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Environmental Protection Agency

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DECISION DOCUMENT

FOR THE REMEDIATION OF THE

KING ROAD LANDFILL

LUCAS COUNTY, OHIO

Division of Environmental Response and Revitalization

September 2012

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Scott J. Nally, Director

I certify this to be a true and accurate copy of the official documents as filed in the records of the Ohio Environmental Protection Agency.

By: Jody Lassiter Date: 9/10/12

DECLARATION

SITE NAME AND LOCATION

King Road Landfill
Lucas County, Ohio

STATEMENT OF BASIS AND PURPOSE

This Decision Document presents the selected remedial action for the King Road Landfill (Site) in Lucas County, Ohio (see Figures 1 and 2), chosen in accordance with the policies of the Ohio Environmental Protection Agency, statutes and regulations of the State of Ohio, and the National Contingency Plan, 40 CFR Part 300.

ASSESSMENT OF THE SITE

Actual and threatened releases of industrial waste, hazardous waste, and municipal wastes at the Site, if not addressed by implementing the remedial action selected in the Decision Document, constitute a substantial threat to public health or safety and are causing or contributing to air or water pollution or soil contamination. The municipal waste originated during the twenty-three (23) year operating history of the landfill, 1954 through 1976. During at least a three (3) year period, industrial and hazardous wastes were also accepted at the landfill.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy is Alternative No. 11 from the December 2010 Preferred Plan. Selection of this remedy is possible as a result of the exemption, issued by the Director of Ohio EPA on April 16, 2009, from the current construction standards for a solid waste cap. The exemption allows for the installation of an alternative cap. The Plan includes: a groundwater monitoring system, the collection of hazardous gases which form within the Site, an operation-& maintenance program, an environmental covenant to limit use of the Site, supplemental cover and an evapotranspirative cover, control of the Site to eliminate public contact with dangerous areas, permitted beneficial reuse, and the establishment of an administrative "No Well Zone" (NWZ) in conjunction with ensuring that all local receptors are linked to the municipal water supply. All existing measures to control leachate discharge from the Site must be retained.

The remedy will require the installation of additional soil cover in areas previously identified as having exposed waste or less than 24 inches of soil above the waste. The remedial design for the cover must be approved by Ohio EPA and the cover must pass

a post-construction inspection by Ohio EPA. Operation and maintenance of the cover must be provided for 30 years, at a minimum, through the development of an Operation and Maintenance (O&M) Plan, to be approved by Ohio EPA.

The Lucas County Board of Health intends to establish a NWZ around the landfill sufficient in radius to encompass the radial groundwater flow from the landfill, thus eliminating the dermal, inhalation, and ingestion potential of any contaminants found in the groundwater. The NWZ would prohibit all use of groundwater within this area. A series of shallow groundwater monitoring wells would be established between the landfill and Ten Mile Creek. The objective would be to establish a monitoring program to evaluate the shallow groundwater flow from the landfill toward the creek.

Monitored natural attenuation (MNA) is the most appropriate alternative to address the pond water and sediments. The first step in the MNA program is to control or eliminate the source material. This would be accomplished by the reduction/elimination of leachate through landfill capping. The collection basins currently required by the Ohio EPA Division of Surface Water (DSW) would continue to operate in order to remove contaminated surface water via the Publicly Owned Treatment Works (POTW). The second step in the MNA process is periodic monitoring of the pond water and sediments for all contaminants of concern (COCs).

Beneficial reuse projects would be allowed at the King Road Landfill, on a case by case basis, subject to a detailed written proposal, which would be submitted to Ohio EPA through the office of the Lucas County Sanitary Engineer.

The landfill cover must meet the Remedial Action Objectives (RAOs) for reducing leachate production, containing solid refuse, and collecting/controlling landfill gas.

Details of the final cover will be determined during the development of the Remedial Design and implemented during the Remedial Action. The final surface must be appropriately graded and maintained to ensure that erosion does not adversely impact the remedy, and the soil cover must be augmented with an appropriate vegetative cover.

The property boundary of the King Road Landfill is larger than the area comprising the known limits of waste deposition. Only the known limits of waste deposition must be covered by the vegetative cover material. Surface soils outside the known limits of waste deposition may be impacted from contaminant migration.

The cover must pass periodic inspections by Ohio EPA.

Existing fencing and signage around the perimeter of the landfill must be maintained. Fencing and signage must also be installed and maintained to restrict access to the Borrow Pit Pond waters and sediments. These actions must protect the capped section

of the landfill from damage, and prevent access to the areas containing contaminated surface water and sediments of the Borrow Pit Pond. These actions are expected to meet the RAO to prevent direct surface contact with contaminants.

Hot spots (i.e., sediment deposition in ditches) have been identified in the Remedial Investigation and Feasibility Study Reports approved by Ohio EPA. The hot spots include those ditches demonstrated to have been in seasonal contact with the unconfined aquifer, and/or to have been a receptor of landfill leachate and solid waste discharges. These materials must be stockpiled, sampled and the samples submitted for laboratory analysis to determine if the stockpiled material is a characteristic hazardous waste. Only non-hazardous excavated materials may be placed under the cap. Any materials determined to be hazardous wastes must be transported off-Site to a permitted hazardous waste disposal facility. This action is expected to meet the RAO of preventing direct surface contact with contaminants.

The NWZ would prohibit all use of groundwater within this area. The Lucas County Sanitary Engineer has determined that a public water supply is available to all homes and facilities currently present in the area around the King Road Landfill. This action is expected to meet the RAO of preventing contact with contaminated groundwater.

With a NWZ in place, the remaining concern would be potential environmental impact to Ten Mile Creek from the shallow aquifer, which is in communication with this surface water body. A series of shallow groundwater monitoring wells would be established between the landfill and Ten Mile Creek. The specific locations and number of wells, the monitoring frequencies and analytical parameters will be determined in Remedial Design. The objective would be to establish a monitoring program to evaluate the shallow groundwater flow from the landfill toward the creek. Results of initial annual monitoring would establish the frequency of future monitoring and/or the necessity for contingent (more active) remedial actions.

Increased contaminant flow toward the creek may necessitate the installation of leachate collection wells, with subsequent leachate discharge to the Lucas County POTW for treatment. This would provide control of contaminant migration in groundwater and assure that the leachate is properly treated prior to discharge to surface water.

The intermediate and deep groundwater zones are also to be included in the NWZ area. No practical or economic method exists for the remediation of the existing low contamination levels. The dilution of existing contaminants by natural groundwater movement, combined with the infiltration reduction associated with the cap, is expected to provide the most effective solution to the contaminants in these zones.

Direct communication between the Borrow Pit Pond and the ground water in the shallow aquifer has been documented. At present, the water discharged from the Pond is

captured and pumped to the Lucas County POTW by a pump station and force main installed for this purpose under a December 4, 1992 Consent Order between the State of Ohio and the Board of Lucas County Commissioners.

The contaminant levels in the sediments of the Pond are generally low in concentration and not precisely identified as to location, making physical remedial actions such as dredging or de-watering costly, while providing questionable benefits. Thus, monitored natural attenuation (MNA) is the most appropriate alternative to address the Pond water and sediments. The first step in the MNA program is to control or eliminate the source material. This will be accomplished by the reduction/elimination of leachate through landfill capping. The collection basins required by DSW must continue to operate in order to remove contaminated surface water via the POTW. The second step in the MNA process is periodic monitoring of the Pond water and sediments for all COCs. This action is expected to meet the RAO for preventing direct surface contact with contaminants.

Beneficial reuse projects would be allowed at the King Road Landfill, on a case-by-case basis, subject to a detailed written proposal, which would be submitted to Ohio EPA through the office of the Lucas County Sanitary Engineer. The submission and approval process would occur during the Remedial Design phase. Sufficient detail, as determined by Ohio EPA, will be required for each beneficial reuse project in order to allow Ohio EPA to evaluate each project.

STATUTORY DETERMINATIONS

The selected remedial action is protective of human health and the environment, complies with legally applicable state and federal requirements, is responsive to public participation and input and is cost-effective. The remedy uses permanent solutions and treatment technologies to the maximum extent practicable to reduce toxicity, mobility and volume of hazardous substances at the Site. The effectiveness of the remedy will be reviewed regularly.

Scott J. Nally, Director

8/31/12
Date

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DECISION SUMMARY
For King Road Landfill
Lucas County, Ohio

1.0 SUMMARY OF SITE CONDITIONS

1.1 Site History

The King Road Landfill (Site or landfill) is located at 3535 King Road, Sylvania Township, Lucas County, Ohio 43617. The landfill is within Section 20, Township 9 South, Range 6 East, of Sylvania Township. The Site occupies a total of approximately 104 acres. The former Toledo, Angola, and Western Railroad right-of-way traverses the Site and provides separation between an approximate 25-acre former soil borrow area to the north and an approximate 79-acre disposal area to the south. The 79-acre disposal area is bounded by the former railroad right-of-way to the north, King Road to the east, Covert Road to the south, and Silica Road to the west. Approximately 70 acres of this 79-acre disposal area are believed to have been disturbed by waste disposal activity. The former soil borrow area, now known as the Borrow Pit Pond, contains ponded water and marsh-like vegetation.

The key geologic and hydrogeologic features of the Site consist of a surficial sand layer extending to depths between 20 and 45 feet below the ground surface, which contains an unconfined aquifer with a water table typically found between one and eight feet below the ground surface. A silty to gravelly clay layer ranging from 3 to 35 feet in thickness is located beneath the surficial sand layer. Bedrock consisting of dolomitic limestone is found beneath the clay layer. A confined aquifer is contained within the dolomitic bedrock. The Borrow Pit Pond is an apparent discharge area for the unconfined aquifer. Ten Mile Creek is located west of Silica Road and is apparently both a discharge area for the unconfined aquifer and a recharge area for the confined aquifer. General groundwater movement in the unconfined aquifer is northwest toward Ten Mile Creek. Groundwater movement within the confined aquifer is east toward the Maumee River.

The Lucas County Commissioners purchased the Site in 1953. Landfilling operations commenced at the Site in January 1954 under the direction of the Lucas County Sanitary Engineer. The facility was operated by the County until May 8, 1967, when Park Forest Development, Inc. was contracted to operate the landfill. On March 15, 1970, the County again took over control of landfill operations. Commercial waste haulers were prohibited from using the landfill on August 21, 1973, after which usage of the landfill gradually lessened. The County officially ceased waste disposal activities in December 1976.

Upon opening in 1954, only local residents used the landfill. Gradually, commercial waste haulers and small municipalities began bringing their wastes to the facility. While

the majority of disposed materials were believed to be general household refuse, disposal of some industrial wastes cannot be ruled out. During the time that Park Forest Development, Inc. operated the facility, the number of commercial and industrial waste haulers using the Site is reported to have increased. No disposal records are known to exist, but both solid and liquid wastes were reportedly accepted.

While open burning of the wastes was not typically an accepted practice, there are several reports of waste having caught fire during the operational life of the King Road Landfill. Due to the scarcity of records regarding landfill operations at the Site, it is impossible to determine the disposal rate at the facility over its entire period of operation. However, available records do indicate that the average volume of waste disposal between March 1970 and August 1973 was approximately 25,000 cubic yards per month. After commercial waste haulers were prohibited from using the facility in August 1973, the average volume of waste disposed reportedly decreased to approximately 5,000 cubic yards per month.

Since the cessation of waste disposal activities in 1976, few modifications to the facility have been made. Beginning in May 1980 and continuing through July 1991, a transfer station was operated near the main gate on King Road. In October 1991, a perimeter fence was installed to control Site access by unauthorized individuals.

A Remedial Investigation (RI) was conducted during 1993-94, and the results were issued in a November 1994 RI Report. A supplemental investigation was conducted in 1995 and a revised RI Report was issued in February 1996. The primary objectives of the RI investigation were to identify which contaminants were leaving the Site, the pathways through which this migration was occurring, and what risk to human health and the environment was associated with this migration. No investigation of deposited wastes was conducted. A Feasibility Study (FS) Report identifying and evaluating a total of nine (9) remedial alternatives was completed in October 2002 for the Site. The FS Report is a compilation of the draft FS Report (nine alternatives), a modification of the FS Report to include an additional alternative (Alternative No. 10), and several iterations of an alternative (Alternative No. 11) submitted to Ohio EPA by the Lucas County Commissioners for consideration as an addendum.

A force-main interceptor sewer and associated pump station were installed in the 1993-94 period, at the northwest corner of the landfill along Silica Road. These facilities collect and transport landfill surface water runoff contaminated with landfill-derived leachate to the Lucas County Maumee River Wastewater Treatment System, a Publicly Owned Treatment Works (POTW). This collection and transport system was placed into service in May 1994.

