles containing arsenic. LOF discharged the G&P slurry into the nearby former quarries and other areas such as the "Original Sand Pond" (see Figure 2) for settling of solids and discharge of overflow water into the Illinois River. The G&P slurry in the settling areas contains appreciable levels of arsenic and is the primary source of arsenic at the site.

The U.S. Environmental Protection Agency (EPA) is the lead agency and the Illinois Environmental Protection Agency (Illinois EPA) is the support agency at the OTFG site. The site is a potentially responsible party (PRP)-lead site; to date, the PRP, PNA, has performed a time critical removal action, a remedial investigation and baseline human health and ecological risk assessments under EPA oversight. In addition, the PRP has conducted a feasibility study for potential groundwater cleanup actions.

EPA has divided the OTFG site into four portions, called "operable units" (OUs), for ease of investigating and addressing site contaminant levels and potential health risks. The four OUs are: "Residential Soils" (OU 1), "Illinois River Sediment" (OU 2), "Source Areas and Groundwater South of the Illinois River" (OU 3), and "Source Areas and Groundwater North of the Illinois River" (OU 4). This Interim Record of Decision (ROD) pertains only to OU 3 (Source Areas and Groundwater South of the Illinois River).

## II. Site History and Enforcement Activities

### A. Site History

The Federal Plate Glass Company built and began operating the glass manufacturing facility in 1908. The next owner, National Plate Glass (for which the Village of Naplate is named), bought the facility in 1921. National Plate Glass had become a subsidiary of Fisher Body in 1920 and Fisher Body, in turn, became a wholly-owned subsidiary of General Motors Corporation in 1926. National Plate Glass sold the Naplate glass plant to the Libbey-Owens-Ford (LOF) Company of Toledo, Ohio, in 1931.

From 1908 to 1970, the facility's glass-making recipe contained less than one percent arsenic (as arsenic trioxide) to reduce discoloration caused by trace amounts of iron in the melt. The final step in the flat glass manufacturing process involved grinding and polishing the raw glass surfaces with fine silica sand and water. The process generated waste in the form of a slurry consisting of mostly sand, water and glass particles containing arsenic. The G&P slurry was discharged into nearby former silica sand quarries and other areas (termed "sand ponds") for settling of solids and discharge of the decanted waters into the Illinois River. In 1970, the facility converted over to the recently invented Pilkington "float glass" manufacturing method to make its flat glass products. The float method did not require the use of arsenic or a grinding and polishing step; thus, the discharge of arsenic-containing G&P slurry material into sand ponds was discontinued.

PNA purchased the glass manufacturing facility from LOF in 1986, about 16 years after the use of arsenic in the glass-making process was discontinued, and still operates it today.

### B. Enforcement

Illinois EPA managed the initial OTFG site investigations from the mid-1980s until 1999 when it referred the site to EPA. EPA has managed the site in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund), as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). In September 2001, EPA reached an agreement with PNA, the current site owner, whereby the OTFG site would be handled as a Superfund Alternative Site, or as if it were listed on the Superfund National Priorities List (NPL) even though it did not go through the formal

NPL site-listing process. EPA and PNA also signed an Administrative Order on Consent (AOC) in September 2001, under which PNA agreed to conduct a remedial investigation and feasibility study at the site under EPA oversight. PNA has been conducting remedial investigation activities at the OTFG site in accordance with the AOC to determine the nature and extent of (arsenic) contamination in area groundwater, surface water, soil and sediment.

C. Previous Site Cleanup Actions

The "Residential Soils" operable unit (OU 1) is located in the Village of Naplate. PNA conducted soil sampling in several Naplate residential areas in late 2002 and discovered elevated levels of arsenic in shallow (0 to 6 inches) and deep (greater than 12 inches) sampling points on two residential lots located close to the factory. Soil arsenic levels were found to be as high as 44,800 milligrams per kilogram (mg/kg or "parts per million" or "ppm") on parts of these lots. EPA's removal action trigger point for arsenic levels in residential soil is about 100 ppm. PNA later determined that fill material containing G&P slurry solids had been taken from the facility and used to fill in low spots so that a home could be built on one of the lots.

Under the terms of the AOC, PNA conducted a time-critical removal action at the two residences. In December 2003, PNA began digging up soil and G&P slurry material that contained arsenic levels generally above about 20-40 ppm instead of the 100 ppm trigger value. The lower value was used as the target cleanup level because PNA reasoned that a potential future remedial action at the site might need to achieve a lower cleanup standard than 100 ppm; therefore, it would be more cost effective to complete a single cleanup action rather than potentially having to come back and re-open the excavations to complete a second cleanup action.

Under EPA oversight, PNA excavated a total of 3,325 cubic yards of soil and G&P slurry material from the two lots and disposed of it in an off-site landfill. While this work was being done, the residents of the two homes were temporarily relocated to a local hotel. After sampling the edges and bottoms of the excavations to confirm that all impacted soils had been removed, PNA placed clean soil backfill into the excavations and reseeded the lots. The removal action was completed in June 2004. The homes were also found to have above-normal levels of arsenic-laden dust inside and PNA conducted a cleanup inside the homes to reduce the interior arsenic levels to safe levels.

From 2003 through 2005, PNA measured soil arsenic levels at a total of 210 residential or commercial properties in Naplate (over 90 percent of the village) by taking five soil samples from each yard. The majority of the village properties were found to have an average arsenic level at or below the average naturally occurring soil arsenic level (11 ppm) for rural counties in Illinois. EPA issued a ROD in September 2008 (see Section IV) that called for no further cleanup action at OU 1 because the estimated human health risk due to arsenic levels measured in the soils did not exceed EPA's target risk range. Meanwhile, PNA noted that eight of the residential properties (of the total 210 tested) had a single soil sample that had an arsenic test result above 50 ppm. The slightly higher arsenic readings resulted in a slightly higher average arsenic level in the soil at these properties than at the remainder of the properties in the village. Although not deemed harmful by EPA, PNA excavated these eight properties to remove the 50 ppm arsenic "hot spots," thereby bringing the average soil arsenic levels on these eight properties in line with those of the rest of the village. PNA completed this last residential soil cleanup effort in October 2008.

## III. Community Participation

EPA, in consultation with Illinois EPA, issued a proposed plan fact sheet for OU 3 of the OTFG site to the public for review and comment in August 2009. EPA placed the proposed plan and other site documents into the Administrative Record file and the information repository maintained at EPA's Records Center (U.S. EPA Region 5, 77 W. Jackson Blvd., Chicago, IL) and at the Reddick Library (1010 Canal St., Ottawa, IL). EPA also placed a notice of the availability of the proposed plan and other documents in the *Ottawa Times*, an area newspaper of wide circulation, in August 2009.

EPA opened a public comment period on the proposed plan from August 19, 2009, to September 18, 2009. EPA held a public meeting on August 26, 2009, at the La Salle County Government complex in Ottawa, Illinois, to present the proposed plan and take public comment. EPA and Illinois EPA answered questions at the meeting about the actual or potential health risks posed by arsenic at the site and why the agencies believe that Modified Alternative 4 is the appropriate response action for OU 3. EPA's response to the public comment it received during the comment period is included in the Responsiveness Summary section of this interim ROD.

## IV. Scope and Role of the Operable Units

As described in Section I, above, EPA divided the OTFG site into four operable units for ease of investigating and addressing site contaminant levels and potential health risks.

The response action taken at OU 1 under EPA's CERCLA removal authority removed arsenic-contaminated soil from the residential area, leaving residual arsenic levels in the soil at or below general background levels for rural counties in Illinois. EPA found that no further response activity was necessary to protect human health or the environment at OU 1. Additionally, EPA found that no response activity is necessary to protect human health or the environment at OU 2. Thus, EPA, with Illinois EPA concurrence, issued a ROD in September 2008 that selected the "No Action" alternative for both OU 1 and OU 2. EPA plans no further cleanup activity at either of these two operable units.

This Interim ROD addresses the third operable unit – "Source Areas and Groundwater South of the Illinois River." In addition to implementing this Interim ROD, EPA will continue to evaluate conditions in OU 3 so that it can propose for public comment a final response action for OU 3 when appropriate.

EPA and Illinois EPA are beginning to evaluate potential response actions for OU 4. The response actions will address the arsenic contamination in the upper aquifer beneath the site and the potential sources of arsenic in the former settling ponds. As in OU 3, ingestion of water contaminated with arsenic could pose a current and potential future risk to human health because EPA's acceptable risk range is exceeded and the concentration of arsenic is greater than the maximum contaminant level (MCL) for drinking water (as specified under the Safe Drinking Water Act). The response actions for OU 4, as well as the final response action for OU 3, would represent the final response actions for this site.

Note: The operable units do not address conditions inside the plant buildings or the buildings themselves because the plant is an operating facility regulated under the Solid Waste Disposal Act (also known as the Resource Conservation and Recovery Act).

## V. Site Characteristics and Investigation Results

The OTFG site is situated on both sides of the Illinois River near Ottawa, Illinois. The north side property is 228 acres area and contains a glass manufacturing facility ("Plant #5" (active) and "Plant #7" (currently inactive)), plus former silica sand quarries, wastewater disposal areas and a 56-acre undeveloped parcel of land. The "Residential Soils" (OU 1) and "Source Areas and Groundwater North of the Illinois River" (OU 4) operable units are located on the north side of the river. (OU 2 is the "Illinois River Sediment" operable unit.) OU 3, "Source Areas and Groundwater South of the Illinois River," is on the south side of the river and consists of a 122-acre parcel containing four former silica sand quarries ("Quarry 1," "Quarry 2," etc.) located due east of the manufacturing facility (see Figure 3). The 56-acre undeveloped parcel, Parcel 4, is located in the northeast corner of the property and has been called the "old golf course." It is unknown if this parcel was ever used as a golf course. An additional undeveloped parcel, Parcel 5, is located in the southeast corner of the Village of Naplate. This parcel is 0.97 acres and was never sold or developed as residential property (see Figure 4).

As recounted above, from 1908 through 1970, the facility's glass-making formula contained one percent or less arsenic to reduce discoloration caused by trace amounts of iron in the melt. The final step in the manufacturing process involved grinding and polishing the cast glass with fine silica sand and water. The process generated G&P slurry waste, mostly consisting of silica sand, glass particles containing arsenic and water. LOF discharged G&P slurry into Quarry 1 from about 1954 until March 1970 and pumped clarified water from the quarry into the Illinois River. In 1970, LOF covered the eastern two-thirds of Quarry 1 with about 1,700 tons of sludge from the City of Chicago's publicly owned treatment works (POTWs) and covered the remaining one-third with topsoil from the site.

A prominent ridge runs along the southeastern property boundary of OU 3, roughly paralleling the Illinois River. The top of the ridge is about 60 feet above the quarries, where the land surface is about 30 feet above the river water level. The depth of the Illinois River adjacent to OU 3 is 18 to 20 feet.