Specific explosive gas monitoring requirements for the Site were included in an October 20, 1994 Order issued by the Director (and modified on October 25, 1995) upon recommendation from Ohio EPA's Division of Solid and Infectious Waste Management.

In the fall of 1996, a gas remediation trench was installed on the west side of the landfill, and six passive gas vents were installed near the south side of the landfill.

On December 4, 2008, the Lucas County Sanitary Engineer requested an exemption pursuant to ORC 3734.02(G) and OAC 3745-27-03(B), from the requirements to construct a composite cap system in accordance with OAC 3745-27-11(G). On April 16, 2009, the Director of Ohio EPA approved the request for exemption from the 2003 construction standards for a solid waste cap, such that an alternative cap may be installed. Threshold requirements for cap design must still be met; however, the exemption enables the threshold requirements of overall protection of human health and environment and compliance with ARARs to be achieved.

1.2 Summary of the Remedial Investigation

The RI was conducted by the Lucas County Commissioners and included a number of tasks to identify the nature and extent of Site-related chemical contaminants. The investigation was conducted with oversight by Ohio EPA, and the subsequent RI Report was approved in February 1996. The tasks included sampling of air, water, soil, surface water and ground water. The data obtained from the investigation were used to conduct a baseline risk assessment and to determine the need to evaluate remedial alternatives. This Decision Document contains only a brief summary of the findings of the RI and FS. Please refer to the RI and FS Reports for additional information on contaminant concentrations.

The nature and extent of contamination at the King Road Landfill in each environmental medium and the COCs attributable to the Site are described below.

1.2.1 Soil Contamination

Throughout the Site, the principal contaminant of concern is arsenic. Arsenic concentrations in soil were high enough to cause excess cancer risks for ingestion and dermal contact. The areas of greatest concern are associated with landfill leachate seeps.

1.2.2 Ground Water Contamination

In both the confined and unconfined aquifers, contaminants were found at concentrations which result in unacceptable cancer risks for both ingestion and dermal exposure pathways. The primary contaminant is arsenic, although other chemicals of concern, including copper, beryllium, bromodichloromethane, bis(2-ethylhexyl)phthalate, 1,4-dioxane, and tetrahydrofuran were found in the unconfined aquifer. Copper is the only other chemical of concern, in addition to arsenic, found in the confined aquifer.

Based on the potentiometric surface of the unconfined aquifer and the results of groundwater modeling (particle tracking), most of the groundwater in this aquifer migrates westward toward the flood plain. There is also an apparent tendency for some migration to the south across Covert Road and to the east across King Road. This is consistent with the mounding of groundwater within the landfill.

1.2.3 Surface Water Contamination

Seasonally, surface water in the ditches is in communication with the unconfined aquifer. The ditches have been receptors of landfill leachate and surface water discharge from the landfill. The primary contaminant is arsenic.

The Borrow Pit Pond has also been a receptor of landfill leachate. The water and sediments in the pond have proven to be toxic to certain aquatic test species. One toxic agent has been identified as ammonia.

Contaminants were identified in both Ten Mile Creek and its flood plain, although the landfill may not be the source or only source of these contaminants. The primary contaminant is arsenic.

1.2.4 Sediment Contamination

The ditches have been receptors of landfill leachate from surface water discharge from the landfill. The primary contaminant is arsenic. Sediments from the Pond have been demonstrated to exhibit toxicity.

1.2.5 Outdoor and Indoor Air Contamination

Investigation of the air pathway determined that no chemicals of concern are present.

1.3 Interim or Removal Actions Taken to Date

A force-main interceptor sewer and associated pump station were installed and placed into service in 1993-94, under an Order issued by the Director upon recommendation of Ohio EPA's Division of Surface Water (DSW). These facilities are located at the northwest corner of the landfill along Silica Road, where they collect and transport landfill surface water runoff contaminated with landfill-derived leachate to the Lucas County Maumee River Wastewater Treatment System.

Specific explosive gas monitoring requirements for the Site were included in an October 20, 1994 Order issued by the Director (and modified on October 25, 1995) upon recommendation of Ohio EPA's Division of Solid and Infectious Waste Management. In the fall of 1996, a gas remediation trench was installed on the west side of the landfill, and six passive gas vents were installed near the south side of the landfill.

1.4 Summary of Site Risks and Need for Remedial Action

A baseline risk assessment was conducted to evaluate current and potential future risks to human health and to ecological receptors as the result of exposure to contaminants present at the Site. The results demonstrated that the existing concentration of contaminants in environmental media pose risks to human and ecological receptors at a level sufficient to necessitate remedial actions.

1.4.1 Risks to Human Health

The human health risk assessment is an analysis of the potential adverse health effects caused by substance releases from the Site in the absence of any actions to control or mitigate these releases. The risk assessment contributes to the Site characterization and subsequent development, evaluation, and selection of appropriate response alternatives.

Table 7.1.1 of the FS lists all of the chemicals included in the human health risk assessment. Since three risk assessment scenarios were evaluated, the parameters differ for each case. Inclusion of a particular parameter as a potential chemical of concern at this stage does not necessarily indicate such a parameter is at a concentration of significance for health risk.

The first step was to characterize the Site with respect to the general physical characteristics and with respect to the characteristics of the populations near the Site. Exposure pathways were identified and then exposure concentrations and intakes were estimated. An exposure pathway generally consists of 4 elements: (1) a source and mechanism of chemical release; (2) a retention or transport medium; (3) a point of potential human contact with the contaminated medium; and (4) an exposure route at the contact point.

The human health risk assessment scenarios for the King Road Landfill include:

I. Current and Future On-Site Trespass

II. Future On-Site Residential Use
    Unconfined aquifer
    Confined aquifer

III. Current and Future Off-Site Residential Use
    Unconfined aquifer
    Confined aquifer

Current and Future On-Site Trespass

Currently, access to the Site by the general public is restricted by a fence surrounding the entire Site. Nevertheless, the on-Site trespass scenario has been considered.

The risk assessment scenario assumes that three types of persons may trespass at the King Road Landfill; an adult, an adolescent, and a child. The adult and adolescent trespassers were evaluated for both current and future scenarios, and the child for the future case scenario only.

The pathways of exposure for this risk assessment case are soil dermal and ingestion, surface water dermal and ingestion, sediment dermal, and air inhalation. The groundwater and fish consumption pathways were not considered since it is assumed that the trespassers will not have access to the groundwater, nor will they eat fish while trespassing.

All of the surface soil analytical data results were used for the soil concentrations in the soil ingestion and soil dermal pathways. All of the surface water and sediment sample analytical data results obtained from the flood plain, Ten Mile Creek, the Borrow Pit Pond, Porter Ditch and the northwest ditch were used in the surface water and sediment pathways. The surface water analytical data was divided into two cases: (1) the first case considered the flood plain, Porter Ditch, and the northwest ditch to be wading areas; and (2) the second case considered the Borrow Pit Pond and Ten Mile Creek to be swimming areas.

Air samples were collected on four separate occasions. For the first two sampling events, samples were collected at five locations at the King Road Landfill. Samples were collected at two locations during the last two sampling events.

Future On-Site Residential Use

The King Road Landfill is not being used for any purpose at the present time. However, for risk assessment purposes, one of the scenarios assumes that residents will live on the landfill in the future. The risk assessment scenario assumes that an adult resident lives at the King Road Landfill an average of 9 years and the reasonable maximum exposure time is 30 years. The average time a child lives at the landfill is 6 years and the reasonable maximum exposure time is also 6 years.

The pathways of exposure for this risk assessment case are soil dermal and ingestion, surface water dermal and ingestion, sediment dermal, and air inhalation. Groundwater (confined and unconfined aquifers) dermal and ingestion and fish consumption are also considered. Separate scenarios were considered for the two distinct aquifers.

All of the surface soil analytical data results were used for the soil concentrations in the soil ingestion and soil dermal pathways. All of the surface water and sediment sample analytical data results obtained from the flood plain, Ten Mile Creek, the Borrow Pit Pond, Porter Ditch and the northwest ditch were used in the surface water and sediment pathways. The surface water analytical data was divided into two cases: (1) the first case considered the flood plain, Porter Ditch, and the northwest ditch to be wading areas; and (2) the second case considered the Borrow Pit Pond and Ten Mile Creek to be swimming areas.

Air samples were collected on four separate occasions. For the first two sampling events, samples were collected at five locations at the King Road Landfill. Samples were collected at two locations during the last two sampling events.

Current and Future Off-Site Residential Use

The risk assessment scenario assumes that an adult resident lives near the King Road Landfill an average of 9 years and the reasonable maximum exposure time is 30 years. The average time a child lives near the landfill is 6 years and the reasonable maximum exposure time is also 6 years. The pathways of exposure for this risk assessment case are soil dermal and ingestion, surface water dermal and ingestion, sediment dermal, air inhalation, groundwater (confined and unconfined aquifers) dermal and ingestion, and fish consumption. Separate scenarios were considered for the two distinct aquifers.

Air samples were collected on four separate occasions. For the first two sampling events, samples were collected at five locations at the King Road Landfill. Samples were collected at two locations during the last two sampling events.

Fish concentrations were obtained from previous Ohio EPA studies/reports. If a parameter was detected in the fish and was also detected at the King Road Landfill, then it was considered to be potentially Site-related and therefore was included in the risk assessment.

1.4.1.1 Human Health Assessment, Toxicity Assessment

Table 7.1.4 in the FS Report provides the toxicity values and carcinogenicity classifications for all of the chemicals used in the human health risk assessment, along with the sub-chronic reference dose (RfD) used in the Current and Future Trespasser scenario. The sub-chronic toxicity values were used to evaluate the potential non-carcinogenic effects of exposure periods between 2 weeks and 7 years. All toxicity values were obtained from either the Integrated Risk Information System (IRIS) or Health Effects Assessment Summary Tables (HEAST). These references were used to determine USEPA reviewed/accepted toxicity information. For a limited number of chemicals which did not have IRIS or HEAST data available, RfDs were estimated using equations in the *Risk Assessment Guidance for Superfund Evaluation Manual (RAGS)*. In order to be conservative, the maximum number of uncertainty and modifying factor values were used.

To help assess the polynuclear aromatic hydrocarbons for this risk assessment, the *Provisional Guidance for Quantitative Risk Assessment of Polynuclear Aromatic Hydrocarbons* was referenced.

1.4.1.2 Human Health Assessment, Risk Characterization

Non-Carcinogens

For non-carcinogens, *RAGS* and the Ohio EPA Generic Statement of Work (SOW) use a hazard index (HI) to assess the overall potential for health effects. For each non-carcinogenic chronic exposure pathway, a HI was calculated. To assess the overall potential for non-carcinogenic effects posed by all of the exposure pathways, a total exposure HI was calculated. In each case, whenever the HI exceeds unity (i.e., 1.0), there may be concern for potential non-carcinogenic health effects.

Carcinogens

The risk posed by carcinogens was also calculated to determine risk numbers. The calculated risk was then compared to acceptable risk standards. Ohio EPA has set an acceptable risk limit of $1x10^{-5}$ for remediation goals for single constituents.

Exposure determination for each pathway involved determining either the HI or the carcinogenic risk calculation. The chronic daily intake or dermal absorbed dose for each constituent was then considered. The *RAGS* evaluation manual and Dermal Exposure Assessment manual provided specific equations which were used to calculate exposure for each pathway.

Carcinogenic risks for both adults and children, and for each potential exposure pathway, have been calculated based on the daily intake, absorbed rates, and carcinogenic slope factors. After each of these risks was calculated, a separate total risk was compiled. Non-carcinogenic hazard index values for both adults and children were calculated for each potential pathway based on the daily intake and absorbed rates, and the verified reference doses.

1.4.2 Risks to Ecological Receptors

The ecological risk assessment presents an evaluation of potential ecological effects, and characterizes the adverse effects of waste constituents on flora and fauna, and at the population, community or ecosystem level.

The overall environmental assessment area includes all terrestrial areas within the landfill's property lines, the Borrow Pit Pond, the flood plain west of Silica Road, and Ten Mile Creek. By combining information from the presence of potential waste constituents in environmental media with information concerning the ecology of the various areas assessed, ecological resources of primary concern were identified.

Several criteria, as outlined by USEPA, were used to determine whether the King Road Landfill or surrounding areas contained ecological resources or areas of concern. Some environments such as wetlands, flood plains, lakes and streams may require consideration if local, state, or federal laws and regulations require that these ecological resources be given special consideration or protection. Other areas, such as unique or unusual habitats, or areas necessary for the continued propagation of key species may also warrant consideration. Areas which may meet one or more of the ecological criteria include the Borrow Pit Pond, Ten Mile Creek, and its adjacent flood plain.