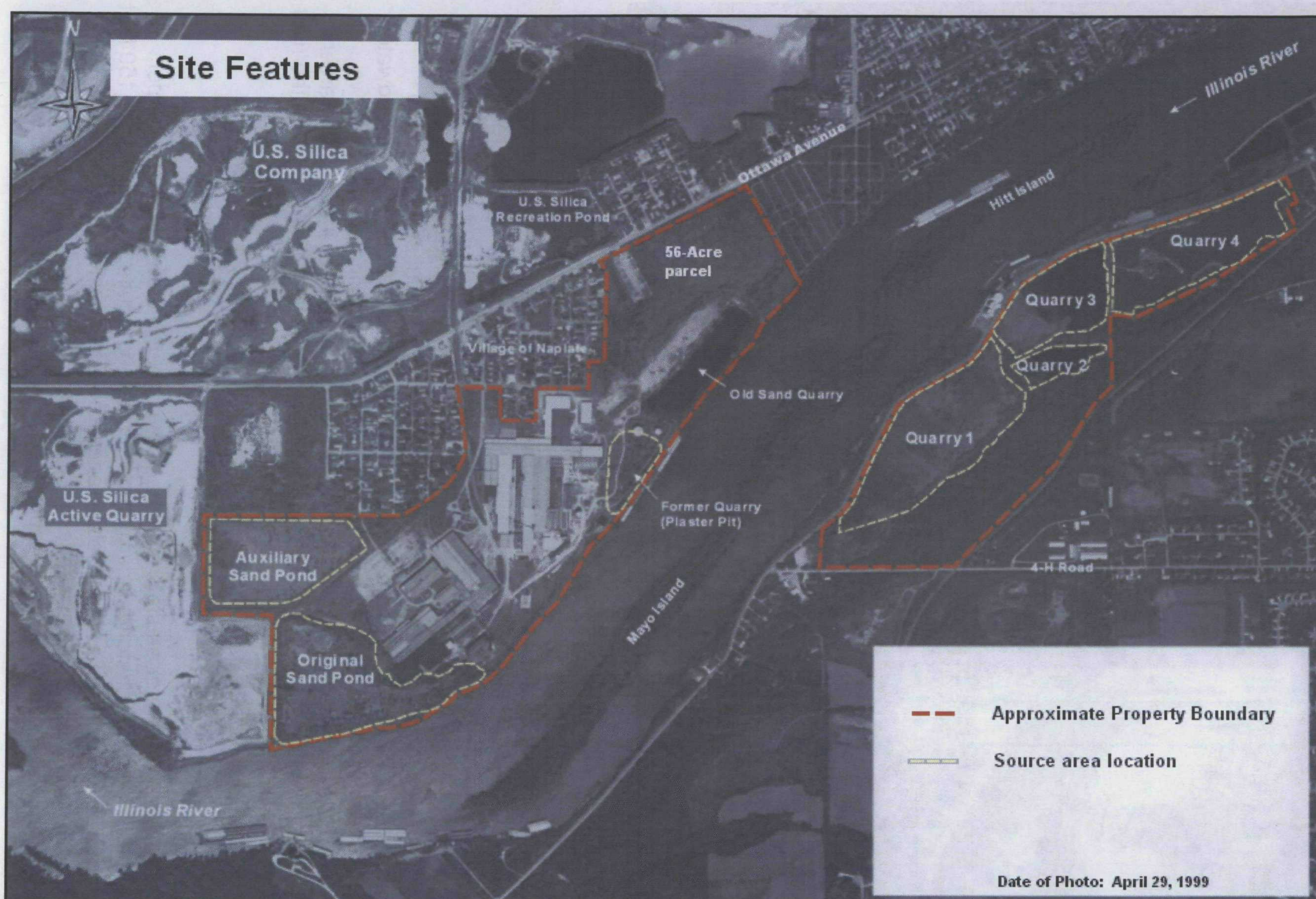


**Figure 3:** Site features


**Figure 4:** Parcels 4 and 5

Surrounding the OU 3 property are residential areas, both incorporated (South Ottawa) and unincorporated. To the southwest along the river and below the bluff are several properties on private wells. To the southeast and above the bluff are the 4-H fairgrounds and further east is a subdivision that is on municipal water. The 4-H facility has a private well that serves the fairgrounds. Historically, about six wells in the unincorporated area have been impacted by arsenic contamination in the groundwater, as well as the well on the 4-H fairgrounds. A June 2010 sampling event found two residential wells and one business well in the unincorporated area impacted by arsenic groundwater contamination. The Cargill grain terminal just west of Quarry 3 on the river is on a private well, drilled into an unaffected aquifer.

## A. Hydrogeology

There are two groundwater aquifers of immediate concern below OU 3. The upper aquifer, the St. Peter Sandstone, is a regional unconfined aquifer that averages 150 feet in thickness below the site. The St. Peter Sandstone is a massive, fine to medium-grained, well sorted, white quartz sandstone formation. Upper portions of the aquifer are friable (crumbles easily), while at depth, the sandstone is well-cemented with limestone and silica cements. Locally, groundwater flow in the upper portion of the aquifer generally discharges into the Illinois River while in the middle and lower portions of the formation groundwater flow is under the river towards the northwest. Previous wastewater discharge into Quarry 2 created a groundwater mounding effect, which may have caused the arsenic plume to expand to the east near the residential areas. The mounding effect should wane now that discharge to Quarry 2 has stopped.

The lower aquifer, the New Richmond Sandstone, is about 100 feet thick and is used locally for industrial and municipal water supplies. Both aquifers contain naturally occurring levels of radium above the MCL.

Between the two aquifers lies the Shakopee Dolomite, a 150-200 foot thick aquitard that forms an effective barrier between the St. Peter and New Richmond Sandstones. The Shakopee Dolomite unit is generally encountered at about 180 feet below ground surface and the top of the formation is marked by a 3- to 7-foot soft shale deposit. Figure 5 presents the generalized stratigraphy in the vicinity of the site. Figure 6 depicts the groundwater elevations in the vicinity of the site, including OU 3.

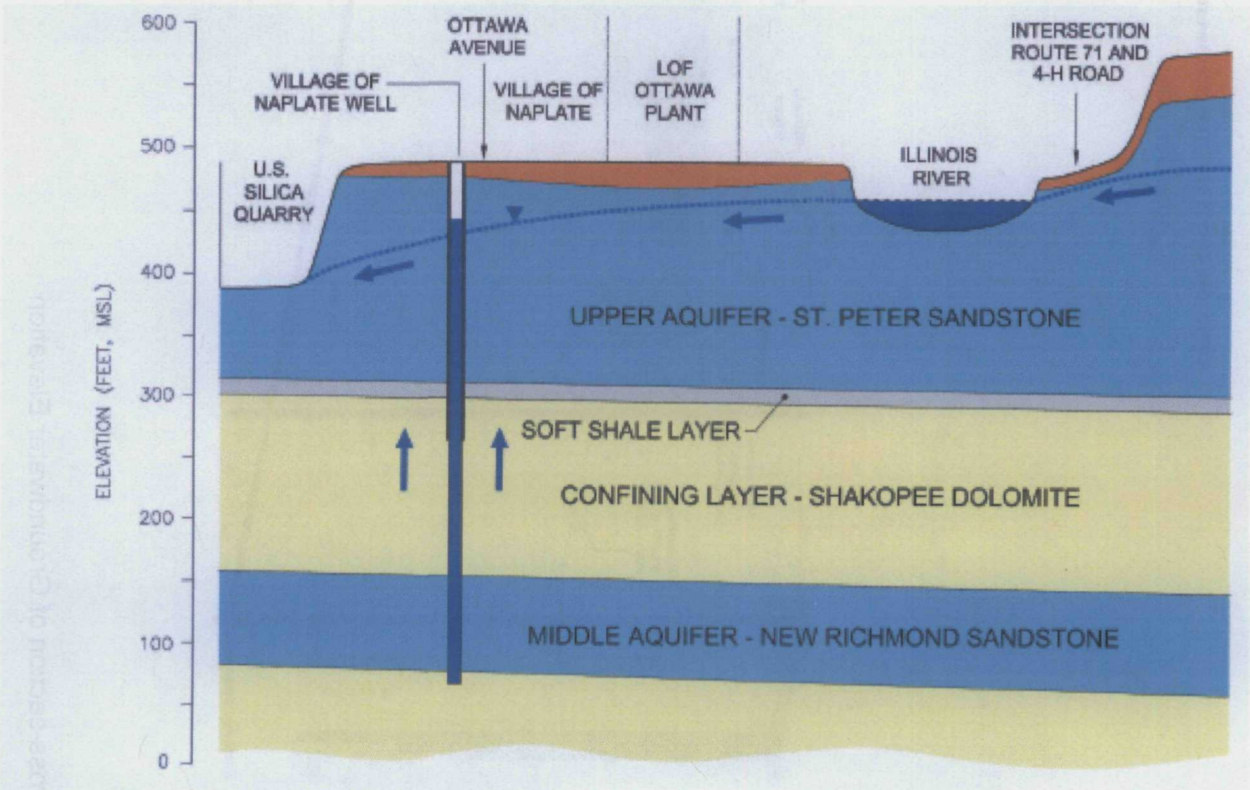


**Figure 5**: Stratigraphy in the Naplate area.

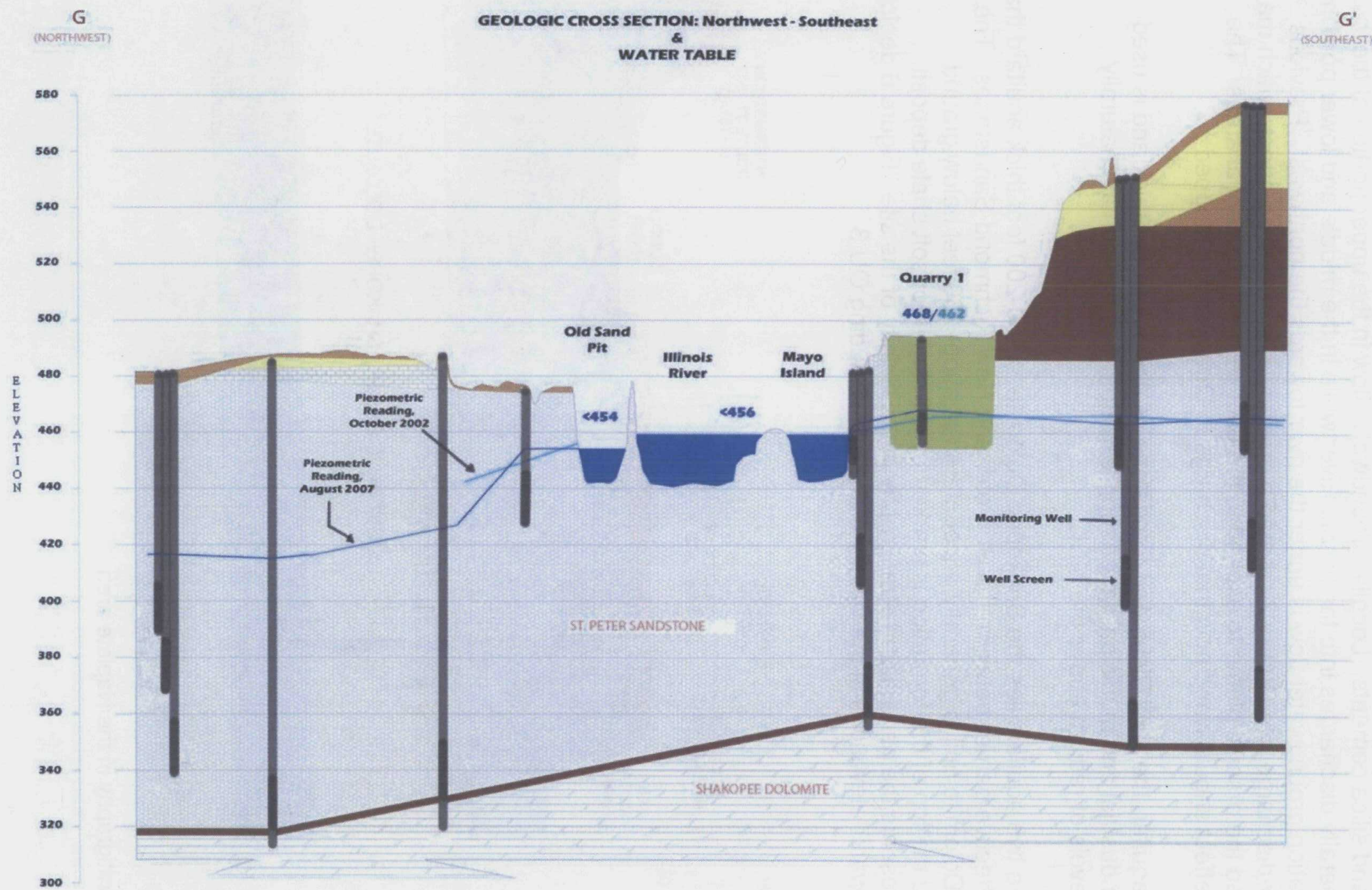


**Figure 6:** Cross-section of Groundwater Elevation

B. Conceptual Site Model

EPA's conceptual site model (see Figure 7) for OU 3 demonstrates that the G&P slurry in Quarry 1 and, to a lesser extent, Quarry 3 is the major source of arsenic contamination in the groundwater beneath the site, leading to potential human exposure by ingestion or dermal contact from potable uses such as drinking, cooking or bathing. Surface water in the remaining three quarries could also be impacted by arsenic derived from the G&P slurry in Quarry 1 and Quarry 3, which could lead to human and ecological receptor exposure by ingestion or dermal contact. The natural background concentration of arsenic in area soils is an insignificant source of arsenic contamination at OU 3.

Based on the conceptual site model, the remedial investigation focused on answering the question of whether unsafe levels of arsenic were released from the G&P slurry in Quarry 1 into the area soil, sediment, groundwater and surface water. In addition, the investigation focused on whether arsenic was discharging into the Illinois River due to contaminated groundwater infiltration from OU 3. Therefore, OU 3 area soil, sediment, surface water and groundwater were sampled and tested for contaminant levels. Based on the groundwater sampling results, calculations were run to determine whether arsenic levels in the groundwater could adversely impact Illinois River water quality. Water column sampling results were also available to be evaluated for a stretch of river a few miles upstream (to determine background conditions) and a few miles downstream of the site to determine impacts, if any, to river water quality.

1. Source Areas

The four quarries were investigated as potential contaminant source areas due to the placement of G&P slurry into Quarry 1 and the management of clarified water and other plant wastewaters in the remaining three quarries. Soil, sediment and surface water samples were taken to determine the nature and extent of arsenic contamination. (Groundwater results are discussed separately.)

**Quarry 1**

Quarry 1 is about 33 acres in size and contains between 35 and 45 feet of fill material consisting of G&P slurry. Surface soils were sampled on Quarry 1 at four locations and arsenic concentrations ranged from 6.5 ppm to 20 ppm. These levels are the same as those found in the residential soils of the Village of Naplate and are similar to background concentrations. A literature search revealed a range of 1 ppm to 24 ppm for reported statewide naturally occurring or background arsenic values in soil. Site-specifically, Parcel 4, the 56-acre open parcel of land adjacent to the "Old Sand Quarry" (see Figures 3 and 4) was selected as an area potentially not impacted by arsenic contamination and thus a source of background samples for the site. This parcel reportedly was used as a golf course in the past, although it is not in use today. PNA took 23 soil borings from this area for arsenic analysis. Results ranged from 1.5 ppm to 8.7 ppm, confirming that the 56-acre parcel is not impacted by potential arsenic

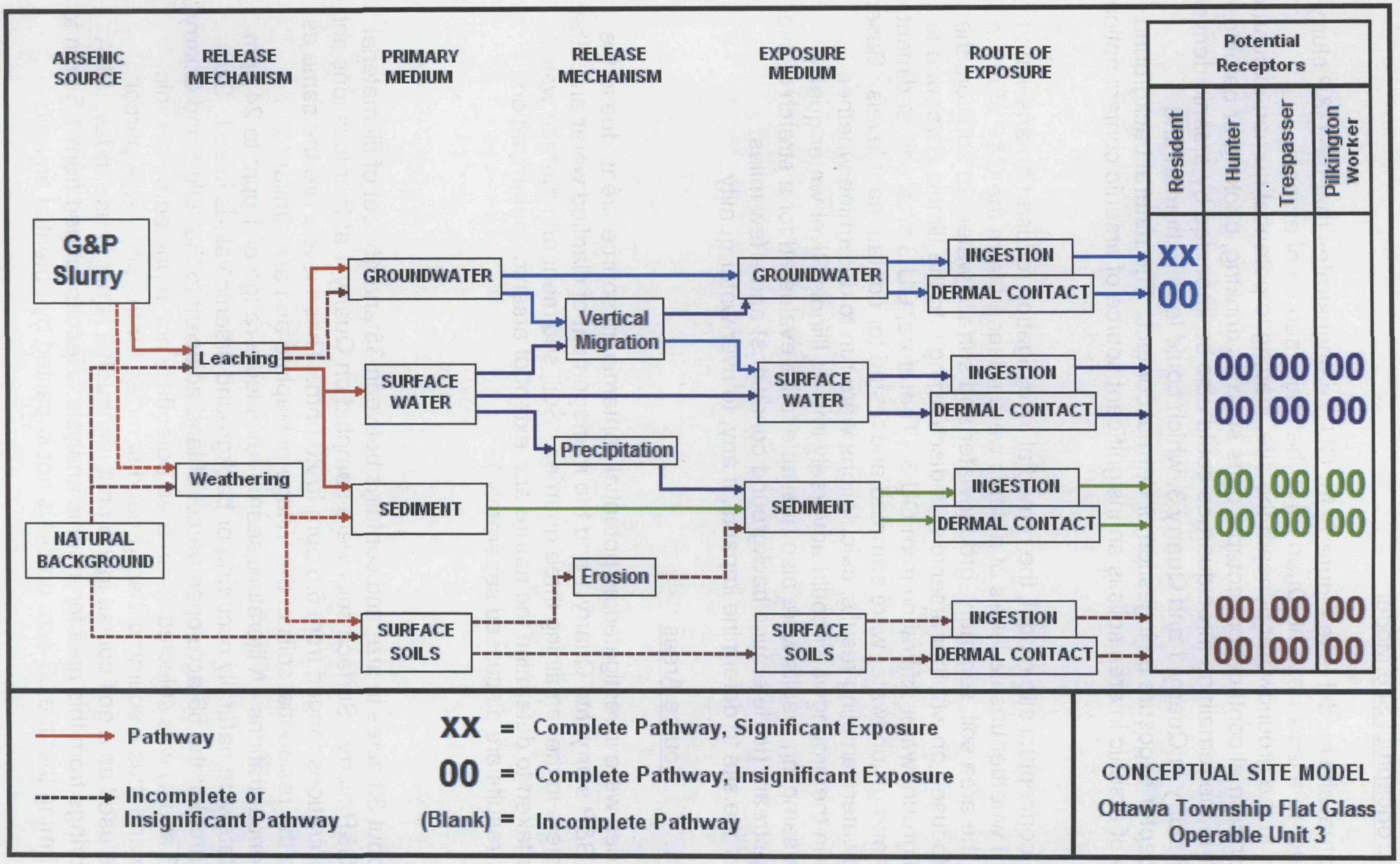


**Figure 7**: Conceptual Site Model for the "Source Areas and Groundwater South of the Illinois River" Operable Unit. Ecological receptors are not depicted in this figure. They will be included in the final remedy document.

releases from the plant. The calculated 95 percent upper confidence limit value was 9.8 ppm for this data set, meaning that the site-specific background arsenic level is considered to be 9.8 ppm. The state's published background level is 11 mg/kg (ppm).[2]

There are an estimated 2 million cubic yards of G&P slurry in Quarry 1. Two soil borings were advanced through the fill material until bedrock was reached at about 45 feet below ground surface. Arsenic concentrations in the G&P slurry material ranged from 16.7 ppm to 259 ppm, with higher concentrations at depth. PNA conducted a synthetic precipitation leaching procedure analysis on the G&P slurry material and found that the material would leach arsenic into solution. Based on water level measurements taken in wells screened in the St. Peter Sandstone around the quarry, about 30 percent of the G&P slurry sits in the water table.

**Quarry 2**

Quarry 2 is about 4 acres in size and contains open water at depths ranging from 1 foot to 12 feet. Until March 2006, PNA pumped wastewater across the Illinois River and discharged it into a ditch that originates at the southwestern end of Quarry 1. The ditch runs along the southern edge of Quarry 1 and discharges directly into Quarry 2. Sampling results showed that there was no G&P slurry in Quarry 2.

The surface water in Quarry 2 was sampled at three discrete depths at a single sampling point. Arsenic levels ranged from 25 ppb to 28 ppb. Surface water in the ditch was also measured. Here, arsenic was measured at 31 ppb and 33 ppb for the two samples collected.

Sediment in the ditch was measured at 25 ppm and 26 ppm arsenic for the two samples collected. Sediment in Quarry 2 was measured at a range of 9 ppm to 53 ppm for 10 samples. Where measurable, the thickness of sediment in Quarry 2 ranged from 0 to 3 feet.

**Quarry 3**

Quarry 3 is about 14 acres in size and is water-filled on the eastern side. Some G&P slurry material appears to have overflowed from Quarry 1 into Quarry 3 on the western side. Thickness of the sediment ranges from 10 feet to as much as 30 feet. Sample results ranged from 14 ppm arsenic to as high as 130 ppm for the eight samples. The surface water in Quarry 3 was also sampled at three discrete depths at a single sampling point. Arsenic levels ranged from 58 ppb to 66 ppb. A volume estimate of G&P slurry in Quarry 3 was not made.

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[2] This applies to regional soil arsenic concentrations in counties within rural areas (source: Illinois EPA, Part 742 Tiered Approach to Corrective Action Objectives (TACO) program).

**Quarry 4**

Quarry 4 is about 19 acres in size and ranges in depth from 1 to 30 feet of water. Thickness of the sediment ranges from 0 to 10 feet, appearing to be mostly slough-off from the sides of the quarry. Sediment sample results ranged from 10 ppm arsenic to as high as 92 ppm for the nine samples. As above, the surface water in Quarry 4 was sampled at three discrete depths at a single sampling point. Arsenic levels ranged from 37 ppb to 38 ppb.

2. Groundwater

**St. Peter Sandstone**

PNA has installed monitoring wells in about 20 locations at OU 3. Many locations have a cluster of wells screened at multiple depths (upper, middle, and lower) in the St. Peter Sandstone. Sampling results range from < 5 ppb to 350 ppb arsenic, with the higher levels associated with the G&P slurry in Quarry 1. Water quality is marginal (aside from any arsenic concentrations in the water); radium was measured at levels above its MCL and the high levels of iron, sulfate and magnesium, among others, can make for very hard, and reportedly foul-smelling[3] water in the aquifer. The St. Peter Sandstone has been identified as a potential source of drinking water and in areas up-gradient of the site, as well as areas not contaminated by the site, the St. Peter Sandstone is used as a source of drinking water.