Borrow Pit Pond

Based upon observations relative to the Borrow Pit Pond, it appears that any ecological risk associated with the leachate and the toxic constituent in the surface water (i.e., ammonia) is limited to the area in the immediate vicinity of the leachate seeps. However, any ecological risks which may be present as a result of the sediment toxicity in the Pond may be more aerially extensive. Since sediment toxicity has been demonstrated and it is clear that at least some fauna are likely to feed on the macro invertebrates and amphibians that inhabit the pond, the only conclusion that can be drawn at this time is that there may be some ecological risk associated with one or more of the constituents that have been detected in the sediments.

Ten Mile Creek

Parameter concentrations in the Creek were generally low. The exceedances of Ohio EPA water quality criteria were cyanide and total recoverable iron. Similar values for these parameters were experienced both upstream and downstream of the landfill.

Flood Plain

Amphibian and reptilian fauna appeared to be conspicuously absent from the flood plain during the period of investigation. The flood plain area is a unique forested wetland habitat that no longer exists elsewhere along the banks of Ten Mile Creek. Recent disturbances in the vicinity of the flood plain may be the reason for the absence of fauna in the area. These disturbances have included deforestation in the flood plain north of the area of study, excavation and blasting in the area for installation of a sanitary sewer system, and changes in hydrology due to the installation of a sump system which collects water leaving the landfill before it enters the flood plain.

1.4.3 Summary of Risks

In general, the primary health and environmental risks of this Site result from arsenic contamination. Concentrations of arsenic in shallow soils are high enough to cause excess cancer risks through ingestion and dermal contact. Arsenic, in both the confined and unconfined aquifers, has been identified at concentrations which result in

unacceptable cancer risks for both ingestion and dermal exposure pathways related to the current and future off-Site resident and the future on-Site resident scenarios. Bis(2-ethylhexyl)phthalate has been identified in excess of the carcinogenic risk goal for dermal contact in the unconfined aquifer related to the current and future off-Site scenario. Bis(2-ethylhexyl)phthalate and beryllium have been identified in excess of the carcinogenic risk goal for the ingestion and dermal pathways in the confined and unconfined aquifers related to the future on-Site scenario. And finally, 1,4-dioxane has been identified in excess of the carcinogenic risk goal for the ingestion pathway in the unconfined aquifer related to the future on-Site scenario.

The ecological risks associated with the King Road Landfill were evaluated based on several criteria for delineating ecological resources or areas of concern. Based on this evaluation, the areas of ecological significance were determined to be the Borrow Pit Pond and Ten Mile Creek and its adjacent floodplain. Water in the areas of leachate seeps in the Borrow Pit Pond was found to be toxic to two aquatic test species. The toxic agent was determined to be ammonia. Sediments in the Borrow Pit Pond were also determined to be toxic to environmental receptors. Arsenic and ammonia were constituents of concern identified in both Ten Mile Creek and its flood plain. These contaminants represent an environmental concern. Arsenic is a known human carcinogen and ammonia has been demonstrated to be toxic to environmental receptors.

2.0 REMEDIAL ACTION OBJECTIVES

As part of the RI/FS process, remedial action objectives (RAOs) were developed in accordance with the National Contingency Plan (NCP), 40 CFR Part 300, which was promulgated under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by, *inter alia,* the Superfund Amendments and Reauthorization Act of 1986 (SARA), and U.S. EPA guidance. The RAOs are goals that a remedy should achieve in order to ensure the protection of human health and the environment. The goals are designed specifically to mitigate the potential adverse effects of Site contaminants present in environmental media. For environmental media, remediation levels were developed for a range of potential residual carcinogenic risk levels (*i.e.*, 1 in 100,000, 1 in 1,000,000 etc.) and using a non-cancer hazard quotient (or index) of 1 for a range of potentially exposed receptors, including:

I. Grounds workers;
II. Construction workers;
III. Off-Site residents;
IV. On-Site trespassers;
V. Office employees;
VI. Future construction workers;
VII. Future adult residents; and
VIII. Future child residents.

These carcinogenic risk levels refer to the increased likelihood that someone exposed to the chemical releases from the Site would develop cancer during his/her lifetime as compared with a person not exposed to the Site. For example, a 1 in 10,000 risk level means that if 10,000 people were chronically exposed to the carcinogens at the Site, there is a probability of one additional case of cancer. Note that these risks refer only to the incremental risks created by exposures from the Site. They do not include the risks of cancer from other non-Site related factors to which people may be exposed. Non-carcinogenic hazards are generally expressed in terms of a hazard quotient or index, which combines the concentration of chemical exposures with the toxicity of the chemicals (quotient refers to the effects of an individual chemical whereas index refers to the combined effects of all chemicals). A hazard index of 1.0 represents the maximum exposure at which no harmful effects are expected.

The RAOs were developed to ensure that remedial actions reduce the projected risk to humans to acceptable levels. The U.S. EPA, through the NCP, defines acceptable Site remediation goals for known or suspected carcinogens to be concentration levels that represent an upper bound excess lifetime cancer risk, above that of the background, to an individual between 1 in 10,000 and 1 in 1,000,000 using information on the relationship between dose and response with the 1 in 1,000,000 risk level as the point of departure (the level of risk at which further remedial action is considered unnecessary). Ohio EPA has set an acceptable risk limit of $1x10^{-5}$ (1 in 100,000) for

remediation goals for single constituents. Noncarcinogenic risks are also to be reduced to an acceptable level, which corresponds to a hazard index of 1.0, at which harmful effects are generally not observed in exposed persons. In a similar manner, important ecological resources (e.g. waters of the state or endangered species) will also be protected.

The RAOs developed for the Site are detailed below.

- Reduce leachate production (to the maximum extent practicable);
- Contain the solid refuse;
- Collect/control landfill gas;
- Prevent contact with ground water; and
- Prevent direct surface contact with contaminants.

3.0 SUMMARY OF REMEDIAL ALTERNATIVES

A total of eleven (11) remedial alternatives have been presented. The FS Report, approved by Ohio EPA in October 2002, was comprised of the original nine alternatives. A modification to the FS Report included an additional alternative (Alternative No. 10), and several iterations of an alternative (Alternative No. 11) submitted to Ohio EPA for consideration as an addendum. A brief description of the major features of each of the remedial alternatives follows. More detailed information about these alternatives can be found in the FS Report.

3.1 No Action - FS Alternative No. 1

This alternative is required as part of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and provides a baseline against which other alternatives can be compared. Under Alternative 1, no future actions are planned. However, those engineering controls already undertaken are considered part of this remedy. These actions include the collection of leachate from the seeps at the northwest corner of the landfill, the collection of discharge from the Borrow Pit Pond and its subsequent pumping to the Lucas County POTW, and the continuation of the existing explosive gas monitoring plan.

This alternative provides no control of exposure to contaminated soils, sediments, or surface waters. While certain engineering controls have been implemented (i.e., collection of leachate, explosive gas monitoring, etc.) at the Site, Alternative 1 provides no additional reduction in risk to human health, nor is the migration of contaminants to ground water abated.

3.2 Alternate Cap Alternative - FS Alternative No. 2

This alternative includes a Geosynthetic Clay Liner (GCL) landfill cap to cover the entire landfill area; consolidation of hot spots from ditch sediments, Pond sediments, and other areas to beneath the future cap; leachate removal by extraction wells, with leachate discharged to the POTW; elimination of continued infiltration of contaminant sources to the Pond and other surface waters through capping and leachate extraction; allowing natural attenuation to decrease existing contaminant concentrations in the Borrow Pit Pond sediments; providing the opportunity for recovery of other surface waters through the combination of all other mentioned actions and institutional controls; establishing a No Well Zone around the landfill and implementing restrictions to control future use of the property; and continuing explosive gas monitoring, and periodic monitoring of groundwater and surface water.

3.3 Limited Action Alternative - FS Alternative No. 3

This alternative includes a composite barrier cap that consists of an 18 inch recompacted clay liner, a 40 mil high-density polyethylene membrane and 36 inches of soil cover to cover the entire landfill area; consolidation of hot spots from ditch sediments, Pond sediments, and other areas to beneath the future cap; leachate removal by extraction wells, with leachate discharged to the POTW; elimination of continued infiltration of contaminant sources to the Pond and other surface waters through capping and leachate extraction; allowing natural attenuation to decrease existing contaminant concentrations in the Borrow Pit Pond sediments; providing the opportunity for recovery of other surface waters through the combination of all other mentioned actions and institutional controls; establishing a No Well Zone around the landfill and implementing restrictions to control future use of the property; and continuing explosive gas monitoring, and periodic monitoring of groundwater and surface water. This alternative is similar to Alternative No. 2 with the exception that the GCL landfill cap is replaced with a composite barrier cap that consists of an 18 inch recompacted clay liner, a 40 mil high-density polyethylene membrane and 36 inches of soil cover.

3.4 Water Pre-Treatment Alternative - FS Alternative No. 4

This alternative includes a Geosynthetic Clay Liner (GCL) landfill cap to cover the entire landfill area; consolidation of hot spots from ditch sediments, Pond sediments, and other areas to beneath the future cap; leachate removal by extraction wells, on-Site pre-treatment of leachate; discharge of leachate to the POTW; elimination of continued infiltration of contaminant sources to the Pond and other surface waters through capping and leachate extraction; allowing natural attenuation to decrease existing contaminant concentrations in the Borrow Pit Pond sediments; providing the opportunity for recovery of other surface waters through the combination of all other mentioned actions and institutional controls; establishing a No Well Zone around the landfill and implementing restrictions to control future use of the property; and continuing explosive gas monitoring, and periodic monitoring of groundwater and surface water. This alternative is similar to Alternative No. 2 with the exception that extracted leachate would be pre-treated on-Site prior to discharge to the POTW.

3.5 Full Leachate Treatment/Discharge to Surface Waters - FS Alternative No. 5

This alternative includes a Geosynthetic Clay Liner (GCL) landfill cap to cover the entire landfill area; consolidation of hot spots from ditch sediments, Pond sediments, and other areas to beneath the future cap; leachate removal by extraction wells; complete treatment of leachate on-Site; discharge of leachate to surface water; elimination of continued infiltration of contaminant sources to the Pond and other surface waters through capping and leachate extraction; allowing natural attenuation to decrease existing contaminant concentrations in the Borrow Pit Pond sediments; providing the opportunity for recovery of other surface waters through the combination of all other mentioned actions and institutional controls; establishing a No Well Zone around the landfill and implementing restrictions to control future use of the property; and continuing explosive gas monitoring, and periodic monitoring of groundwater and surface water. This alternative is similar to Alternative No. 2, with the exception that extracted leachate would be fully treated on-Site prior to discharge to surface water.

3.6 Installation of Slurry Wall Around Landfill Perimeter - FS Alternative No. 6.

This alternative includes a Geosynthetic Clay Liner (GCL) landfill cap to cover the entire landfill area; consolidation of hot spots from ditch sediments, Pond sediments, and other areas to beneath the future cap; leachate removal by extraction wells, with leachate discharged to the POTW; elimination of continued infiltration of contaminant sources to the Pond and other surface waters through capping and leachate extraction; allowing natural attenuation to decrease existing contaminant concentrations in the Borrow Pit Pond sediments; providing the opportunity for recovery of other surface waters through the combination of all other mentioned actions and institutional controls; establishing a No Well Zone around the landfill and implementing restrictions to control future use of the property; installation of a Slurry Wall around the landfill perimeter to minimize the migration of contaminated groundwater; and continuing explosive gas monitoring, and periodic monitoring of groundwater and surface water. This alternative is similar to Alternative No. 2, with the exception that a barrier wall would be installed around the perimeter of the landfill to contain contaminated ground waters.

3.7 Eliminate Access to Off-Site Ditches - FS Alternative No. 7

This alternative includes a Geosynthetic Clay Liner (GCL) landfill cap to cover the entire landfill area; consolidation of hot spots from ditch sediments, Pond sediments, and other areas to beneath the future cap; leachate removal by extraction wells, with leachate discharged to the POTW; elimination of continued infiltration of contaminant sources to the Pond and other surface waters through capping and leachate extraction; allowing natural attenuation to decrease existing contaminant concentrations in the Borrow Pit Pond sediments; providing the opportunity for recovery of other surface waters through the combination of all other mentioned actions and institutional controls; establishing a No Well Zone around the landfill and implementing restrictions to control future use of

the property; installation of a Slurry Wall around the landfill perimeter to minimize the migration of contaminated groundwater; conversion of open ditches to enclosed storm sewers; and continuing explosive gas monitoring, and periodic monitoring of groundwater and surface water. This alternative is similar to Alternative No. 6, with the exception that open ditches would be converted to enclosed storm sewers.