**New Richmond Sandstone**

The nine wells screened in the New Richmond Sandstone in the entire site area, including municipal and industrial supply wells, do not display detectable levels of arsenic, although the water is hard and contains appreciable levels of radium. Specifically, the Village of Naplate has its municipal water well screened in the New Richmond Sandstone, as does the Cargill grain terminal well, and these wells are not impacted by the arsenic plume at OU 3.

**Drinking Water Wells**

PNA conducted a residential well survey prior to the 2001 AOC and identified a total of 48 private wells in the entire site area. Thirty-three were found to be completed in the St. Peter Sandstone and the others were found to be completed in the New Richmond Sandstone or in other aquifers not impacted by arsenic from the site. A small number of the 33 wells had detectable levels of arsenic in the water; two had levels above 50 ppb (the MCL for arsenic that was in effect at the time of sampling). Near OU 3, PNA currently supplies three area residences and one small business with bottled water due to their proximity to the site or measured arsenic levels in their wells. On June 29, 2010, EPA resampled wells near the site. As of the sampling date, two wells exceeded

[3] A local resident at the August 26, 2009, proposed plan public meeting in Ottawa remarked to EPA representatives that her water "stinks."

the MCL for arsenic, which is now 10 ppb.[4] One residential well had an arsenic level of 11 ppb and the small business' well (which exceeded the arsenic MCL in 2002) had an arsenic level of 112 ppb.

**Illinois River**

PNA took more than 30 sediment samples from the Illinois River in the vicinity of the OTFG site. Upstream or background samples had arsenic values that ranged from not detected to 13 ppm, averaging about 5 ppm. The only river sediment area found to be impacted by arsenic from the site was at the base of the "Original Sand Pond" a site feature of OU 4. Sediment near OU 3 was not found to be impacted by arsenic.

PNA evaluated water quality data for the Illinois River from samples taken by others in the 1990s. These sample results showed that there were no measurable levels of arsenic from the site in the river water. In 2002, PNA took three samples of Illinois River water down-gradient of the site at the request of EPA. Each sample was not-detect for arsenic (less than 5 ppb).

PNA conducted a flux modeling effort to estimate the potential impact of groundwater discharge from OU 3 on Illinois River water quality. Although the maximum groundwater arsenic concentration measured to date at OU 3 is 350 ppb, PNA used a more conservative concentration of 1,000 ppb arsenic in the model and calculated that the maximum concentration of arsenic in the river water attributable to the site would be 0.5 ppb, which is well below the drinking water MCL (10 ppb) and the Illinois General Use Surface Water Quality Standard for chronic exposure (190 ppb).

In 2002, PNA conducted river water toxicity testing on benthic organisms and data showed some chronic effects; however, there was no discernible difference between the upstream and downstream chronic toxicity effects on test benthic organisms. Thus, no fish sampling was done because literature suggests that health impacts on fish occur at arsenic levels that are at least an order-of-magnitude above that of benthic organisms.

3. Conclusions

Sampling evidence shows that the G&P slurry in Quarry 1 (and perhaps Quarry 3) is a source of arsenic contamination to the groundwater in the St. Peter Sandstone formation. Although some local residents may have wells screened in the impacted aquifer, none are drinking contaminated water at this time. The G&P slurry also has impacted surface water quality and slightly contaminated sediments in the other three quarries; however, area soil is not contaminated. Because sample results showed high arsenic concentrations in the groundwater and G&P slurry at OU 3, the results were evaluated with respect to actual or potential human health or ecological risks as discussed in Section VII, below.

[4] On January 22, 2001, EPA adopted an MCL of 10 ppb for arsenic, effective January 23, 2006. *See* 66 Fed. Reg. 6976 (January 22, 2001).

## VI. Current and Potential Future Land and Resource Uses

OU 3 is PNA-owned property located in unincorporated LaSalle County, adjacent to the City of Ottawa. Under a LaSalle County zoning ordinance enacted in 2006, land outside any city or town is zoned for agricultural use until a change is made in the use of the property—then a zoning change is made. Thus, the quarries in OU 3 will be zoned for agricultural use until there is a change in the land use. OU 3 formerly was used for mining silica sand and then for management of the G&P slurry and wastewaters from plant operations. The property is now vegetated and generally out of use. Land surrounding the PNA property is primarily residential, with some commercial use also evident. Future land use is reasonably assumed to remain the same as current use. PNA has not announced any changes to or plans to change the way it manages the property.

## VII. Summary of Site Risks

EPA generally follows a four-step process for preparation of the baseline human health risk assessment (HHRA) at Superfund sites:

1. Identify chemicals of concern (COCs)
2. Conduct an Exposure Assessment for COCs
3. Conduct a Toxicity Assessment of COCs
4. Characterize Risk and Evaluate Uncertainties

EPA evaluated the levels of chemical contaminants found at OU 3 to determine the actual or potential risks to human health and the environment. As noted above, EPA first identified "chemicals of potential concern" (COPCs) - those compounds that exceeded health-based levels at the site - using screening levels or preliminary remediation goals published by the State of Illinois and/or EPA. EPA then winnowed down the list of COPCs to "chemicals of concern" (COCs) – those compounds that are most pervasive at the site or most representative of a chemical class.

EPA next evaluated chemical fate and transport factors to determine whether the COCs were potential short-, medium-, or long-term risks at the site. EPA then examined potential pathways of concern to human health and the environment under current and future site-use scenarios in an exposure assessment and applied the results of the above steps to quantify actual or potential risks to human health and the environment by combining exposure level assumptions with estimated carcinogenic risk or toxicity factors for the COCs. The human health and ecological risk assessment work is fully presented in the "Remedial Investigation and Baseline Human Health and Ecological Risk assessment of Operable Units 3 & 4 for the Ottawa Township Flat Glass Site," which is in the Administrative Record for the site.

## A. Chemical of Concern

Chemicals of concern are contaminants that potentially present the greatest human health concerns (*i.e.*, those present in the highest concentrations, with the widest distribution over the site, or that exhibit the highest mobility or the highest toxicity). The purpose of identifying COCs is to focus the risk assessment on the most important contaminants found at a site.

The only COC at OU 3 is arsenic. Arsenic trioxide is the chemical that was previously used in the flat glass formulation at the glass plant site and it is in the G&P slurry material that was disposed off in Quarry 1 (and perhaps Quarry 3). There is no information derived from on-site sampling or historical company information indicating that other hazardous chemicals were used at the facility or were disposed of at OU 3.

### 1. Fate and Transport

Arsenic tends to adhere to soil and sediment particles and the mobility of this compound on these media is usually low. Arsenic is soluble in water, where its mobility can be moderate to high. Arsenic bioaccumulation is moderately likely to occur in receptors and it does not biodegrade. Arsenic is found in the site groundwater. Thus, this COC, if not addressed, will persist for years to come and be readily available for people and animals to become exposed to it.

## B. Exposure Assessment for Arsenic

The baseline HHRA evaluated the carcinogenic and non-carcinogenic risks at OU 3 associated with a future exposure by residential use of contaminated drinking water, and current and future exposure to PNA site workers, adult trespassers (hunters) and adolescent trespassers.[5] The potential exposure routes that were quantified include ingestion (through hand-to-mouth activities), inhalation and dermal contact (through the skin).

### 1. Current Pathways

Exposure to arsenic at OU 3 could occur if people were to come onto the PNA property and come into contact with the G&P slurry in Quarry 1 and Quarry 3, arsenic-impacted sediment at the bottom of the quarries or arsenic-impacted surface waters in the quarries. A person could be exposed to arsenic by dermal contact if one were to touch the G&P slurry or sediment, by ingestion if one were to put one's hand into the mouth after touching the G&P slurry or sediment or by inhalation if dust particles were suspended into the air. Swimming in the surface water could expose someone to arsenic by dermal contact or by ingestion if the water was swallowed.

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[5] The quarries are surrounded by fences and patrolled by PNA security. In addition, they have steep banks and are surrounded by thick brush and other vegetation; therefore, they are not easily accessible by trespassers.

Ingestion of groundwater is not occurring on the PNA property because there are no wells producing groundwater for potable use on the property. In addition, area residents with private wells screened in the St. Peter Sandstone either have wells in areas not impacted by arsenic from the site or are being provided with bottled water and are not using their well water as a potable supply.

### 2. Future Pathways

Except for groundwater, future exposure pathways to arsenic would be the same as current pathways as no projected land-use changes are noted. EPA's groundwater cleanup policy requires the Agency to determine potential human health risks by assuming that for potentially useable aquifers, the contaminated water would be used for potable purposes in the future. Because the St. Peter Sandstone produces a potentially useable water supply (despite the hard water, iron taste and radium levels), the residential use of groundwater is a future exposure pathway.

## C. Toxicity Assessment for Arsenic

EPA evaluated the relationship between the magnitudes of actual or potential exposure to arsenic at the site with corresponding adverse health effects. An estimate of the increased likelihood and severity of the adverse effects was calculated and used in the assessment of risk for arsenic at the site.

Generally, adverse health effects are divided into two categories – non-cancer causing (non-carcinogenic) and cancer causing (carcinogenic). Arsenic is considered to be carcinogenic but it also causes noncarcinogenic effects. Risk calculations were performed separately for arsenic as a carcinogen and a non-carcinogen because the adverse health effects are different (*e.g.*, cancer-causing versus causing kidney failure).

### 1. Non-carcinogenic Effects

Non-carcinogenic effects are evaluated using reference doses (RfD) developed by EPA. Reference doses for non-carcinogens are developed on the assumption that certain levels of contaminants may not pose ill effects to, for example, the liver or kidney, due to daily exposure at threshold levels over a lifetime of exposure. The RfD for arsenic is based on human chronic oral exposure studies and includes a safety factor of 3. The RfD is based on the lowest observed adverse effect level and the critical health effects caused by arsenic include hyperpigmentation, keratosis and possible vascular complications.

Combined with the results of the exposure assessment, EPA is able to calculate the Hazard Index (HI) quotient for a COC. An HI quotient is the ratio of the amount of a non-carcinogenic chemical contaminant that an individual may be exposed to at a site to the amount of the contaminant that causes an adverse toxic reaction within the body. An HI quotient of 1 or more would mean that there is enough contaminant at the site to cause a toxic reaction (likely an adverse impact to the target organs) in a person should one be exposed to the contaminant. An HI quotient of less than 1 indicates no adverse health effects would be expected due to exposure to a chemical at site concentrations.

### 2. Carcinogenic Effects

Similarly, RfDs for carcinogens are developed based on published cancer slope factors extrapolated from animal testing or other means. To calculate risk, arsenic was assigned a toxicity value in accordance with EPA's Integrated Risk Information System (IRIS). IRIS provides a database of human health effects that may result from exposure to arsenic (as well as from many other chemicals).

Studies have shown that arsenic intake can be associated with certain types of cancer such as of the lung, liver, kidney, bladder and skin. Arsenic is a human carcinogen that can be inhaled, ingested or absorbed; however, toxicity values provided in IRIS typically reflect doses to study subjects only via inhalation or ingestion exposure.