3.8 Replace the Borrow Pit Pond with a Constructed Sedimentation Pond/Wetland System - FS Alternative No. 8

This alternative includes a Geosynthetic Clay Liner (GCL) landfill cap to cover the entire landfill area; consolidation of hot spots from ditch sediments, Pond sediments, and other areas to beneath the future cap; leachate removal by extraction wells, with leachate discharged to the POTW; elimination of continued infiltration of contaminant sources to the Pond and other surface waters through capping and leachate extraction; elimination of the Borrow Pit Pond through filling and construction of a sedimentation pond/wetland system that is not in direct communication with the unconfined aquifer; providing the opportunity for recovery of other surface waters through the combination of all other mentioned actions and institutional controls; establishing a No Well Zone around the landfill and implementing restrictions to control future use of the property; installation of a Slurry Wall around the landfill perimeter to minimize the migration of contaminated groundwater; conversion of open ditches to enclosed storm sewers; and continuing explosive gas monitoring, and periodic monitoring of groundwater and surface water. This alternative is similar to Alternative No. 7, with the exception that the existing Borrow Pit Pond would be filled and a sedimentation pond/wetland system would be constructed which is not in direct communication with the unconfined aquifer. Effluent water would be discharged to Ten Mile Creek.

3.9 Future Beneficial Use Concept - FS Alternative No. 9

This alternative includes a Geosynthetic Clay Liner (GCL) landfill cap to cover the entire landfill area; consolidation of hot spots from ditch sediments, Pond sediments, and other areas to beneath the future cap; leachate removal by extraction wells, with leachate discharged to the POTW; elimination of continued infiltration of contaminant sources to the Pond and other surface waters through capping and leachate extraction; elimination of the Borrow Pit Pond through filling and construction of a sedimentation pond/wetland system that is not in direct communication with the unconfined aquifer; providing the opportunity for recovery of other surface waters through the combination of all other mentioned actions and institutional controls; establishing a No Well Zone around the landfill and implementing restrictions to control future use of the property; installation of a Slurry Wall around the landfill perimeter to minimize the migration of contaminated groundwater; conversion of open ditches to enclosed storm sewers; continuing explosive gas monitoring, and periodic monitoring of groundwater and surface water; and allowance for installation of beneficial re-use facilities on-Site. This alternative is

similar to Alternative No. 8, but would also allow for the installation of beneficial use facilities.

3.10 The No Barrier Cap Alternative - Alternative No. 10

This alternative includes a 24 inch uncompacted soil cover and appropriate vegetative cover for the entire landfill area; consolidation of hot spots from ditch sediments, Pond sediments, and other areas to beneath the future cap; leachate removal via existing extraction wells, with leachate discharged to the POTW; elimination of continued infiltration of contaminant sources to the Pond and other surface waters through capping and leachate extraction; elimination of the Borrow Pit Pond and construction of a pond/wetland system; providing the opportunity for recovery of other surface waters through the combination of all other mentioned actions and institutional controls; establishing a No Well Zone around the landfill and implementing restrictions to control future use of the property; and continuing explosive gas monitoring, and periodic monitoring of groundwater and surface water. This alternative is similar to Alternative No. 2 except it utilizes a cap with 24 inches of uncompacted soil cover and appropriate vegetative cover. It would utilize the existing leachate collection system with subsequent treatment at the Maumee River Wastewater Treatment Plant, and a constructed pond/wetland instead of a sedimentation pond.

3.11 Vegetative Final Cover/Site Controls and O&M Alternative - Alternative No. 11

This alternative includes additional soil cover for areas previously identified as having exposed water or less than 24 inches of soil cover above the waste and appropriate vegetative cover; consolidation of hot spots from ditch sediments, Pond sediments, and other areas to beneath the future cap; leachate removal via existing extraction wells, with leachate discharged to the POTW; elimination of continued infiltration of contaminant sources to the Pond and other surface waters through capping and leachate extraction; elimination of the Borrow Pit Pond and construction of a pond/wetland system; providing the opportunity for recovery of other surface waters through the combination of all other mentioned actions and institutional controls; establishing a No Well Zone around the landfill and implementing restrictions to control future use of the property; continuing explosive gas monitoring, and periodic monitoring of groundwater and surface water; and allowance for installation of limited beneficial re-use facilities on-Site. This alternative is similar to Alternative No. 2 except it includes additional soil in areas previously identified as having exposed waste or less than 24 inches of soil cover above the waste and vegetative cover. It would utilize the existing leachate collection system, with subsequent treatment at the Maumee River Wastewater Treatment Plant.

4.0 COMPARISON AND EVALUATION OF ALTERNATIVES

4.1 Evaluation Criteria

In selecting a remedy for a contaminated site, Ohio EPA considers the following eight evaluation criteria as outlined in U.S. EPA's NCP promulgated under CERCLA (40 CFR 300.430):

1. Overall protection of human health and the environment - Remedial alternatives shall be evaluated to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site.

2. Compliance with all applicable or relevant and appropriate requirements (ARARs) - Remedial alternatives shall be evaluated to determine whether a remedy will meet all of the applicable or relevant and appropriate requirements of state and federal environmental laws.

3. Long-term effectiveness and permanence - Remedial alternatives shall be evaluated to determine the ability of a remedy to maintain reliable protection of human health and the environment over time once pollution has been abated and RAOs have been met. This includes assessment of the residual risks remaining from untreated wastes, and the adequacy and reliability of controls such as containment systems and institutional controls.

4. Reduction of toxicity, mobility, or volume through treatment - Remedial alternatives shall be evaluated to determine the degree to which recycling or treatment are employed to reduce toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site.

5. Short-term effectiveness -Remedial alternatives shall be evaluated to determine the following: (1) Short-term risks that might be posed to the community during implementation of an alternative; (2) Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures; (3) Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and (4) Time until protection is achieved.

6. Implementability - Remedial alternatives shall be evaluated to determine the ease or difficulty of implementation and shall include the following, as appropriate: (1) Technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the

effectiveness of the remedy; (2) Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions); and (3) Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and the availability of prospective technologies.

7. Cost - Remedial alternatives shall evaluate costs and shall include the following: (1) Capital costs, including both direct and indirect costs; (2) Annual operation and maintenance (O&M) costs; and (3) Net present value of capital and O&M costs. The cost estimates include only the direct costs of implementing an alternative at the site and do not include other costs, such as damage to human health or the environment associated with an alternative. The cost estimates are based on figures provided by the feasibility study.

8. Community acceptance - Remedial alternatives shall be evaluated to determine which of their components interested persons in the community support, have reservations about, or oppose.

Evaluation Criteria 1 and 2 are threshold criteria required for acceptance of an alternative that has accomplished the goal of protecting human health and the environment and complied with the law. Any acceptable remedy must comply with both of these criteria. Evaluation Criteria 3 through 7 are the balancing criteria for selecting the best remedial alternatives. Evaluation Criteria 8 (Community Acceptance) is a modifying criterion that will be determined by the public comments on the alternatives.

4.2 Analysis of Evaluation Criteria

This section reviews how each of the evaluation criteria is applied to each of the remedial alternatives found in Section 3.0 and compares how the alternatives achieve the criteria.

4.2.1 Overall Protection of Human Health and the Environment

The assessment of cancer risks and non-cancer hazards to human receptors requires that exposure pathways be identified and the risks and hazards of each pathway be numerically estimated. Two (2) chemical exposure routes have been identified: ingestion and dermal. The normal criteria for acceptability of risk represent an upper bound excess lifetime cancer risk to an individual to between 1 in 10,000 and 1 in 1,000,000. Ohio EPA has set an acceptable risk limit of $1x10^{-5}$ for remediation goals for single constituents. The total noncarcinogenic adverse health effects should result in a hazard index of less than 1.0.

Adverse impacts to ecological receptors are identified as a hazard quotient and, when appropriate, a hazard index value greater than 1.0. Thus, RAOs for ecological receptors in the feasibility study report are based on either a hazard quotient or hazard index of 1.0. Full attainment of the appropriate water quality criteria are also evaluated in the feasibility study report for sites with contaminated surface water bodies.

Alternative 1 fails to meet the threshold criteria of overall protection of human health and the environment. It also fails to control exposures to contaminated soils, sediments, or surface water and reduce risk to human health posed by contaminants in groundwater. Alternative No. 1 fails this threshold criterion and is no longer carried forward in the evaluation of alternatives.

Alternative 2 protects human health and the environment in the short term based upon the exemption, pursuant to ORC 3734.02(G) and OAC 3745-27-03(B), from the requirement to construct a composite cap system in accordance with OAC 3745-27-11(G). GCL liners are intended to serve as backup barriers underneath flexible membrane liners, not as primary barriers. It is likely that the cap would deteriorate in the long term and allow precipitation to pass through the contaminated waste. A cap designed according to current solid waste regulations (OAC-3745-27-08) would be protective.

This remedy provides long-term protection by eliminating exposures to groundwater by establishing a No Well Zone; reducing soil/sediment exposures by deed restrictions and consolidation of hot spots under the cap; controlling leachate and groundwater migration by extraction well collection; eliminating Borrow Pit Pond surface water and sediments by drain/dredging; and reducing leachate/hydraulic head with the GCL cap. Short-term worker risk is controlled via sound work practice. Short term risk to trespassers is limited by the fence barrier.

Alternative 3, using a different cap design (i.e., composite barrier cap), would provide a satisfactory level of protection of human health and the environment in comparison to Alternative 2. All other aspects of this alternative are the same as Alternative 2.

Alternative 4 is similar to alternative 2, except that pretreatment insures that constituent loading of leachate is adequately reduced prior to POTW treatment.

Alternative 5 is similar to alternative 2, except that on-Site full treatment allows discharge to Ten Mile Creek, which aids in re-establishing former flood plain and creek flows prior to interceptor well installation.

Alternative 6 is similar to alternative 2, except that the slurry wall minimizes volume and migration of groundwater contaminants into and out of the landfill and Borrow Pit Pond area.

Alternative 7 is similar to alternative 6, except that the ditches are converted to enclosed storm sewers to eliminate contact with residual contaminated sediments/surface water.

Alternative 8 is similar to alternative 7, except the quality of Borrow Pit Pond sediments/surface waters is improved by eliminating communication with the unconfined aquifer. Former surface water flows and recharge are re-established by restoring discharge to Ten Mile Creek. The current flow to the POTW is reduced by approximately 67 percent.

Alternative 9 is similar to alternative 8, with a beneficial use incorporated (e.g., "Rails to Trails" bike path connection and research experimentation station).

Alternatives 10 and 11 would adequately protect human health and the environment if access to the Site is prohibited, if existing engineered controls are maintained, and if a No Well Zone is established around the landfill. Alternative 11 incorporates the existing soil cover via augmentation where the material is less than 24 inches in thickness and provides for limited beneficial re-use of the landfill.

4.2.2 Compliance with ARARs

Alternative 2 includes a cap design that meets the present legal requirements for a solid waste cap (OAC 3745-27-08) based on the exemption, pursuant to ORC 3734.02(G) and OAC 3745-27-03(B), from the requirement to construct a composite cap system in accordance with OAC 3745-27-11(G). Location-specific ARARs regarding wetland and endangered/threatened species can be met by action/management consistent with U.S. Army Corps of Engineers (USACE) and Ohio Department of Natural Resources (ODNR) directives prior to the design phase.

Without an exemption, pursuant to ORC 3734.02(G) and OAC 3745-27-03(B), from the requirement to construct a composite cap system in accordance with OAC 3745-27-11(G), Alternative 3 would not meet the solid waste cap requirement as a result of the absence of a drainage layer between the soil cover and the flexible membrane liner. Compliance with other ARARs is identical to Alternative 2.

Alternative 4 is similar to Alternative 2, but also meets chemical-specific ARARs for air stripping, and action-specific ARARs for generated waste streams of sludge and filter bags.

Alternative 5 is similar to Alternative 4.

Alternatives 6 through 9 are similar to Alternative 2.

Alternative 10 utilizes a cap with 24 inches of un-compacted soil cover and appropriate vegetative cover with a constructed pond/wetland, and is otherwise similar to Alternative 2; however, the Director of Ohio EPA issued an exemption on April 16, 2009, pursuant to ORC 3734.02(G) and OAC 3745-27-03(B), from the requirements to construct a composite cap system in accordance with OAC 3745-27-11(G). As a result, Alternative 10 would comply with ARARs.

Alternative 11 is similar to Alternative 10 with respect to the additional soil and vegetative cover and includes bioremediation. The alternative complies with ARARs based on the exemption from the requirement to construct a composite cap system in accordance with OAC 3745-27-11(G).

4.2.3 Long-Term Effectiveness and Permanence

Alternative 2, as stated above, includes a cap that would not be reliable in the long-term because the GCL would be likely to deteriorate with time.

Alternative 3 includes a cap design that would have long-term effectiveness and permanence compared with the GCL option.