Using reasonable maximum exposure (RME) rates based on the results of the exposure assessment, EPA can calculate an excess lifetime cancer risk (ELCR) value for arsenic. An ELCR is an estimate of one's chances of contracting cancer due to lifelong exposure to a chemical at site concentrations and is usually expressed as an exponential value (*e.g.* a risk value of $1 \times 10^{-2}$ is 1 in 100).

## D. Human Health Risk

Carcinogenic risks are generally expressed as the incremental increase in the probability of an individual's developing cancer over a lifetime as a result of lifetime exposure to the carcinogen. For example, an excess lifetime cancer risk of $1\times10^{-6}$ indicates that an individual experiencing the reasonable maximum exposure to a carcinogen has a 1 in 1,000,000 (one in one million) chance of developing cancer as a result of site-related exposure to the chemical.

Note: calculated risk values are referred to as an "excess lifetime cancer risks" because the risks would be in addition to the more prevalent risks of cancer that individuals face due to other factors such as smoking or exposure to too much sunlight. The chance of an individual's developing cancer during one's lifetime from all other causes has been estimated to be as high as 1 in 3 ($3.3 \times 10^{-1}$).

Excess lifetime cancer risk (ELCR) is calculated from the following equation:

$$ELCR = CDI \times SF$$

where:
ELCR = a unit-less probability (*e.g.*, $1 \times 10^{-2}$)
CDI = chronic daily intake level (mg/kg-day)
SF = slope factor, expressed as $(\text{mg/kg-day})^{-1}$

Non-carcinogenic health effects are expressed as an HI quotient. A calculated HI that is less than 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 to occur. A total HI quotient can be generated by adding the HI quotient for all site-wide COCs that affect the same target organ (*e.g.*, liver) to which a given individual may reasonably be exposed. An HI that is less than 1 indicates that, based on the sum of all HI's from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present a risk to human health.

The HI is calculated as follows:

HI = 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.

1. <u>Target Risk</u>

EPA generally cleans up Superfund sites to reduce contaminant levels or exposure to contaminants so that the estimated ELCRs posed by carcinogenic contaminants fall within a risk range of $1 \times 10^{-4}$ to $1 \times 10^{-6}$ (1 in 10,000 to 1 in 1,000,000) and/or the calculated HI values for non-carcinogenic compounds fall to less than 1. EPA may use the term "unacceptable risk" when referring to contaminants at concentrations above levels that yield estimated an ECLR greater than $1 \times 10^{-4}$ or an HI greater than 1 after a risk assessment is performed.

2. <u>Uncertainties</u>

Calculated ELCRs and HI values are estimates of potential upper-bound risks that are useful in regulatory decision-making. However, it is improper to consider the risk estimates to be representative of actual risk to potentially exposed individuals because the risks were estimated by making numerous conservative assumptions (that is, assumptions that over-estimate potential exposure levels and thus, potential risk) due to uncertainties inherent in the HHRA process. For example, some exposure and toxicity value assumptions have greater amounts of scientific data supporting them than others (that is, a widely-used chemical may be well-studied whereas a newer compound may not yet have any testing data associated with it). Uncertainty is also introduced into the risk assessment process every time an exposure assumption is made based on current or potential site uses.

One example of uncertainty at the OTFG site is the estimated site-specific soil (or sediment) ingestion rate. Estimates may vary widely. Thus, a higher EPA-recommended rate was used to yield a more conservative risk value than may be actually occurring. Another uncertainty is the assumption that future use of the contaminated groundwater for potable purposes will occur.

PNA conducted bioavailability tests on the G&P slurry material. These tests are used to determine how much arsenic is taken up by the body if the contaminated material is consumed and how much merely "passes through" without causing an impact. Testing showed that about 50 percent of the arsenic in the G&P slurry is available to be absorbed into the body if it is consumed. EPA reviewed the testing data and concurs with the interpretation of the results. Usually arsenic is conservatively considered to be 95 percent bioavailable in the HHRA process. Thus, the site-specific bioavailability factor of 50 percent may yield a less conservative risk value for arsenic exposures at the OTFG site.

There are many potential man-made sources of arsenic making it potentially available to receptors beyond the naturally occurring levels in soil or sediment. These include: rat poison and other pesticides, green-treated wood (copper arsenate), coal ash, certain fertilizers, automobile batteries, tobacco smoke and pigments found in old paint or wallpaper. Potential use of any of these materials at one's residence during one's lifetime could result in exposure to higher levels of arsenic than from naturally occurring or "background" sources.

3. <u>Human Health Risk Assessment Results</u>

EPA used an exposure point concentration for arsenic using a reasonable maximum exposure (RME) scenario and the central tendency exposure (CTE) scenario to estimate human health risks at OU 3. The term "RME" generally refers to exposure to the highest contaminant concentration found and is usually used as the basis for cleanup action at a Superfund site because it is the most conservative exposure assumption. The term "CTE" generally refers to an average exposure level that is more likely to occur at a site and can provide a mitigating factor towards remedy selection.

For OU 3, EPA used RME and CTE values to estimate health risks for residents (adults and children), for glass plant maintenance workers and for recreational users (trespassers), as discussed above (Exposure Pathways).

a. Residential Groundwater (Future Use)

ELCR and HI quotients were calculated for adult and child residential exposure to arsenic in groundwater if it were to be used for drinking or other potable purposes in the future. Children were assumed to consume less water than adults; however, deleterious effects of hazardous chemicals are usually higher for children than adults. Table 1a presents the calculated risks for potable groundwater use.

| RECEPTOR | RME ELCR | RME HI | CTE ELCR | CTE HI |
|---|---|---|---|---|
| Adult | *$4 \times 10^{-4}$* | *3* | $1 \times 10^{-5}$ | 0.3 |
| Child | *$3 \times 10^{-4}$* | *8* | $1 \times 10^{-5}$ | 1 |

**Table 1a.** HHRA results for potable groundwater use at OU 3. Results in ***red italics*** exceed the target risk ranges.

The HHRA identified that arsenic is present at concentrations in the groundwater contaminant plume that result in estimated human health risks above EPA's target risk levels.

b. Trespassers and Site Maintenance Workers

An HHRA was performed for the soil, sediment and surface water media at each of the quarries. It was assumed that only intermittent exposures would occur rather than residential exposures because the site is not used for housing. Potential trespassers were assumed to be adults during the yearly, approximately 14-day deer hunting season and adolescents (exploring, swimming, etc.) about twice a month during the warm weather months. Exposure to company workers could occur during routine maintenance activities such as mowing on or around Quarry 1 (only) or fence repair. Exposures would be through dermal contact, ingestion, and inhalation of dust. Tables 1b – 1f present the calculated risks for each exposure scenario for the above receptors.

| RECEPTOR | RME ELCR | RME HI | CTE ELCR | CTE HI |
|---|---|---|---|---|
| Company worker | $7 \times 10^{-6}$ | 0.04 | $3 \times 10^{-7}$ | 0.005 |

**Table 1b.** HHRA results for company workers (surface soil/G&P slurry) at Quarry 1.

| RECEPTOR | RME ELCR | RME HI | CTE ELCR | CTE HI |
|---|---|---|---|---|
| Hunter | $1 \times 10^{-6}$ | 0.09 | $6 \times 10^{-8}$ | 0.001 |
| Adolescent | $5 \times 10^{-6}$ | 0.05 | $2 \times 10^{-7}$ | 0.007 |

**Table 1c.** HHRA results for trespassers (surface soil/G&P slurry) at Quarry 1.

| RECEPTOR | RME ELCR | RME HI | CTE ELCR | CTE HI |
|---|---|---|---|---|
| Hunter – soil/sediment | $1 \times 10^{-6}$ | 0.01 | $1 \times 10^{-7}$ | 0.003 |
| Hunter - water | $4 \times 10^{-7}$ | 0.003 | $6 \times 10^{-8}$ | 0.001 |
| Adolescent – soil/sediment | $3 \times 10^{-6}$ | 0.09 | $4 \times 10^{-7}$ | 0.02 |
| Adolescent – water | $1 \times 10^{-6}$ | 0.02 | $2 \times 10^{-7}$ | 0.01 |

**Table 1d.** HHRA results for trespassers (surface soil/surface water) at Quarry 2.

| RECEPTOR | RME ELCR | RME HI | CTE ELCR | CTE HI |
|---|---|---|---|---|
| Hunter – soil/sediment | $3 \times 10^{-6}$ | 0.03 | $2 \times 10^{-7}$ | 0.004 |
| Hunter - water | $1 \times 10^{-6}$ | 0.007 | $1 \times 10^{-7}$ | 0.003 |
| Adolescent – soil/sediment | $1 \times 10^{-5}$ | 0.2 | $5 \times 10^{-7}$ | 0.02 |
| Adolescent – water | $4 \times 10^{-6}$ | 0.05 | $5 \times 10^{-7}$ | 0.03 |

**Table 1e.** HHRA results for trespassers (surface soil/surface water) at Quarry 3.

| RECEPTOR | RME ELCR | RME HI | CTE ELCR | CTE HI |
|---|---|---|---|---|
| Hunter – soil/sediment | $1 \times 10^{-6}$ | 0.01 | $1 \times 10^{-7}$ | 0.002 |
| Hunter - water | $6 \times 10^{-7}$ | 0.004 | $9 \times 10^{-8}$ | 0.002 |
| Adolescent – soil/sediment | $4 \times 10^{-6}$ | 0.1 | $3 \times 10^{-7}$ | 0.02 |
| Adolescent – water | $2 \times 10^{-6}$ | 0.03 | $3 \times 10^{-7}$ | 0.02 |

**Table 1f.** HHRA results for trespassers (surface soil/surface water) at Quarry 4.

The calculated ELCR risks and HI quotients for recreational users (trespassers) and company workers are less than EPA's target risk levels.

4. Ecological Risk Characterization

EPA conducted a survey of aquatic, avian, and terrestrial species living at OU 3. Both plants and animals were inventoried and no sensitive or endangered species were identified, which is to be expected because of the heavy industrial use in the past (mining) had caused a great degree of habitat degradation. No ecologically sensitive niches were noted due to the previously disturbed lands. Communities of common species, including deer, burrowing animals and avian species were observed on the PNA property and numerous (bullfrog) tadpoles, snails and leeches were found in the aquatic areas. Both plants and animals seem to be thriving due to the lack of heavy human use of the property.

EPA examined the potential risks to ecological receptors based upon the arsenic levels documented at OU 3. EPA assumed that aquatic, terrestrial and avian species observed at the site could be exposed to contaminants through external direct contact or ingestion of impacted sediment or food. The arsenic concentrations observed in the surface waters of the quarries (25-66 ppb) do not exceed the chronic ambient water quality level for arsenic (150 ppb). Using recommended dose limits of various arsenic compounds for terrestrial and avian biota to calculate HI quotients, EPA concluded that there is no potential for adverse effects to terrestrial and avian species caused by arsenic in the soil, sediment or surface water at OU 3 because none of the calculated HI values were greater than one. However, the risk assessment did not look at wading birds such as herons, egrets and cranes, nor did it evaluate fish-eating gulls, ducks and their nestlings. The environmental risk characterization will be revisited to include ecologic receptors of concern in the final ROD.

5. Conclusions

The calculated risk levels for the trespasser and site worker scenarios do not exceed EPA action levels; however, the potential residential use of OU 3 area groundwater from the St. Peter Sandstone results in calculated risk levels that exceed EPA action levels. Therefore, active cleanup measures may be necessary to protect human health and the environment. Accordingly, PNA conducted a feasibility study for OU 3 to evaluate potential cleanup remedies for the site. Further ecological risk characterization will be conducted to support the final remedy for OU 3.