Alternative 4 is similar to Alternative 2, but the pre-treatment system would require monitoring to ensure POTW parameters were not exceeded.

Alternative 5 is similar to Alternative 4, but monitoring of the treatment stream would need to meet surface water discharge requirements.

Alternative 6 is similar to Alternative 2, but the short-term residual ecological risk to the Borrow Pit Pond surface water and sediments would be reduced based on the installation of a perimeter barrier system designed to contain contaminated groundwater.

Alternative 7 is similar to Alternative 2, except that it would require maintenance of the storm drains.

Alternative 8 improves on Alternative 2 in that the Borrow Pit Pond area would be eliminated via filling. Both the sedimentation basin and the wetland would require maintenance (periodic cleaning).

Alternative 9 is essentially the same as Alternative 8. Design and operation would require maintenance of remedial systems and Site monitoring activities.

Alternative 10 does nothing to reduce the magnitude of residual risk in soils, but may reduce the risks posed by contaminated groundwater. Reliability rests on the physical control provided by security fencing.

Alternative 11 reduces both soil and groundwater residual risk over time via natural attenuation.

4.2.4 Reduction of Toxicity, Mobility or Volume Through Treatment

Alternative 2 provides treatment by POTW, which is very reliable and which effectively reduces the toxicity of the collected leachate. The natural attenuation of Borrow Pit Pond Area contaminant recharge requires monitoring. The combined cap and leachate collection system reduces volume treated by POTW. Minimum toxicity reduction by discharges to POTW is tied to levels specified in the NPDES permit of the POTW. POTW treatment is irreversible. Attenuation is dependent upon loading, contact time and temperature.

Alternative 3 is similar to Alternative 2, except the cap reduces leachate output by an estimated 300,000 gallons per year, according to the FS Report.

Alternative 4 is similar to Alternative 2, but in addition, the leachate stream pre-treatment reduces contaminant levels to acceptable ranges for the POTW treatment. Solid waste is generated, which contains levels of contaminants reduced to levels lower than those found in the leachate stream.

Alternative 5 is similar to Alternative 4, except chemical flocculation is used to remove heavy metals and activated carbon is used to remove residual organic compounds. Full treatment may generate additional contaminant laden solid waste (carbon cartridges) which may be regenerated or landfilled. Flow to the POTW is also reduced by 52 percent of current output through elimination of all leachate flow to the POTW.

Alternative 6 is similar to Alternative 2, but the slurry wall acts in conjunction with the cap and extraction wells to control contaminant migration via the unconfined aquifer and volume of contaminated media. Volume treated by POTW is reduced by 48 percent of current output due to reduction in leachate flow. POTW treatment reduces contaminants to minimum levels established in the POTW NPDES permit. It also decreases the amount of contaminants to be treated by elimination of off-Site contaminants. Treatment efficiency is maintained with the duration of the slurry wall (approximately 30 years).

Alternative 7 is similar to Alternative 2.

Alternative 8 is similar to Alternative 2, except that the reconstruction of the Borrow Pit Pond area into the sedimentation/wetland eliminates surface water sent to the POTW, which is in contact with contaminated water from the unconfined aquifer. Reconstruction of the Borrow Pit Pond area eliminates communication of surface waters

with the unconfined aquifer, thus reducing the volume of contaminated water for POTW treatment to 33 percent of current output.

Alternative 9 is similar to Alternative 8.

Alternatives 10 and 11 provide no reduction, since treatment is not implemented.

4.2.5 Short-Term Effectiveness

Alternative 2 allows trespassers to be at risk by direct contact with arsenic in soil, until structural fill is placed over all Site soils. During draining/dredging of the Pond, workers incur risk due to arsenic by direct contact with sediment. Impacts during construction are mitigated by replacement improvements during the implementation phase. Objectives are realized during the first year of operation.

Alternatives 3 through 8 are the similar to Alternative 2.

Alternatives 9 through 11 are similar to Alternative 2 except direct contact with sediment associated with draining/dredging the Pond are not an issue based on natural attenuation.

4.2.6 Implementability

Based on the exemption from the requirement to construct a composite cap system in accordance with OAC 3745-27-11(G), Alternative 2 meets the regulations for solid waste landfill construction. Well application is an established technology. The volume of structural fill and cover soils required are challenging to obtain. The reliability of a leachate collection system is dependent upon design-phase placement of wells, and requires monitoring to assess acceptability for POTW discharge. If necessary, additional leachate treatment can be conducted (installed) at the northwest corner of the landfill. The discharge of surface water can be easily modified (POTW or Ten Mile Creek) based on monitoring. Extraction wells can be abandoned/added depending on the migration control needs. Monitoring of the groundwater is easily implemented with existing/new wells. The Borrow Pit Pond and leachate can be easily monitored. Cap integrity is also easily inspected. Approvals from ODNR, Army Corps of Engineers, Ohio EPA, and Lucas County can proceed along well-established means, but are dependent upon agency schedules/resources. Coordination with ODNR for the wetlands, with USACE for the Borrow Pit Pond, and with the Lucas County Health Department for the No Well Zone will be necessary. Numerous off-Site treatment, storage or disposal (TSD) services are established and operated locally. Skilled equipment and construction/operation contractors are readily available. Technologies are well-established and readily available.

Alternative 3 is similar to Alternative 2. Implementation of the composite barrier cap is allowable based on the exemption from the requirement to construct a composite cap system in accordance with OAC 3745-27-11(G).

Alternative 4 is similar to Alternative 2; the primary difference is that the pre-treatment system is easily constructed and operated. The pre-treatment system is based upon reliable chemical/physical processes, but is vulnerable to electrical current failure and requires a trained technician for operation and maintenance. The pre-treatment system utilizes electrical process monitoring and a control panel. Monitoring of influent and effluent streams is also required. Additional approval is necessary for the air permit and the NPDES permit to install the pre-treatment system. Local solid and hazardous waste facilities are readily available for disposal of sludge/bag filter wastes from the pre-treatment system.

Alternative 5 shares similarities with Alternatives 2 and 4. They are similar in that they readily provide for construction and operation of the same basic technologies. Additional similarities include the pre-treatment system, the electrical process monitoring and the control panel. Monitoring of influent and effluent streams is also required, as is the necessity to obtain an air permit and a NPDES permit. Local solid and hazardous waste facilities are readily available for disposal of sludge/bag filter wastes from the pre-treatment system. All other aspects of Alternative 5 are similar to Alternative 2.

Alternative 6 is similar to Alternative 2, except the slurry wall requires specialized construction methods which may be limited by Site soil conditions and which may require additional subsurface soil investigation. If slurry wall construction cannot be implemented before completion of structural fill placement, available fill soils will be lost. Less efficient barrier walls may be substituted for the slurry wall if Site soil conditions are prohibitive. Breaches in the slurry wall may be repaired and compensated by well-managed installation and operation. A number of qualified slurry wall contractors and specialized equipment are available. Related technologies such as deep soil mixing and sheet piling are also available.

Alternative 7 is similar to Alternative 2, except that the conversion of open ditches to storm sewers requires no special technology, and construction is common to such urban areas. The conversion process eliminates the possibility of potential contact with sediment and surface waters. The need for monitoring surface water in the ditches is eliminated.

Alternative 8 is similar to Alternative 2 with a few exceptions. Construction oversight would be necessary. Special equipment and materials are not needed except for the necessity to protect certain wetland plant species. Uncertainty regarding the quality of surface water discharge from the Borrow Pit Pond area is eliminated. Additional remedial action would not pose a problem and is less likely to affect water levels to the

Borrow Pit Pond area. The uncertainty of meeting the RAOs for surface water quality from the Borrow Pit Pond area is eliminated.

The necessity of ODNR and USACE involvement may increase. Construction oversight utilizing wetland specialists is required for the Borrow Pit Pond area. All of these resources and technologies are readily available.

In Alternative 9, construction of the facility would need to meet the requirements of the remediation systems implemented. Additional remedial actions would require consideration of modifications to the facility O&M, and would require limitations to public access during the construction period. It may be prudent to construct/install the facility after remediation elements have been implemented and evaluated for a sufficient period of time. The involvement of various Lucas County agencies is increased.

In Alternatives 10 and 11, implementation is readily accomplished.

4.2.7 Cost

Alternative 2. Capital Costs =	$8,824,400
Operating and Maintenance Costs =	Year Zero = $26,400 First Year = $179,900 Subsequent Years = $2,713,400
Present Worth =	$11,897,100 assuming no purchase of structural fill. If purchase of all fill is required, estimate increases by approximately $5.1 million.
Alternative 3. Capital Costs =	$10,766,900
Operating and Maintenance Costs =	Year Zero = $26,400 First Year = $198,000 Subsequent Years = $2,988,100
Present Worth =	$14,132,400 assuming no purchase of structural fill. If purchase of all fill is required, estimate increases by approximately $5.1 million.
Alternative 4. Capital Costs =	$8,974,200
Operating and Maintenance Costs =	Year Zero = $26,400 First Year = $210,300 Subsequent Years = $3,142,100
Present Worth =	$12,507,100 assuming no purchase of structural fill. If purchase of all fill is required, estimate increases by approximately $5.1 million.
Alternative 5. Capital Costs =	$9,007,500
Operating and Maintenance Costs =	Year Zero = $26,400 First Year = $204,700 Subsequent Years = $3,086,900
Present Worth =	$12,478,600 assuming no purchase of structural fill. If purchase of all fill is required,

		estimate increases by approximately $5.1 million.
Alternative 6.	Capital Costs =	$10,334,000
	Operating and Maintenance Costs =	Year Zero = $26,400 First Year = $174,400 Subsequent Years = $2,631,200
	Present Worth =	$13,319,000 assuming no purchase of structural fill. If purchase of all fill is required, estimate increases by approximately $5.1 million.
Alternative 7.	Capital Costs =	$8,870,300
	Operating and Maintenance Costs =	Year Zero = $26,400 First Year = $179,900 Subsequent Years = $2,713,400
	Present Worth =	$11,897,100 assuming no purchase of structural fill. If purchase of all fill is required, estimate increases by approximately $5.1 million.
Alternative 8.	Capital Costs =	$9,181,100
	Operating and Maintenance Costs =	Year Zero = $26,400 First Year = $173,100 Subsequent Years = $2,576,400
	Present Worth =	$12,110,100 assuming no purchase of structural fill. If purchase of all fill is required, estimate increases by approximately $5.1 million.
Alternative 9.	Capital Costs =	$10,453,700
	Operating and Maintenance Costs =	Year Zero = $26,400 First Year = $251,100 Subsequent Years = $3,757,400
	Present Worth =	$14,641,700 assuming no purchase of structural fill. If purchase of all fill is required,

estimate increases by approximately $5.1 million.

Alternative 10. Capital Costs = Between $4,739,600 and $9,852,100

Operating and Maintenance Costs = Year Zero = $26,400
First Year = $144,500
Subsequent Years = $141,400

Present Worth = $7,096,000 to $12,208,500

Alternative 11.

The manner in which this late addition to the alternative array was presented failed to break down the elements of cost. The preliminary analysis merely indicated that the cost would be more than the No Action alternative and less than any alternative requiring a capping option. A present worth value was offered in the range of $1 to $3 million. By letter to Ohio EPA, dated June 12, 2012, the Lucas County Sanitary Engineer provided the following cost estimate.

Capital Costs = $ 1,373,500

Operating and Maintenance Costs = Year Zero =$ 18,500
First Year =$ 70,500
Subsequent Years = $ 1,012,500

Present Worth = $2,701,000.

4.2.8 Community Acceptance

Community acceptance is an important criterion that Ohio EPA evaluates during the remedy selection process for the King Road Landfill Site. Ohio EPA gauges the degree of community acceptance by including open dialogue with citizens concerning the results of the investigation, and by encouraging citizens to participate in the remedy selection process by commenting on the remedial alternatives. This interaction with the public is important to the remedy selection process and to making sound environmental decisions.

Ohio EPA received comments (Appendices C and D) from interested parties during the public comment period and at the public meeting held at the Toledo-Lucas County Public Library, Holland Branch, Holland, Ohio, on January 11, 2011. Those comments and Ohio EPA's responses are included in the Responsiveness Summary (Section 7.0).

5.0 SELECTED REMEDIAL ALTERNATIVE

Ohio EPA selected a modified version of Alternative 11 as the remedy for the King Road Landfill Site. The modification is based on the decision to install an additional cover, and included development of an operation and maintenance plan to ensure adequate cover integrity throughout the required duration.

The elements of Alternative 11 are as follows: supplemental soil cover; operation and maintenance of the soil cover; institutional controls to limit use of the Site; consolidation of contaminated sediments under the soil cover; ground water monitoring and establishment of the NWZ to ensure local receptors are connected to the municipal water supply; leachate control; and acceptable beneficial reuse.

5.1 Vegetative Final Cover /Site Controls and O&M

On April 16, 2009, the Director of Ohio EPA approved an exemption from the 2003 construction standards for a solid waste cap, such that an alternative cap may be installed. This exemption allows the installation of a vegetative cover.

The installation of additional soil cover will be required in areas previously identified as having exposed waste or less than 24 inches of soil above the waste. The Remedial Design for the cover must be approved by Ohio EPA and the cover must pass a post-construction inspection by Ohio EPA. The landfill cover must meet the RAOs for reducing leachate production (to the maximum extent practicable), containing solid refuse, and collecting/controlling landfill gas.

Details of the final cover will be determined during the development of the Remedial Design and implemented during the Remedial Action. The final surface will be appropriately graded and maintained to ensure that erosion does not adversely impact the remedy, and the soil cover will be augmented with an appropriate vegetative cover.

The property boundary of the King Road Landfill Site is larger than the area comprising the known limits of waste deposition (see RI and FS Reports). Only the known limits of waste deposition must be covered by the vegetative cover material. Surface soils outside the known limits of waste deposition may be impacted from contaminant migration.

Operation and maintenance of the cover must be provided for 30 years, at a minimum, through the development of an O&M Plan, to be approved by Ohio EPA. The cover must pass periodic inspections by Ohio EPA.

With respect to the Site controls, one of the requirements is to reduce and eventually eliminate leachate that would otherwise enter Ten Mile Creek. Such reduction may be provided through continued compliance with the requirements of Section V (Compliance

Schedule to Eliminate the Discharge of Leachate into the Drainage Ditch Tributary to the Ottawa River) of the Consent Order (Appendix A) for this Site dated December 4, 1992, between the State of Ohio and the Board of Lucas County Commissioners.

A second aspect of the Site controls is to collect and control landfill gases in a manner consistent with OAC 3745-27-12 (effective 8/15/2003), and more specifically pursuant to the Director's Orders dated October 20, 1994 (and as amended on October 25, 1995). Landfill gas concentrations shall be monitored at appropriate compliance points in accordance with this rule for a period of at least twenty years, with corrective actions taken should gas concentrations exceed safe levels. After that twenty year period, monitoring may be discontinued upon a demonstration that landfill gas no longer poses a risk of formation and migration. All actions shall be in accordance with the October 1994 and October 1995 Orders (Appendix B).

Performance Standards

- Installation of a landfill cap which meets or exceeds the current (2003) construction standards for a solid waste cap, or use of an alternative design as allowed by the April 16, 2009 exemption, to meet the RAOs for containing the solid waste, preventing direct contact with contamination and reducing leachate production (to the maximum extent practicable). The Remedial Design for either cap must be approved by Ohio EPA and the cap must pass a post-construction inspection by Ohio EPA, to ensure that the RAOs are being met.

- Provide for 30 years, at a minimum, of operation and maintenance (O&M) of the cap in accordance with an O&M Plan, to be approved by Ohio EPA, to ensure that the RAOs are being met. The cap will be expected to pass periodic inspections by Ohio EPA, to ensure that the RAOs are being met.

- The performance standard for reduction and eventual elimination of leachate that would otherwise enter Ten Mile Creek is met through compliance with the terms and conditions of the December 4, 1992 Consent Order, between the State of Ohio and the Board of Lucas County Commissioners.

- The performance standard for collection and control of landfill gases in a manner consistent with OAC 3745-27-12 (effective 8/15/2003) is met through compliance with the terms and conditions of the October 20, 1994 (and as amended on October 25, 1995) Order.

5.2 Site Access and Institutional Controls

Existing fencing and signage around the perimeter of the landfill must be maintained. Fencing and signage must also be installed and maintained to restrict access to the

Borrow Pit Pond waters and sediments, per a future O&M Plan, to be approved by Ohio EPA.

An Environmental Covenant - to maintain its land use, prohibit subsurface activities unless authorized by Ohio EPA, and prohibit the use of on-Site ground water for potable purposes - must be established and recorded. The environmental covenant will be transferable with the deed and will remain in place until it can be demonstrated that concentrations of chemicals of concern have attenuated to levels that no longer pose an unacceptable threat to human health.

These actions are expected to protect the capped section of the landfill from damage, and prevent access to the areas containing contaminated surface water and sediments of the Borrow Pit Pond. These actions are expected to meet the RAO to prevent direct surface contact with contaminants.

Performance Standards

Access controls (e.g., fencing, signage) will be established and maintained to eliminate human contact with surface water and ditch sediments.

- If the existing continuous fencing and signage around the perimeter of the landfill are maintained per an O&M Plan, to be approved by Ohio EPA, this performance standard is met.

- If the Borrow Pit Pond and ditches are fenced off with continuous fence and signage identified in an O&M Plan, to be approved by Ohio EPA, this performance standard is met.

- If Site access controls (i.e., fencing and signage) identified in an O&M Plan, to be approved by Ohio EPA, pass periodic inspections by Ohio EPA, this performance standard is met.

- The performance standard is met by providing documentation that an environmental covenant has been recorded with the Lucas County Recorder's Office, restricting the King Road Landfill to industrial land use only, prohibiting subsurface activities, and prohibiting the use of ground water for potable purposes.

5.3 Ditch Sediments

Hot spots (i.e., sediment deposition in ditches) have been identified in the RI and FS Reports approved by Ohio EPA. The hot spots include those ditches demonstrated to have been in seasonal contact with the unconfined aquifer, and/or to have been a receptor of landfill leachate and solid waste discharges. These materials must be

removed, stockpiled and sampled, and the samples submitted for laboratory analysis to determine if the stockpiled material is a characteristic hazardous waste. Only non-hazardous excavated materials may be placed under the cap. Any materials determined to be hazardous wastes must be transported off-Site to a permitted hazardous waste disposal facility. This action is expected to meet the RAOs of containing solid wastes and preventing direct surface contact with contaminants.

Performance Standard

- Hot spots (i.e., sediment deposition in ditches) can be considered to have been properly eliminated if post-removal sampling and analyses do not show any COCs, as identified per the RI Report, in excess of the acceptable risk limit of 10^{-5} remedial goal established for single carcinogenic constituents and a hazard index of 1 for non-carcinogenic constituents. Specific concentrations of each COC must be calculated as a part of future Remedial Design activities.

5.4 Groundwater (off-Site)

The Lucas County Board of Health intends to establish a "No Well Zone" (NWZ) around the landfill sufficient in radius to encompass the radial flow of potentially contaminated groundwater from the landfill, thus eliminating the dermal, inhalation, and ingestion potential of any contaminants found in the groundwater. The NWZ would prohibit all use of groundwater within this area. The Lucas County Sanitary Engineer has determined that a public water supply is available to all homes and facilities currently present in the area around the King Road Landfill. This action is expected to meet the RAO of preventing contact with contaminated groundwater.

With a NWZ in place, the remaining concern would be potential environmental impact to Ten Mile Creek from the shallow aquifer, which is in communication with this surface water body. A series of shallow groundwater monitoring wells must be established between the landfill and Ten Mile Creek. The specific locations and number of wells, the monitoring frequencies and analytical parameters shall be determined during Remedial Design activities. The objective is to establish a monitoring network and program to evaluate the shallow groundwater flow from the landfill toward the Creek. Results of initial annual monitoring will be used to establish the frequency of future monitoring and/or the necessity for contingent (more active) remedial actions.

Increased contaminant flow toward the Creek may necessitate the installation of leachate collection wells, with subsequent leachate discharge to the Lucas County POTW for treatment. This would provide control of contaminant migration in groundwater and assure that the leachate is properly treated prior to discharge to surface water.

The intermediate and deep groundwater zones are also to be included in the NWZ area. No practical or economically available method exists for the remediation of the existing low contamination levels. The dilution of existing contaminants by natural groundwater movement, combined with the infiltration reduction associated with the cap is expected to provide the most effective solution to the contaminants in these zones.

Performance Standards

- The performance standard is met if written documentation is provided to Ohio EPA documenting the establishment of the No Well Zone by the Lucas County Board of Health. There must be an enforceable requirement that the No Well Zone will remain in place until drinking water quality standards are met.

- The performance standard is met if documentation is provided to Ohio EPA documenting that all existing water delivery systems within the No Well Zone are connected to a municipal supply, and that there is an enforceable requirement that all future water delivery systems within the No Well Zone must be connected to a municipal supply.

- Ground water sample analyses of COCs must demonstrate, prior to the five-year remedy review, a statistically significant decreasing trend in the contaminant ground water flow from the landfill using methodology approved by Ohio EPA, before any reduction in the monitoring program is approved. Although unlikely, a statistically significant increasing trend would necessitate an evaluation of whether an alternative remedial technology (e.g., ground water collection system) would be necessary to address off-Site migration of contaminants in ground water.

- When drinking water quality standards are achieved, this performance standard is met.

5.5 Pond Water and Sediments

Direct communication between the Borrow Pit Pond and the ground water in the shallow aquifer has been documented. At present, the water discharged from the Pond is captured and pumped to the Lucas County POTW by a pump station and force main installed for this purpose under the December 4, 1992 Consent Order.

The contaminant levels in the sediments of the Pond are generally low in concentration and not precisely identified as to location, making physical remedial actions such as dredging or de-watering costly, while providing questionable benefits. Thus, monitored natural attenuation (MNA) is the most appropriate alternative to address the Pond water and sediments. The first step in the MNA program is to control or eliminate the source material. This would be accomplished by the reduction/elimination of leachate through

landfill capping. The collection basins required by Ohio EPA's Division of Surface Water (DSW) will continue to operate in order to remove contaminated surface water via the POTW. The second step in the MNA process is periodic monitoring of the Pond water and sediments for all COCs. This action is expected to meet the RAO for preventing direct surface contact with contaminants.

Performance Standards

- Ohio EPA inspections must show that the catch basins and pump stations are being operated per the specifications of the December 4, 1992 Consent Order for this Site.

- Periodic sampling and analyses of the Pond water and sediments for all COCs identified in the RI and FS Reports must be conducted to monitor contaminant levels until the remedial goals are met. Although unlikely, a statistically significant increasing trend would necessitate an evaluation of whether an alternative remedial technology would be necessary.

5.6 Beneficial Reuse

Beneficial reuse projects (*e.g.,* Bicycle Trail, vehicle parking area, and University research projects) will be allowed at the King Road Landfill, on a case by case basis, subject to a detailed written proposal, which is expected to be submitted to Ohio EPA through the office of the Lucas County Sanitary Engineer. The submission and approval process is expected to occur during the Remedial Design phase. Sufficient detail, as determined by Ohio EPA, will be required for each beneficial reuse project in order to allow Ohio EPA to evaluate each project.

Performance Standards

- Plans to support the expansion of the trail and the establishment of a parking area are to be approved by Ohio EPA. The trail expansion and parking area must not impact the remedy and users of these areas must be physically separated from the Borrow Pit Pond waters and sediment as well as the remainder of the landfill by security fencing.

- Any research projects conducted by any group or organization must be approved by Ohio EPA prior to any work being conducted. This will be required to insure that activities do not adversely impact the remedy.

6.0 DOCUMENTATION OF SIGNIFICANT CHANGES

Two significant changes to the Preferred Plan are contained in this Decision Document. The first change is based on the Director's April 16, 2009 approval of the request for an exemption from the 2003 construction standards for a solid waste cap, such that an alternative cap may be installed.

Threshold requirements for cap design must still be met. The exemption enables the threshold requirement of compliance with ARARs to be achieved. Now, an alternative cap design must be demonstrated, to the satisfaction of the Agency, to meet the threshold requirement of overall protection of human health and the environment.

The second significant change, prompted by public input, is the allowance on a case by case basis of alternative or beneficial re-uses of the landfill. The Agency will work with the Lucas County Sanitary Engineer to evaluate re-use projects.

7.0 RESPONSIVENESS SUMMARY

During the public comment period and at the public hearing, Ohio EPA received several comments concerning the Preferred Plan. Please find below a summation of the comments and Ohio EPA's responses. Appendix C contains a copy of the public hearing transcript and verbal comments, and Appendix D contains a copy of each written public comment received by the Ohio EPA.

RESPONSIVENESS SUMMARY for King Road Landfill
Sylvania, Lucas County, Ohio

A Public Meeting/Hearing was held on January 10, 2011, to present the Agency's Preferred Plan for the King Road Landfill ("KRL") and solicit public comment. Attached is the stenographic record of the public hearing portion of the meeting. Written comments were received during the public comment period. The majority of the comments received expressed support for the Preferred Plan. For those comments received by the Agency, a summation of each comment followed by the Agency's response is presented below.