## VIII. Remedial Action Objectives

Groundwater in the St. Peter Sandstone formation at the site is contaminated with arsenic above the drinking water standard (MCL) of 10 ppb. Therefore, a potential adverse health risk exists if residents consume the contaminated water in the future. The remedial action objectives (RAOs) of an interim cleanup action at OU 3 are to:

- Prevent the potable use of groundwater contaminated with arsenic above 10 ppb; and,
- Reduce the concentration of arsenic in the groundwater over time.

Although the human health risks calculated for a site maintenance worker or trespassers did not exceed EPA's target risk ranges, a secondary interim RAO is to:

- Prevent future contact with the G&P slurry material in Quarry 1, as well as arsenic-impacted sediment in all of the quarries.

## IX. Description of Alternatives

EPA evaluated the following alternatives, proposed by PNA in the feasibility study, which were designed to achieve the remedial action objectives at OU 3. In calculating the costs of each of the alternatives, the feasibility study used an average of the costs of the proposed alternate water supplies, which is reflected below. Section X.7 sets forth the estimated costs of each proposed alternate water supply and Section XII.B includes the estimated cost of the preferred alternate water supply remedy.

**Alternative 1**: No Action

Under the No Action alternative, EPA would take no further action to remove, control, mitigate or minimize exposure to arsenic-contaminated media in OU 3. This alternative establishes a baseline against which to compare the other alternatives. Under the No Action alternative, EPA estimates that the arsenic groundwater contaminant plume will remain at levels above 10 ppb for many decades. Thus, there would be no reduction in potential health risks if contaminated groundwater were to be consumed in the future. This alternative costs nothing to implement.

**Alternative 2**: Alternate Water Supply, Institutional Controls and Monitored Natural Attenuation

Under Alternative 2, EPA would take action to ensure that residences with private wells within or very near the impacted portion of the St. Peter Sandstone aquifer would receive an alternate water supply until arsenic levels in the aquifer decline to 10 ppb or below. Five alternatives for providing an alternate water supply were proposed: 1) drilling an individual drinking water well for each affected residence in a location on the property that is not contaminated or likely to be contaminated by the arsenic plume; 2) providing bottled water to each affected residence; 3) providing a point-of-use treatment system, such as reverse osmosis, of the residential water; 4) extending the City of Ottawa drinking water service line to provide access to the City of Ottawa drinking water; or 5) constructing a community drinking water supply well for more than one residence. The average cost of these alternatives is $590,000.

In addition, the use of institutional controls (ICs), such as an ordinance to restrict consumption of groundwater, would be pursued, as well as placing environmental covenants on certain area properties to prevent their use as residential land. The use of ICs and alternate water supplies would reduce the potential health risks that could occur if the contaminated groundwater were to be consumed.

EPA also would track the arsenic contaminant plume at OU 3 over time, through monitored natural attenuation (MNA), until the arsenic levels no longer exceed the MCL of 10 ppb. This alternative would require that additional monitoring wells be drilled and then periodically sampled for arsenic over a minimum 20-year timeframe until the MCL is met outside the PNA property boundaries. It would take approximately 12 months to implement the remedy and not more than two years. EPA estimates that it may take many decades to achieve the MCL because no action is taken to remove or control the arsenic contamination in this alternative. The cost to construct the remedy is estimated to be $800,000, with an annual cost of $50,000 due to monitoring groundwater and reporting results. The total present worth cost is estimated at $1.45 million.

**Alternative 3**: Plume Containment via Pump and Treat, Surface Flow Measures and Alternative 2

Under Alternative 3, EPA would implement the provisions of Alternative 2 and take measures to contain the arsenic plume in the area around Quarry 1 by installing pumping wells to the east of the quarries and altering the surface water drainage pathways around the quarries. The additional work would change groundwater flow in the upper portion of the aquifer back towards the Illinois River by reducing the mounding effect that occurred due to previous discharge of wastewater to Quarry 2. This would enhance the rate at which the arsenic levels in the plume on the eastern and southern PNA property boundaries fall to below 10 ppb. This alternative would require that additional monitoring wells be drilled and periodically sampled for arsenic over a minimum 20-year timeframe until the MCL is met outside the PNA property boundaries. It would take approximately 12 months to implement the remedy and not more than two years. EPA estimates that it would take approximately 20 years to achieve the groundwater RAO because it would take time for the pump and treat system to operate properly and efficiently. ICs and alternate water supplies would reduce the potential health risks that could occur if contaminated groundwater were to be consumed.

Pumped water could be discharged to Quarry 4 without treatment, discharged to the City of Ottawa POTW or treated on-site to remove arsenic before discharge to the Illinois River. The cost to construct the remedy is estimated to range from $2 million (pump to Quarry 4) to as much as $9 million (treat on-site), with an annual cost of $335,000 to as much as $1.2 million, depending on the treatment method. The total present worth cost is estimated at $6.25 million (pump to Quarry 4) to as much as $25 million (on-site treatment).

**Alternative 4**: Surface Flow and Infiltration Reduction Measures plus Alternative 2

Alternative 4 generally consists of the same remedial measures evaluated under Alternative 3, above, except that the pump-and-treat remedial component would not be conducted. Specifically, EPA would alter the paths of surface water drainage around Quarries 1 and 2. The surface work would reduce the rate of groundwater recharge in the quarries, which would slow the movement of arsenic from the source material into the groundwater below. The surface flow work also would change groundwater flow in the upper portion of the aquifer back towards the Illinois River by reducing the mounding effect that occurred due to previous discharge of wastewater to Quarry 2. This would enhance the rate at which the arsenic levels in the plume on the eastern and southern PNA property boundaries fall. The use of ICs and alternate water supplies would reduce the potential health risks that could occur if contaminated groundwater were to be consumed.

This alternative would require that additional monitoring wells be drilled and periodically sampled for arsenic over a minimum 10 to 20-year timeframe until the MCL is met outside the PNA property boundaries. It would take approximately 12 months to implement the remedy and not more than two years. EPA estimates that it would take approximately 20 years to meet the groundwater RAO because it will take time to determine if the groundwater flow has been changed by the remedy. The cost to construct the remedy is estimated to be $2.2 million with an annual cost of $62,500 due to monitoring groundwater and reporting results. The total present worth cost is estimated at $3 million.

**Modified Alternative 4**: Surface Flow and Infiltration Reduction Measures and Alternative 2 except for Monitored Natural Attenuation (this is the preferred alternative)

Modified Alternative 4 consists of the same remedial measures evaluated under Alternative 4, but excludes MNA. As noted above, EPA would alter the paths of surface water drainage around Quarries 1 and 2. The surface work would reduce the rate of groundwater recharge in the quarries, which would slow the movement of arsenic from the source material into the groundwater below. The surface flow work also would change groundwater flow in the upper portion of the aquifer back towards the Illinois River by reducing the mounding effect that occurred due to previous discharge of wastewater to Quarry 2. This would enhance the rate at which the arsenic levels in the plume on the eastern and southern PNA property boundaries fall.

At the time that it issued the proposed plan, EPA supported a remedy that included surface flow and infiltration reduction measures, as described above, implementation of ICs and provision of alternate water supplies, but had concluded that not enough information was available to include MNA as part of the cleanup remedy. Despite excluding MNA, this remedial approach includes the same drilling and sampling of new monitoring wells as presented in Alternatives 2 through 6. The cost to implement the remedy is the same as Alternative 4–approximately $3 million.

**Alternative 5**: Groundwater Pump and Treat plus Alternative 2 (except MNA)

Under Alternative 5, EPA would implement the provisions of Alternative 2 (except for MNA) and install a groundwater pump-and-treat system along the Illinois River on PNA property to address the entire arsenic plume in OU 3. Pumped water would be sent to the Ottawa POTW or treated on-site and discharged to the Illinois River. About 600 gallons of water would be pumped per minute until arsenic levels in the bulk of the plume fall to below 10 ppb. This alternative would require that additional monitoring wells be drilled and periodically sampled for arsenic over a minimum 10 to 20-year timeframe until the MCL is met outside the PNA property boundaries. The use of ICs and alternate water supplies in the interim would reduce the potential health risks that could occur if contaminated groundwater were to be consumed.

It would take approximately 12 months to implement the remedy and not more than two years. EPA estimates that it would take approximately 20 years to meet the groundwater RAO because, like with Alternative 3, it will take time for the pump and treat system to operate properly and efficiently. The cost to construct the remedy is estimated to be $2.2 million (POTW) or $ 8.4 million (on-site treatment) with an annual operating cost of $1.3 million (POTW) or $ 2.2 million (on-site treatment). The total present worth cost is estimated at $18 million (POTW) or $36 million (on-site treatment).

**Alternative 6**: Source Material Removal plus Alternative 2

Under Alternative 6, EPA would implement the provisions of Alternative 2 and excavate and dispose off-site the G&P slurry material from Quarry 1. Removing the source material would enhance the rate at which the arsenic levels in the bulk of the plume fall to below 10 ppb. This alternative would require that additional monitoring wells be drilled and periodically sampled for arsenic over a 10 to 20-year timeframe until the MCL is met. In the interim, the use of ICs and alternate water supplies would reduce potential health risks that could occur if contaminated groundwater were to be consumed.

There are about 2.1 million cubic yards of G&P slurry in Quarry 1, which would require over two years of excavation and transportation work to remove. EPA estimates that it would take approximately 20 years to meet the groundwater RAO, depending on the amount of the source area that is excavated and monitoring results. The estimated cost to construct the remedy is $219 million with an annual cost of $50,000 due to monitoring groundwater and reporting results. The total present worth cost is estimated to be $220 million.

## X. Comparative Analysis

EPA evaluated the proposed alternatives using the Nine Criteria outlined in 40 C.F.R. § 300.430(e)(9):

1. Overall protection of human health and the environment - This criterion addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

The No Action alternative is not protective over the long term because it does not address the groundwater plume or prevent consumption of contaminated groundwater. Each of the remaining alternatives would be protective over the short-term because steps would be taken to protect human health (ICs and alternate water supply). Alternatives that include surface water diversion, pump and treat or excavation would be protective in the long-term because they would reduce arsenic levels in the plume to or below the arsenic MCL. EPA does not have enough evidence at this time to support a determination that MNA would be protective in the long-term.

With regard to the alternate water supplies, bottled water is not protective because residents may chose to not use the bottled water, the bottled water may not get delivered on time, and contaminated water would still be available from inside water sources, such as taps, shower and bath water, and water used for washing clothes. Similarly, a point-of-use treatment system, such as reverse osmosis, would not be protective because the system may not be placed appropriately to treat all incoming water and may have long-term maintenance issues.

A community well, new individual wells and the municipal water line are protective because they would provide permanent, reliable, clean water to all properties with private wells penetrating the contaminated portion of the St. Peter Sandstone aquifer. However, a community well and individual wells would require ongoing maintenance by the community or individuals. The best overall protection is the municipal water supply because it is maintained in perpetuity by the municipality.

2. Compliance with ARARs (Applicable or Relevant and Appropriate Requirements) – This criterion addresses whether a remedy will meet all applicable or relevant and appropriate requirements of federal and state environmental laws or provides a basis for invoking a waiver of any of the requirements.