Comments by the King Road Landfill Group

On behalf of the King Road Landfill Group (the "Group"), by letter dated January 17, 2011, Douglas G. Haynam, of Shumaker, Loop & Kendrick, LLP, asserted that the Plan is "unreasonable and unlawful for multiple reasons." The Group "objects to the Ohio EPA's refusal to consider the most recent data and risk analysis prepared by CRA, adopted by the County, and submitted to Ohio EPA in 2000" and re-submitted in 2009. The Group "opposes the selection of Alternative No. 11 . . . because it is inadequately developed, . . . unreasonably expensive, unnecessarily intrusive on the existing phyto cap environment, inconsistent with the Director's DFF&Os from 2009, and more harmful to human health and the environment than existing landfill site conditions." The Group supports "a status quo approach as outlined in CRA Alternative 13 preserving the existing phyto cap and implementing site access and use restrictions as the most cost-effective and environmentally sound remedial alternative . . ."

Specifically, the Group contends that "[t]he Preferred Plan ignores the more complete and current data gathered by Conestoga-Rovers and Associates ('CRA') at the behest of the Group in 1999 and the Baseline Risk Assessment also performed by CRA for the Group in April of 2000."

Ohio EPA's Response

The Preferred Plan is neither unreasonable nor unlawful. Moreover, the remedial alternative suggested by the Group is not substantively different from the Preferred Plan prepared by Ohio EPA. The principal issue distinguishing the alternatives appears to be the extent to which the existing soil cover is adequate. Based on an investigation performed by the Mannik & Smith Group on behalf of Lucas County, data suggests that

many areas of the landfill do not have soil cover of at least two feet in thickness. For areas where the soil cover thickness is not adequate, supplemental soil cover would be necessary in order to comply with the regulatory framework appropriate during the time at which the landfill ceased operations (i.e., 1976 Solid Waste Regulations). Ohio EPA proposes, as part of the Remedial Design, to incorporate delineation activities in an effort to refine the design concept proposed for supplemental soil cover.

Ohio EPA, as part of the Preferred Plan development, reviewed CRA's Evaluation of Remedial Alternatives, 1999 Additional Sampling Activities Report, and Baseline Risk Assessment Report. Ohio EPA concluded that the majority of the information contained within these three reports was previously available as part of the Remedial Investigation/Feasibility Study documentation and acknowledged the inevitable changes in sampling data (e.g., decreasing concentrations, increased extent of vegetative cover) and the variation of interpretations of the data. However, Ohio EPA did note several inconsistencies and erroneous assumptions and/or methodologies contained within the CRA documentation, e.g.:

- Risk assumptions concerning human receptor exposure in the un-sampled portion of the landfill. The Site was sampled only around the perimeter; yet in the human health risk assessment process, it was assumed that the human receptor trespassing, recreating or working in the central part of the Site would be exposed to chemical contaminants at the same concentration as at the perimeter. For on-Site exposures through soil, dust (surface soil), and air (landfill gas), this assumption may result in a significantly underestimated risk.

- Ambient air was not recognized as a medium of concern in the original RA report, and the CRA report also indicates that ambient air is not a concern. However, the supporting sampling method was inappropriate because air samples were only taken during February, when soil particulate matter and air/soil VOCs partitioning would be low compared to warmer months. Soil gas was not evaluated in the RA report. Typically, soil gas is generated by decomposition of organic material in the landfill and may contain volatile organic compounds (see: U.S. EPA: Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites, EPA/540/P-91/001 OSWER, Washington DC, 1991). The soil gas should be sampled, especially in the central part of the landfill, and the analytical results should be included in baseline risk assessment.

- The additional soil sampling for arsenic raises a particular concern. After Ohio EPA's review of the previously submitted RI/FS reports, two options were recommended regarding a potential method to estimate background concentrations of arsenic in the local soil: 1) collecting additional soil samples from an off-Site or appropriate on-Site location; or 2) using existing soil data that was gathered during the installation of the perimeter ground water wells.

  Initially, neither option was selected because the planned capping of the landfill would eliminate points of contact with landfill associated soils. In the present risk

assessment, an on-Site soil background arsenic determination was selected consistent with option 1. In the CRA Evaluation of Remedial Alternatives report, Figure 1.8 shows the results of background arsenic measurements in surficial soil in eight locations around the landfill perimeter. However, even though as stated "... these samples were collected from areas that were undisturbed by landfill operation activities...", the new sampling points selected for background values were located very close to (in the case of sample S3-99, almost identical to) the affected surficial soil sampling locations from 1993 (see: 1999 Additional Sampling Activities, Figure 3.5). Moreover, the new data have shown very low concentrations of arsenic or no-detects at a Sample Quantitation Limit (SQL) of 1 mg/kg. Even though background concentrations of arsenic in soil from similar locations may vary significantly, it is highly unlikely that arsenic levels in the same area (e.g., S3-99 and SS-12), allegedly "undisturbed by landfill operation activities," would show such variability and be reduced by a factor of 6 or more over a few years (1999 Additional Sampling Activities, Figure 3.5). Rather, sampling and/or analysis of the soil samples for arsenic may be suspect.

In addition, there was no attempt to establish background for arsenic.

- Additional concern is caused by the usage of an arithmetic mean (central tendency) to express the concentration term. It is not appropriate to use an arithmetic mean as the concentration term for any media in a Human Health or Ecological Risk Assessment. This is supported by U.S. EPA's "Risk Assessment Guidance for Superfund" (RAGS), and especially, the "Supplemental Guidance to RAGS: Calculating the Concentration Term" (U.S. EPA Publication 9285.7-081). As recommended by the U.S. EPA: "...Because of the uncertainty associated with estimating the true average concentration at a site, the 95 percent upper confidence limit (UCL) of the arithmetic mean should be used for this variable. [...] For decision-making purposes [...] RME is used to estimate risk ..."

  Therefore, in order to appropriately calculate a reasonable maximum exposure ("RME") and a central tendency ("CT") risk estimate, the 95% UCL of the mean is to be used for the concentration term (use the maximum contaminant concentration if it is lower than the UCL value).

  The difference between RME and CT risk estimates is based on using mean and central tendency values for exposure parameters in risk calculations (*e.g.,* soil ingestion rate, skin surface area, soil adherence factor, etc.), and not in using a mean concentration value. As stated above, the concentration term is to be either the 95% UCL of the arithmetic mean or the maximum detected concentration.

- Baseline risk assessment used a method of calculating "mean" or "central tendency" from all results, including non-detect, for use as the concentration term, which is not acceptable for either screening or Risk Assessment purposes.

To appropriately calculate the concentration term, based on the 95% upper confidence limit of the mean, the non-detected points surrounding any contiguous area of concern and/or separating multiple areas of concern should be eliminated from the combined data set. If the concentration of a chemical of concern in any part of the site exceeds safe levels, the individual or aggregated risk for the whole site should also exceed an acceptable level. Consequently, when properly estimated, risk presented by the entire site cannot be less than the risk calculated from either the maximum or the 95% UCL of the mean concentration of chemical contaminants in any specific area of concern. Any individual or aggregated health hazard quotient exceeding 1.0 and any excess in the cancer risk exceeding 1E-6 should be reported in the RA document.

Similarly, the presentation of "central tendency" in the exposure concentration summary tables for risk assessment purposes (Table 2.8 – 2.13), along with 95% UCL of the mean, is unnecessary and sometimes may be even misleading (see the bullet above).

In general, Ohio EPA determined that the CRA documentation did not provide information warranting a change of the assumptions associated with the Remedial Investigation Report, Baseline Risk Assessment Report, and Feasibility Study Report submitted by Lucas County pursuant to the Consent Order.

The Group also contends that "CRA Alternative 13 is the Most Appropriate and Cost-Effective Remedial Approach for the King Road Landfill." The Group contends that "CRA Alternative 13 does not disturb the existing landfill phyto cap," and "is also consistent with the Director's Final Findings and Orders issued on April 16, 2009."

Ohio EPA's Response

Ohio EPA disagrees with CRA's characterization of the existing soil cover as a "phyto cap". Ohio EPA acknowledges that vegetation does exist; however, it does not serve to eliminate the exposure pathway for direct contact and ingestion of waste material associated with the landfill. A minimum of two (2) feet of clean material must be present in order to eliminate the exposure pathway associated with direct contact and ingestion of waste material. In addition to elimination of the direct contact and ingestion exposure potential, two (2) feet of clean material comports with the regulatory requirements for landfill closure at the time Kind Road Landfill ceased operation. Ohio EPA's selection of Alternative 11 ensures that the potential risks associated with direct contact and ingestion are appropriately addressed and complies with the applicable regulatory requirements.

The Group also contends that "Alternative 11 Selected in the Preferred Plan is Insufficiently Developed and is Less Protective than the Status Quo." The Group contends that "[t]here is no analysis of the extent of the current landfill cover that would require supplementation or an analysis of how that supplementation would adversely impact the existing robust natural phyto cover that is already present on the King Road

Landfill. . . . In addition, there is no cost data or cost effectiveness analysis of Alternative 11." The Group also contends that "implementing Alternative 11 would require extensive site work and would needlessly expose workers involved in the remediation and the surrounding community to the waste mass currently covered by the existing phyto cap." In addition, the Group contends that "there is no current data suggesting that there is any exposed waste at the King Road Landfill." And finally, the Group contends that "Alternative 11 is certainly more expensive than CRA Alternative 13," that "Alternative 11 does nothing to enhance protection of human health and the environment," and that Alternative 11 "does not meet the Director's protectiveness standard as well as CRA Alternative 13."

Ohio EPA's Response

As stated in the previous response, Ohio EPA disagrees with CRA's characterization of the existing soil cover as a "phyto cap". The existing vegetation does not eliminate potential exposure for direct contact with wastes associated with the landfill. Further, the existing vegetation does not comply with relevant regulatory requirements for landfill closure. The Remedial Alternative recommended by Ohio EPA contemplates supplemental cover material and evapotranspirative cover as appropriate. As a result, Alternative 11 is more protective than the status quo and complies with the applicable regulatory requirements. The relevant issue is not the presence of exposed waste but rather the extent to which sufficient cover material exists between the waste and the surface of the landfill. The Mannik & Smith Group, on behalf of the Lucas County Sanitary Engineer's Office, performed a limited scale investigation to determine the extent to which sufficient cover material existed. The results indicated that a significant segment of the area investigated did not meet the minimum threshold for soil cover thickness. Ohio EPA plans to incorporate a more comprehensive evaluation as part of the Remedial Design phase of the remediation. For those areas that demonstrate sufficient soil cover exists, additional soil cover will not be necessary. To the extent practical, Ohio EPA plans to maintain existing vegetative features as well as unique Oak Openings flora and fauna. Ohio EPA's selection of Alternative 11 reflects the Agency's consideration of threshold criteria, including the protection of human health and the environment, as well as primary balancing criteria, including the expense of implementing the selected remedy.

Comments by Lucas County

On behalf of Lucas County, by letter dated January 14, 2011, James P. Shaw, III, P.E., Lucas County Sanitary Engineer, expressed support for the selection of Alternative No. 11, as the Preferred Plan, including the proposed research by the University of Toledo, and the proposed bicycle trail (allowance for beneficial reuse). In addition, Lucas County incorporated by reference prior comments that "contest for the record that the KRL received waste after 1975, or that the site was not previously closed." Further, Lucas County's comments included the County's position on arsenic levels and requested that the Agency take this information "into consideration when developing performance standards for the identification and clean up of hot spots at the KRL."

Ohio EPA's Response

Ohio EPA has not asserted that the KRL received waste after 1975, but rather, that the County failed to achieve the established standards for closure. See, *inter alia*, Ohio EPA correspondence with Lucas County, dated August 6, 1976, March 15, 1978, August 18, 1978, and August 30, 1978.

Comment by Olander Park System

Park System endorses the remediation plan and the proposed bicycle trail (allowance for beneficial reuse).

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Sylvania Township Administrator

Township supports Alternative No. 11 as it reflects input from the University of Toledo, Olander Park System, and the Toledo Area Metroparks.

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Sylvania Township Public Works Manager

Sylvania Township Public Works Manager offers the township's stock of leaves and compost material for soil enrichment and requests no truck traffic on Covert and Trotter Roads due to inadequate pavement composition and residential status of neighborhood.

Ohio EPA's Response

Ohio EPA appreciates the offer of potential soil enrichment material and notes the Sylvania Township Public Works objection to truck traffic on Covert and Trotter Roads. Ohio EPA plans to work with the party responsible for implementation of the remedy to ensure that alternative vehicle routes are used.

Comment by Thermodyn Corporation

Thermodyn, located adjacent to the landfill, requested that the landfill fence be relocated to allow for greater access behind the Thermodyn building for emergency vehicles and to address the issue of flooding.

Ohio EPA's Response

Ohio EPA will evaluate the potential relocation of the landfill fence as part of the Remedial Design. Relocation will be dependent on the extent to which the implementation does not adversely affect the proposed remedy.

Comment by University of Toledo

Individuals representing the University of Toledo in the areas of Environmental Sciences and Research Development expressed support for an evapo-transpiration cover with potential for environmental research options.

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Individual comments which were received during the public comment period included the following:

One (1) individual comment was provided during the public hearing portion of the January 10, 2011 meeting, supporting the return to a useful Oak Opening standard with a beneficial reuse option.

Comment by Daniel Becker

"I would like to see it returned to as much of a useful space as possible, and if there's an opportunity to help return it to an Oak Opening standard I think that's the best for everyone."

Ohio EPA's Response

Ohio EPA plans to preserve as much of the existing Oak Opening habitat as possible.

Fifteen (15) separate e-mail comments representing private citizens, each expressing support of Alternative No. 11 and the proposed bicycle trail (allowance for beneficial use).

Comment by Kevin David

"Therefore I am fully in favor of Ohio EPA's Preferred Alternative #11. Furthermore, I would like to see the remediation done as soon as possible and encourage all parties to make every effort to combine the remediation with the proposed greenway/trail for cost savings and other synergies."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by David Elliott

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Linda Wheeler

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Rick Rump

"I am in favor of Ohio EPA's Preferred Alternative #11. I am in favor of incorporating an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Jim House

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Janet Smith

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Laurie Ferguson

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Jacqueline Campbell

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Pat Squire

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Rick Metcalf

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Mike Troxell

"I think it is important for the cycling community and future cyclists to have a complete trail system to provide safe connections to the area parks and the University.

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Susan Richards

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Larry Billingsley

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Patricia Rapp

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

Comment by Laura Schetter

"I am in favor of Ohio EPA's Preferred Alternative #11. I would prefer that the remedy be installed as soon as possible and incorporate an extension of the University / Parks bike trail through the property."

Ohio EPA's Response

No response necessary in light of the commenter's endorsement of Ohio EPA's Preferred Remedial Alternative.

8.0 GLOSSARY

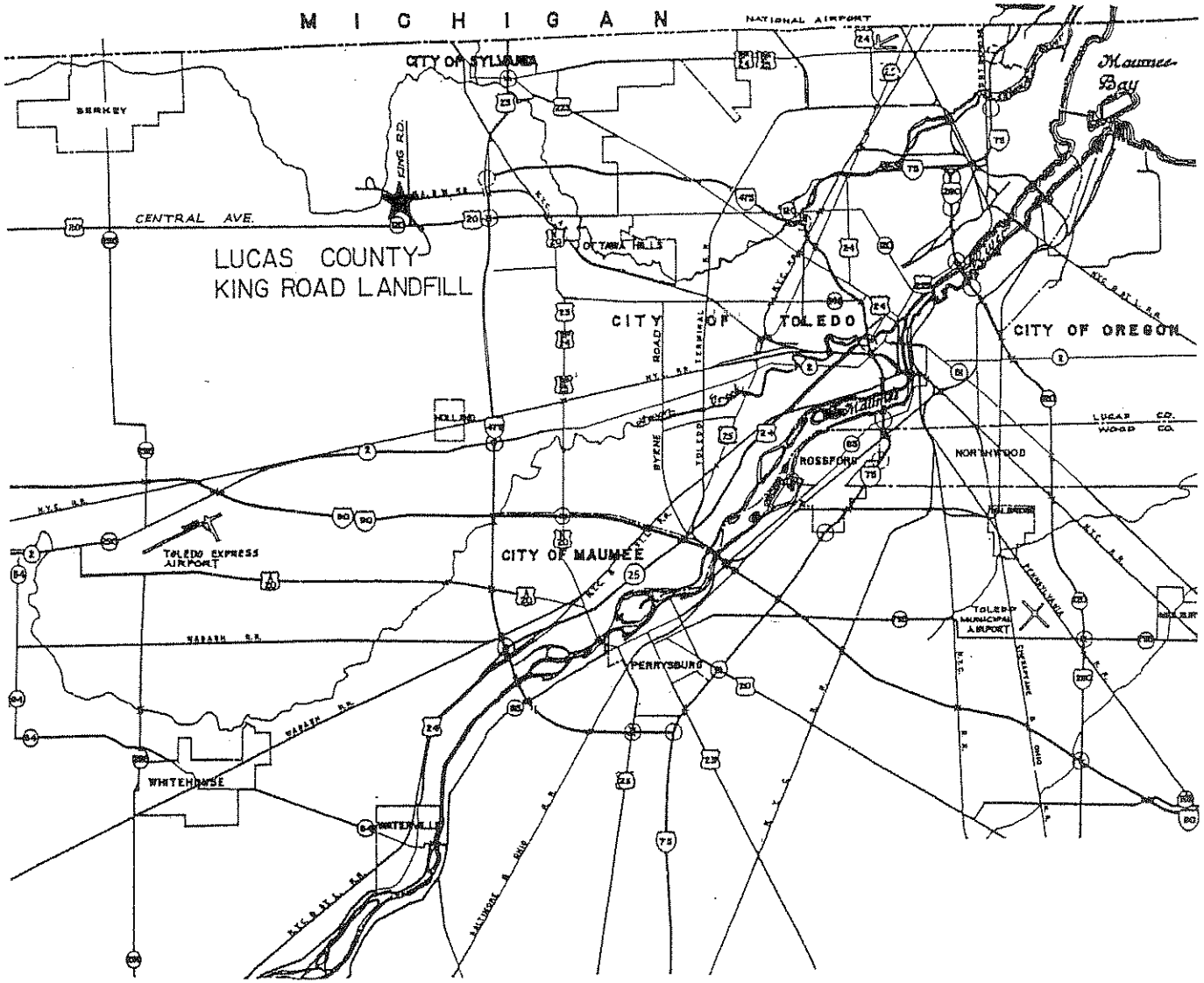
Aquifer -	An underground geological formation capable of holding and yielding water.
ARARs -	Applicable or relevant and appropriate requirements. Those statutes and rules which strictly apply to remedial activities at the site, or those statutes and rules whose requirements would help achieve the remedial goals for the site.
Baseline Risk Assessment -	An evaluation of the risks to humans and the environment posed by a site.
Carcinogen -	A chemical that causes cancer.
CERCLA -	Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq. A federal law that regulates cleanup of hazardous substances sites under the U.S. EPA Superfund Program.
Contaminants of Concern (COCs) -	Chemicals identified at the site which are present in concentrations that may be harmful to human health or the environment.
Decision Document -	A statement issued by the Ohio EPA giving the Director's selected remedy for a site and the reasons for its selection.
Ecological Receptor -	Animals or plant life exposed or potentially exposed to chemicals released from a site.
Environmental Covenant -	A servitude (legal limitation) arising under an environmental response project that imposes activity and use limitations and that meets the requirements established in 5301.82 of the Ohio Revised Code.
Exposure Pathway -	Route by which a chemical is transported from the site to a human or ecological receptor
Feasibility Study -	A study conducted to ensure that appropriate remedial alternatives are developed and evaluated such that relevant information concerning the remedial action options can be presented to a decision-maker and an appropriate remedy selected.

Hazardous Waste -	A waste product, listed or defined by the RCRA, which may cause harm to humans or the environment.
Hazardous Substance -	A chemical that may cause harm to humans or the environment.
Human Receptor -	A person or population exposed to chemicals released from a site.
NCP -	National Oil and Hazardous Substances Pollution Contingency Plan, codified at 40 C.F.R. Part 300 (1990), as amended. A framework for remediation of hazardous substance sites specified in CERCLA.
O&M -	Operation and Maintenance. Long-term measures taken at a site, after the initial remedial actions, to assure that a remedy remains protective of human health and the environment.
Performance Standard -	Measures by which Ohio EPA can determine if RAOs have been met.
Preferred Plan -	The plan that evaluates the preferred remedial alternative chosen by Ohio EPA to remediate the site in a manner that best satisfies the evaluation criteria.
Preliminary Remediation Goal (PRG) -	Initial clean-up goals that (1) are protective of human health and the environment and (2) comply with ARARs. They are developed early in the process (scoping) based on readily available information and are modified to reflect the results of the baseline risk assessment (termed site-specific PRGs at this point in time). They are also used during the analysis of remedial alternatives in the remedial investigation/feasibility study (RI/FS).
Remedial Action Objectives (RAOs) -	Specific goals of the remedy for reducing risks posed by the site.
Remedial Investigation -	A study conducted to collect information necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives.

Responsiveness Summary- A summary of all comments received concerning the Preferred Plan and Ohio EPA's response to all issues raised in those comments.

Water Quality Standards - Chemical, physical and biological standards that define whether a body of surface water is unacceptably contaminated. These standards are intended to ensure that a body of water is safe for fishing, swimming and as a drinking water source. These standards can be found in Chapter 3745-1 of the Ohio Administrative Code.

LIST OF FIGURES



NOT TO SCALE

Figure 1

Site Location Map

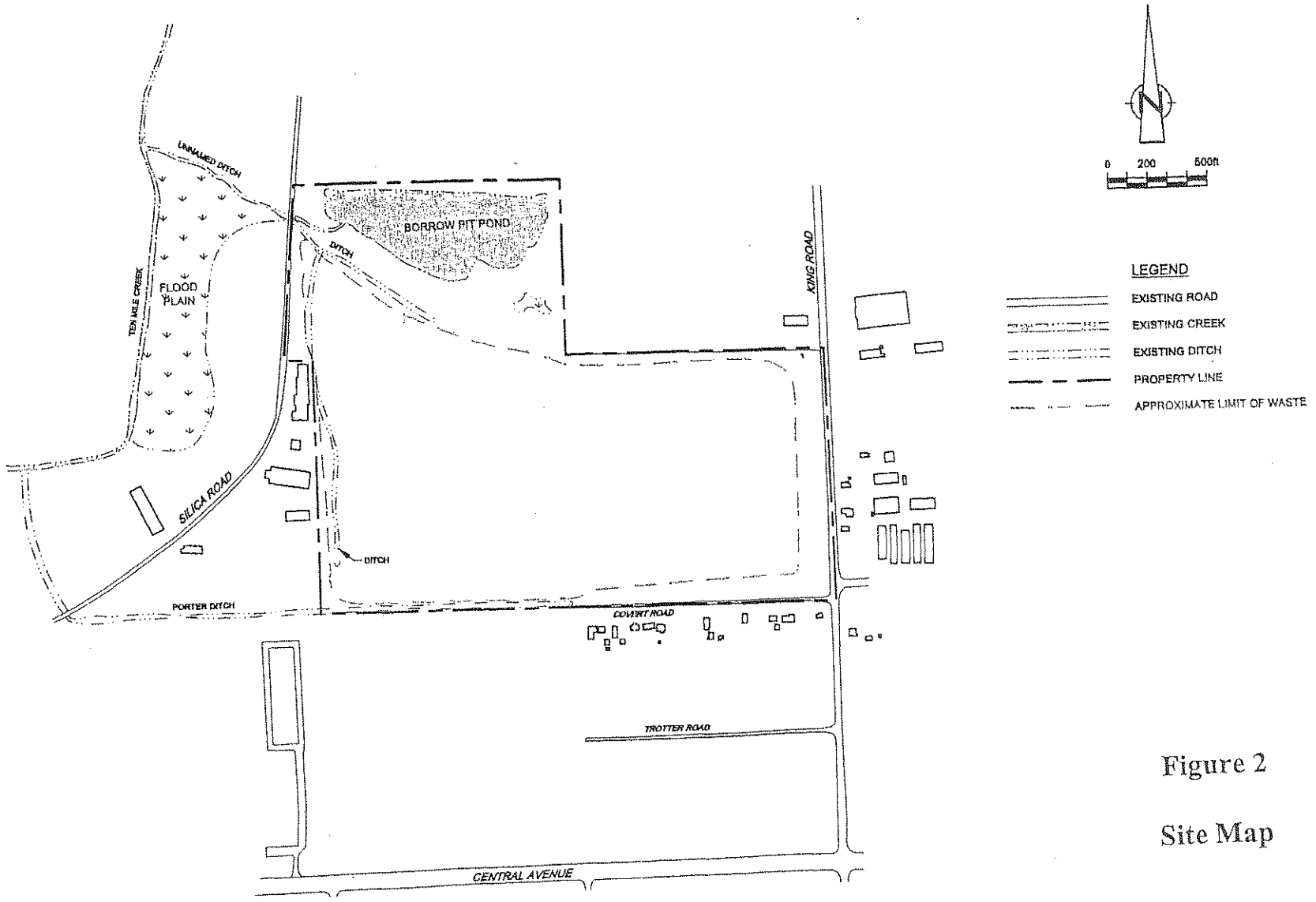


Figure 2

Site Map