The primary chemical-specific ARARs associated with OU 3 are the relevant and appropriate requirements of the Safe Drinking Water Act. Specifically, the arsenic MCL, at 10 ppb, is the target cleanup level for the St. Peter Sandstone aquifer wherever residential use may or could occur. In addition, depending on the remedial alternative, compliance with location-specific ARARs such as: OSHA worker protection standards; NPDES permitting requirements for discharge to surface water; off-site MCLs; Water Quality Criteria (40 C.F.R. Part 131); General Use Water Quality Standard for Protection of Aquatic Life; Secondary Contact and Indigenous Aquatic Life Standard; and Water Pollution, Pollution Control Board, Monitoring and Reporting; may be required.

The No Action alternative does not comply with ARARs. Because the remedy selected by this Interim ROD is an interim action, and attaining the MCL for arsenic will be part of the final remedy for OU 3, EPA is waiving compliance with this ARAR for the purposes of this Interim ROD in accordance with Section 121(d)(4)(A) of CERCLA, 42 U.S.C. § 121(d)(4)(A). For each of the other alternatives, compliance with the location-specific ARARs associated with the alternative is required. The final ROD for OU 3 will identify all of the ARARs with which the final remedy complies.

3. Long-term effectiveness and permanence – This criterion refers to the ability of a remedy to maintain reliable protection of human health and the environment over time after clean-up goals have been met.

The No Action alternative is not effective because cleanup goals would not be met under the alternative. Alternative 2 is not effective because EPA currently does not have enough information to include MNA in the cleanup remedy and it does not remove or contain the arsenic contamination. The remainder of the alternatives would provide reliable protection of human health and the environment over the long term because active measures would be taken to contain or remove the arsenic contamination and prevent exposure to arsenic by preventing the consumption of contaminated groundwater beneath the site. Alternative 6 would provide for the greatest measure of long-term effectiveness because the G&P slurry would be removed from Quarry 1 and would no longer be a long-term source of arsenic contamination to the aquifer, although the contaminant would not be destroyed and would be moved from the site to a more secure location (landfill) for management.

With regard to the alternate water supplies, bottled water is not protective in the long-term because residents may chose to not use the bottled water, the bottled water may not get delivered on time, and contaminated water would still be available from inside water sources, such as taps, shower and bath water, and water used for washing clothes. Similarly, a point-of-use treatment system, such as reverse osmosis, would not be protective because the system may not be placed appropriately to treat all incoming water and requires ongoing maintenance by the user.

A community well, new individual wells and the municipal water line are protective in the long-term because they would provide reliable, clean water to all water sources inside and outside the affected properties. However, a community well and individual wells would require ongoing maintenance by the community or individuals. The best overall protection is the municipal water supply because it is maintained in perpetuity by the municipality.

4. Reduction of toxicity, mobility, or volume – This criterion refers to the anticipated performance of the treatment technologies that a remedy may employ with respect to principal threat wastes at a site.

EPA has not made a determination about whether the G&P slurry or quarry sediment is a principal threat waste (see also Section XI).

5. Short-term effectiveness – This criterion evaluates the period of time needed to achieve protection and any adverse impacts on human health and environment that may be posed during construction and implementation of a clean-up action.

The no action alternative is not effective in the short term. Because of the time it will take to implement a permanent source of drinking water under the various alternate water supply alternatives, during which there is still a potential for exposure to the contaminated water, under the rest of the alternatives, bottled water would continue to be provided to properties with private wells penetrating the contaminated portion of the St. Peter Sandstone aquifer until a permanent alternate water supply is in place. At 28 months, Alternative 6 would take the most time to complete; in addition, there could be adverse short-term effects associated with the large-scale removal of the G&P slurry from Quarry 1 and shipment off-site.

6. Implementability – This criterion refers to the technical and administrative feasibility of a remedy, including availability of goods and services needed to carry out the chosen option.

Most of the alternatives are easily implemented and the goods and services needed to conduct the work are readily available. Extending the municipal water line poses a number of logistical and procedural hurdles (e.g., developing property owner support, municipal annexation); however, the municipal water line remedy is implementable and provides the most permanent clean water supply to properties with private wells penetrating the contaminated portion of the St. Peter Sandstone aquifer.

7. Cost – This criterion evaluates the estimated capital and operation and maintenance costs and estimated present-worth costs of each proposed alternative.

The No Action alternative costs nothing to implement. Alternative 2 is the least expensive of the remaining alternatives, but no active work is conducted to achieve cleanup goals and there is insufficient information to support a remedy that incorporates MNA. Alternative 3 takes action to reduce arsenic levels in the plume but is more costly than Alternative 4 and Modified Alternative 4 and yields no time advantage for the extra cost. Alternative 5 and Alternative 6 take the most action to reduce the arsenic plume; however, they are overly costly in relation to Alternative 4 and Modified Alternative 4.

With regard to the alternate water supply alternatives, the extension of the municipal water line eliminates the cost of maintaining a well and is the most cost effective. Until the selected permanent water supply is constructed and operational, bottled water must be supplied to properties with private wells penetrating the contaminated portion of the St. Peter Sandstone aquifer. Table 2 sets forth the estimated costs of the proposed alternate water supplies.

**Table 2: Costs of Alternate Water Supply Alternatives**

| Alternate Water Supply | Cost to implement |
|---|---|
| Bottled water | $ 531,000 |
| Municipal water extension | $ 427,000 |
| Point-of-use (reverse osmosis) system | $ 300,000 |
| Community well | $ 1,141,000 |
| New individual wells | $ 550,000 |

8. State agency acceptance – This criterion evaluates whether a support agency, based on comments submitted after its review of the Proposed Plan, concurs, opposes, or has no comment on the preferred alternative.

EPA sought Illinois EPA's concurrence on this Interim ROD; however, the State has not established a formal position regarding the remedy set forth in this Interim ROD.

9. Community acceptance – This criterion refers to the assessment of public comments received on the Proposed Plan.

EPA has addressed public comments received on the proposed plan for OU 3 in the attached Responsiveness Summary.

## Table 3: Evaluation of Remedial Alternatives Using the Nine Criteria

| Criterion | 1<br>No Action | 2<br>Alternate Water Supply, ICs, MNA | 3<br>Pump-and-Treat, Surface Flow Work, and Alternative 2 | 4<br>Surface Flow Work and Alternative 2 | 4 (modified)****<br>Surface Flow Work and Alternative 2 (except MNA) | 5<br>Pump-and-Treat, Surface Flow Work, and Alternative 2 (except MNA) | 6<br>Excavate Quarry 1 and Alternative 2 |
|---|---|---|---|---|---|---|---|
| **Protective of human health and the environment** | Not Protective | Not Protective | Protective*** | Protective*** | Protective*** | Protective*** | Protective*** |
| **Meets chemical-specific ARARs**<br>**Meets location-specific ARARs** | No<br>No | Waived<br>Yes | Waived<br>Yes | Waived<br>Yes | Waived<br>Yes | Waived<br>Yes | Waived<br>Yes |
| **Long-term effectiveness** | Not Effective | Not Effective | Effective*** | Effective*** | Effective*** | Effective*** | Effective*** |
| **Reduction of toxicity, mobility, or volume** | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable |
| **Short-term effectiveness** | No construction | > 12 months to complete | > 12 months to complete | > 12 months to complete | > 12 months to complete | < 12 months to complete | 28 months to complete |
| **Implementability** | Easily implemented | Easily implemented | Easily implemented | Easily implemented | Easily implemented | Easily implemented | Easily implemented |
| **Cost** | None | $1.45 million* | $6-25 million* | $3 million* | $ 2.72 million** | $18-36 million* | $220 million* |
| **State acceptance** | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown |
| **Public acceptance** | No | No | No | Yes | Yes | No | No |

* Average cost
** Actual cost
*** See Table 4 for the evaluation of alternate water supply alternatives using the Nine Criteria
**** Modified Alternative 4 is the preferred remedy and includes municipal water as the alternate water supply.

**Table 4: Evaluation of Alternate Water Supply Alternatives Using the Nine Criteria**

| Criterion | Bottled Water | Point-of-Use (Reverse Osmosis) System | Community Well | New Individual Wells | Municipal Waterline |
|---|---|---|---|---|---|
| **Protective of human health and the environment** | Not Protective | Not Protective | Protective | Protective | Protective |
| **Meets chemical-specific ARARs**<br>**Meets location-specific ARARs** | Waived<br>Yes | Waived<br>Yes | Waived<br>Yes | Waived<br>Yes | Waived<br>Yes |
| **Long term effectiveness** | Not Effective | Not Effective | Effective | Effective | Effective |
| **Reduction of toxicity, mobility, or volume** | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable |
| **Short-term effectiveness** | No construction | > 12 months to complete | > 12 months to complete | > 12 months to complete | < 12 months to complete |
| **Implementability** | Easily implemented | Easily implemented | Easily implemented | Easily implemented | Easily implemented |
| **Cost** | $531,107 | $300,000 | $1.14 million | $ 550,000 | $ 427,200 |
| **State acceptance** | Unknown | Unknown | Unknown | Unknown | Unknown |
| **Public acceptance** | yes | yes | yes | yes | yes |

## XI. Principal Threat Waste

The NCP establishes an expectation that EPA will use treatment technology to address the principal threat wastes at a site wherever practicable *(See* 40 C.F.R. § 300.430(a)(1)(iii)(A)). Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant threat to human health or the environment should exposure occur. Remedies that involve treatment of principal threat wastes likely will satisfy the statutory preference for treatment as a principal element.

EPA will make a determination on whether the G&P slurry or arsenic-impacted sediments in the quarries are principal threat waste in a final remedy for OU 3.

## XII. Selected Remedy

EPA selects Modified Alternative 4 – Surface Flow and Infiltration Reduction Measures plus Alternative 2 (except MNA) – to be implemented at OU 3 because it is protective of human health and the environment. The remedy specifically requires:

- Placing institutional controls on certain area properties to prevent future redevelopment for residential use and/or to prevent future potable use of contaminated groundwater;
- Implementing surface flow and infiltration reduction measures;
- Providing municipal water with bottled water in the interim;
- Monitoring groundwater quality over time.

Several different institutional controls will be used to prevent access to contaminated groundwater. Environmental covenants will be placed on properties with private wells penetrating the contaminated portion of the St. Peter Sandstone aquifer to prevent redevelopment for residential use and prevent future use of the groundwater. In addition to the environmental covenants, the City of Ottawa intends to enact a municipal ordinance that requires properties with private wells penetrating the contaminated portion of the St. Peter Sandstone aquifer to be plugged and prohibits the construction of new wells in the contaminated aquifer. Similarly, LaSalle County intends to enact a county-wide ordinance that prohibits the installation or use of water supply wells in the contaminated portion of the aquifer. These ICs will be enforced by LaSalle County and the City of Ottawa to ensure the long-term reliability of the ICs.

EPA will gather additional groundwater data and evaluate the impact of the surface flow and infiltration reduction measures that will be implemented as part of this interim remedy to make a more informed decision about the final remedy for OU 3. The need for this additional data is supported by recently released EPA guidance on groundwater-surface water interface considerations, which suggests that more work may be needed at OU 3 with regard to the actual or estimated arsenic concentration in the pore water of the Illinois River bottom next to the site.


**Figure 8:** OU 3 and the location of surface water drainage modifications

A. <u>Rationale for Selection</u>

EPA selected this interim remedy by evaluating the nine criteria specified in the NCP and site specific risks. A remedy selected for a site will be protective of human health and the environment, comply with ARARs (or justify a waiver) and offer the best balance of tradeoffs with respect to the balancing and modifying criteria in the NCP. Through the analyses conducted for the remedial investigation/feasibility study, EPA has determined that there is an unacceptable risk to human health and the environment from the consumption of arsenic-contaminated groundwater beneath OU 3.

In selecting Modified Alternative 4, EPA determined that the No Action alternative is not protective because it does nothing to prevent the potential consumption of contaminated groundwater. Alternative 2 is less desirable than Modified Alternative 4 because it takes no action to contain or reduce arsenic levels in the plume. Alternative 3 does take action to reduce arsenic levels in the plume but it is much more costly than Modified Alternative 4 and yields no time advantage for the extra cost. Alternatives 5 and 6 take the most action to reduce the arsenic plume; however, they are overly costly in relation to Alternative 4 and further studies are needed to determine their effectiveness. The excavation of the source material under Alternative 6 may have adverse short term effects because the work would take more than two years to conduct and the excavated materials would have to be trucked through the City of Ottawa on the way to an off-site landfill for disposal. Providing municipal water is permanent, cost effective and protective of human health and the environment.

B. Cost Estimate for the Selected Remedy

The present worth cost Modified Alternative 4 is estimated to be $2,720,000 over a 30-year timeframe. The major cost elements of the selected remedy are shown in Table 5.

**Table 5: Major Cost Elements of Selected Remedy**

| **Capital Cost Items** | **Estimated Costs*** |
|---|---|
| Alternate water supply (municipal line) | 305,000 |
| Abandon current well | 50,000 |
| Additional monitor wells | 50,000 |
| Bottled water for one year | 40,000 |
| Install drainage ditch | 45,000 |
| Clay liner in ditch | 195,000 |
| Site prep | 25,000 |
| Diversion around Quarry 2 | 50,000 |
| Install fencing | 110,000 |
| Install culvert to Quarry 4 | 435,000 |
| Miscellaneous construction work | 25,000 |
| Subtotal: | $ 1,330,000 |
| Project management, design, and on-site construction management (20%) | 265,000 |
| Subtotal | $ 1,595,000 |
| Bid contingency (10%) | 160,000 |
| Scope contingency (10 %) | 160,000 |
| Subtotal | $ 1,915,000 |
| Operation, maintenance, and monitoring years 1 to 30, present worth at 7% | (Annual 65,000) PW: 770,000 |
| Five-year reviews | 35,000 |
| **Total:** | **$ 2,720,000** |

* Rounded to nearest $5,000. Estimates are from the feasibility study. Accuracy is within +50% or – 30%. Volume estimates may be refined during the remedial design, potentially impacting cost estimates.

C. Expected Outcomes of the Selected Remedy

EPA estimates that it will take less than 12 months to complete the surface flow modifications at OU 3, thereby enhancing the rate at which groundwater flow in the upper part of the aquifer reverts to discharging into the Illinois River rather than spreading the arsenic contaminant plume around the groundwater mound in the Quarry 2 area. Receiving necessary municipal approvals, annexing properties with private wells penetrating the contaminated portion of the St. Peter Sandstone aquifer and construction of the municipal water supply line is expected to take approximately 12 months and will prevent contaminated water from reaching any drinking water sources. Bottled water will be provided to properties with private wells penetrating the contaminated portion of the St. Peter Sandstone aquifer until the line is fully installed. The use of ICs will provide protection by helping to prevent the use of the contaminated groundwater for potable purposes. In addition, EPA will continue to gather groundwater data and evaluate the impact of the surface flow and infiltration reduction measures implemented as part of this interim remedy to make a more informed decision about the final remedy for OU 3.

## XIII. Statutory Determinations

Section 121 of CERCLA (42 U.S.C. § 9621) and the NCP state that the lead agency must select remedies for Superfund sites 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 sections discuss how Modified Alternative 4 meets these statutory requirements.

1. Protection of Human Health and the Environment

The selected cleanup remedy, Modified Alternative 4, is an interim action and will protect human health and the environment from the groundwater consumption exposure pathway. Municipal water provides a safe and permanent source of drinking water to properties with private wells penetrating the contaminated portion of the St. Peter Sandstone aquifer. The use of ICs will reduce potential exposure to contaminated groundwater through existing wells and will prevent any future installation of wells into contaminated groundwater. Surface flow and infiltration reduction measures to divert surface water flow into the quarries will reduce surface water recharge into the underlying aquifers. The selected alternative presents no short-term threats to human health or the environment that cannot be readily controlled while the cleanup approaches are being implemented.

2. Compliance with Applicable or Relevant and Appropriate Requirements, Including Other Criteria, Advisories, or Guidance To Be Considered (TBCs)

Because this is an interim remedy, chemical-specific ARARs under the Safe Drinking Water Act are waived; however, the interim remedy will comply with location-specific ARARs, including: OSHA worker protection standards; NPDES permitting requirements for discharge to surface water; off-site MCLs; Water Quality Criteria (40 C.F.R. Part 131); General Use Water Quality Standard for Protection of Aquatic Life; Secondary Contact and Indigenous Aquatic Life Standard; Water Pollution, Pollution Control Board, Monitoring and Reporting; and ICs. The final ROD for OU 3 will contain a complete list of ARARs with which the final remedial action complies.

3. Cost-Effectiveness

EPA has determined that the interim remedy is cost-effective and represents a reasonable value for the estimated expenditure. Although it is not the least costly alternative, it achieves the remedial action objectives established in this Interim ROD within a reasonable timeframe at less cost than the pump and treat or excavation alternatives.

4. Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

None of the alternatives considered use of permanent solutions and alternative treatment technologies to address the arsenic in the groundwater or G&P slurry. It is not cost-effective to treat the large volume of G&P slurry at the site or to conduct a groundwater pump-and-treat remedy.

5. Preference for Treatment as a Principal Element

(See also Section XI) Because this action does not constitute the final remedy for OU 3, the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal component will be fully addressed by the final response action selected for OU 3.

6. Five-Year Review Requirement

EPA will perform a statutory five-year review of the remedial action after it is implemented to determine whether the remedy is or will be protective of human health and the environment because the cleanup will result in a hazardous substance, pollutant or contaminant (arsenic) remaining on site in excess of levels allowing for unlimited use and unrestricted exposure.

## XIV. Documentation of Significant Changes

The proposed plan for the OTFG Site was released for public comment in August 2009. The proposed plan identified Modified Alternative 4 – Surface Flow and Infiltration Reduction Measures plus Alternative 2 (except MNA) – as the preferred alternative. EPA reviewed all written and verbal comments submitted during the public comment period and determined that no significant changes to the remedy, as originally indentified in the proposed plan, were necessary or appropriate.

# RESPONSIVENESS SUMMARY

Ottawa Township Flat Glass Site
La Salle County, Illinois

EPA met the public participation requirements of Sections 113(k)(2)(B)(i-v) and 117(b) of CERCLA (42 U.S.C. §§ 9613(k)(2)(B)(i-v) and 9617(b)) during the remedy selection process for the "Source Areas and Groundwater South of the Illinois River" operable unit (OU 3) of the Ottawa Township Flat Glass (OTFG) site. Sections 113(k)(2)(B)(iv) and 117(b) require EPA to respond "...to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan for a remedial action. This Responsiveness Summary addresses those concerns expressed by the public, potentially responsible parties (PRPs), and governmental bodies in written and oral comments we've received regarding the proposed remedy for the site.

EPA has established information repositories for the OTFG site at the following locations:

- U.S. EPA - Region 5, Records Center, 77 W. Jackson Blvd., Chicago, Illinois
- Reddick Library, 1010 Canal St., Ottawa, Illinois

The Administrative Record containing all information EPA used to select the interim cleanup remedy for OU 3 is also available to the public at these locations.

## Background

EPA signed an administrative order on consent (AOC) with Pilkington North America, Inc. (PNA), the current site owner, to begin a remedial investigation and feasibility study at the OTFG site in fall 2001. For OU 3, PNA sampled and analyzed contaminant levels in soil, sediment, surface water and groundwater. A human health and an ecological risk assessment was then conducted using the sampling data to determine actual or potential risks to human health and the environment posed by site contaminants. PNA completed the remedial investigation for OU 3 in August 2008 and completed a feasibility study to evaluate potential cleanup remedies for OU 3 in June 2009.

On August 19, 2009, EPA issued a proposed plan fact sheet to the public to summarize the results of the remedial investigation and baseline risk assessment for OU 3. EPA also presented its recommended interim remedial action in response to the estimated health risks. The proposed plan was available for public comment from August 19 through September 18, 2009. EPA placed an advertisement announcing the availability of the proposed plan and the start of the comment period in the *Ottawa Times,* a local newspaper of wide circulation in the site area. Each fact sheet contained an EPA-self-addressed comment page to facilitate receipt of mailed comments. EPA indicated in the fact sheet that it would accept written, e-mailed, or faxed comments during the public comment period.

EPA held a public meeting and public hearing at the La Salle County government complex on August 26, 2009 to discuss the results of the remedial investigation and feasibility study, to answer any questions regarding the proposed remedial action alternatives, and to take oral comments regarding the proposed actions. About 20 people, including local residents, attended the public meeting. A court reporter documented the proceedings of the public meeting. EPA placed a verbatim transcript of the meeting into the information repositories and the Administrative Record. EPA received no oral comments about the proposed plan during the public meeting.

EPA received one written comment concerning the proposed plan during the comment period. A summary of that comment and EPA's response to the comment is included in this Responsiveness Summary, which is a part of the Interim Record of Decision for OU 3 of the OTFG site.

Summary of Significant Comment

Pilkington North America, Inc., submitted a comment letter to EPA on September 15, 2009, the conclusion of which is set forth below:

> PNA is agrees with EPA's selection of the requirements specified in Alternative 4 (and Modified Alternative 4). These actions are the appropriate remedial approach for this site and are consistent with the NCP.
>
> However, PNA believes the evidence and requirements of the NCP support selection of Alternative 4 (including MNA) as the final remedy for the source areas and groundwater at OU 3. EPA has sufficient information to select MNA as the remedy now. PNA agrees with the EPA that more data must be gathered and that the remedial approach for the entire Site will be implemented in as integrated manner when the remedy for Operable Unit 4 is selected. However, all Superfund RODs require additional information to be gathered and it is unlikely new information will change the basic approach.
>
> Nonetheless, PNA has worked cooperatively with EPA to solve the problems that it inherited when it purchased this property in 1986. We look forward to working with the EPA to implement the appropriate remedy for OU 3 and on determining the remedy for OU 4.

PNA's letter is included in the Administrative Record for the OTFG site; therefore, it is not reproduced in its entirety here.

EPA Response

PNA presented several remedial alternatives in a feasibility study dated June 2009. After evaluating the alternatives set forth in the feasibility study, EPA proposed

Alternative 4, modified to exclude modified natural attenuation (MNA), as the preferred interim remedy. EPA excluded MNA from Alternative 4 because it had determined that not enough information is available to support a remedy at OU 3 that includes MNA as a component. In addition, recently released EPA guidance on groundwater-surface water interface considerations suggests that more work may be needed at OU 3 to determine the actual or estimated arsenic concentration in the pore water of the Illinois River bottom next to the site.

EPA will continue to gather additional groundwater data to make a more informed decision about the final remedy for OU 3.