Phase I Geographic Initiative

Lower Alum Creek Watershed
Southern Delaware and Franklin Counties, Ohio

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1.0 Introduction

There are a significant number of sites reported in the lower Alum Creek watershed where hazardous substances were either released into the environment or have the potential to be released to the environment. These sites include abandoned landfills, dumps, defunct industrial facilities, and some operating facilities.[2] The Ohio Environmental Protection Agency (Ohio EPA) identified the need for further investigations of the potential impact of these sites to Alum Creek. Ohio EPA sought funding for a comprehensive investigation of Lower Alum Creek through Region 5 of the United States Environmental Protection Agency (US EPA). As a result, Ohio EPA and US EPA entered into a cooperative agreement to conduct this Phase I Geographic Initiative. Although the emphasis of this initiative is on identification of potential impacts of unregulated hazardous waste sites, other potential sources and causes of stream impairment were also identified in order to present a more comprehensive view of the many factors affecting the overall environmental quality of lower Alum Creek.

1.1 Objectives

As stated in Section 1.0, the general objective of this Phase I Geographic Initiative is to identify unregulated sources of chemical pollution that could adversely impact Alum Creek or that may present an unacceptable risk to human health or the environment. In order to accomplish this objective, it is necessary to understand the variety of factors that impact the creek and to isolate the relative contribution of each of those factors. The specific objectives of this Phase I Geographic Initiative are as follows:

1. review and compile existing information pertaining to lower Alum Creek;
2. assess the overall water quality of lower Alum Creek;
3. identify impaired or polluted stream segments;
4. identify the potential causes and sources of stream impairment or pollution; and,
5. recommend additional investigations and remedial actions.

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[1] In this Report lower Alum Creek is defined as the stream segment from Alum Creek Dam to Big Walnut Creek.

[2] These sites are addressed by the federal government under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and by the State of Ohio under Ohio Revised Code Chapters 3734, 3745, 3746, and 6111.

The existing data was sufficient to identify areas that need further assessment, and to draw general conclusions regarding the sources and causes of stream impairment. Section 5.0 contains a summary of this investigation, its conclusions, and recommended actions to improve the environmental quality of Alum Creek.

2.0 General Description of the Alum Creek Watershed

Alum Creek is located in the Big Walnut Creek sub-basin of the lower Scioto River Drainage Basin. It is 51.5 miles long and flows in a southerly direction from its headwaters in Morrow County through Delaware County to its confluence with Big Walnut Creek in southeastern Franklin County (Figure 1). In 1973, Alum Creek was impounded in southern Delaware County to form a 3,387-acre reservoir, which was named Alum Creek Lake. The reservoir effectively separates Alum Creek into two distinct segments. For the purposes of this report the segment south of the reservoir is called lower Alum Creek. Lower Alum Creek is the focus of this Geographic Initiative.

Alum Creek is located in the Columbus Lowland Till Plains region of the Central Lowlands Physiographic Province (Brockman, 1998). The landscape in this region reflects the effects of Wisconsin age continental glaciation, which retreated from Ohio approximately 10,000 years ago. In general, the glaciers flattened out the landscape by erosion and burying stream valleys with glacial drift. Lower Alum Creek follows an old pre-Wisconsin valley that was buried with approximately 150 feet of interbedded glacial till and outwash deposits (Schmidt, 1958). The pre-Wisconsin stream that formed the valley cut into Devonian age shale bedrock (Figure 2). Ground water aquifers occur in the glacial outwash deposits and have the potential to yield more than 1000 gallons of water per minute (Schmidt, 1960). The landscape within the Lower Alum Creek valley is a broad nearly level flood plain with low terraces. The surface soils are generally well-drained and were formed in loamy alluvium from sediments deposited by floodwaters (ODNR, 1977). The stream gradient is approximately four feet per mile. The annual mean discharge near Alum Creek Lake is 114 cubic feet of water per second, and the annual mean discharge at Livingston Avenue in Columbus is 196 cubic feet of water per second (USGS, 1999).

Land use in the lower Alum Creek watershed is mainly suburban and urban with some agricultural areas (Figure 3). Residential developments, commercial facilities, and light industry are the main land-uses in the northern reach. Older residential and commercial/industrial areas are the main land-uses in the central and southern reaches. According to the Mid-Ohio Regional Planning Commission, nearly one-half of the adjacent land is publicly owned. Field surveys and aerial photographs revealed that there is generally a buffer zone between the creek and residential/commercial developments. Several parks, golf courses, nurseries, farms, and large residential lots line the creek. A few farm fields, which tend to be plowed to the creek bank, exist north of Westerville and south of urban Columbus.

Lower Alum Creek is a source of water for the general public, agriculture, and industry. Three public water supply systems serve approximately 45,000 people in the lower Alum Creek watershed. The largest user is the city of Westerville, which draws surface water from the creek, approximately five miles downstream of the Alum Creek Dam. The other two users are Citizens Utilities of Huber Ridge and By Way Mobile Home Park, both of which use ground water (Ohio EPA, 2001).

3.0 Biological and Water Quality Assessment

The most comprehensive biological and water quality assessment available for Alum Creek is a study conducted by Ohio EPA's Division of Surface Water (DSW) in 1996. DSW collected biological and chemical data at total of from 37 aquatic and stream sediment sampling stations along 30.5 river miles of Alum Creek. This Geographic Initiative evaluated 31 of these samples that were collected over a span of 26 river miles in lower Alum Creek (Figure 4). The results of the 1996 investigation were published in a document entitled *Biological and Water Quality Study of the Middle Scioto River and Alum Creek* (Ohio EPA, 1999)[3].

In addition to the DSW study, Ohio EPA's Division of Emergency and Remedial Response (DERR) evaluated eight unregulated hazardous waste sites in the watershed during the mid-1990s. Surface water and sediment samples were collected for chemical analysis at six of these sites.

The information and data from these investigations were evaluated for this Geographic Initiative to: (1) assess the general condition of lower Alum Creek; (2) identify impaired and polluted stream segments; and, (3) identify potential causes of stream impairment.

3.1 Aquatic Life Assessment

Alum Creek is classified as a warm water habitat (WWH) stream in the Eastern Corn Belt Plains aquatic ecoregion. Aquatic ecoregions are identified through spacial differences in a combination of landscape characteristics. These characteristics include soil types, physiography, climate, wildlife, water, vegetation, geology, and human land-

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[3]Ohio assesses the health of its streams by setting criteria for designated aquatic life uses and non-aquatic life uses within ecoregions. Streams or stream segments are assigned use designations in accordance with Ohio Administrative Code 3745-1, Ohio Water Quality Standards. Alum Creek's use designation is WWH aquatic life use, Primary Contact Recreation, Public Water Supply, Industrial Water Supply, and Agricultural Water Supply.

use. The Eastern Corn Belt Plains ecoregion is defined as a rolling plain of glacial till with local end moraines dominated by corn fields, soy bean fields, and livestock production (Omnerik, 1995).

In order to assess the health of aquatic life in lower Alum Creek, DSW sampled macroinvertebrates and/or fish at 22 locations. The results were compared to other WWH streams in the Eastern Corn Belt Plains ecoregion. According to DSW, approximately 72% of lower Alum Creek is in full attainment of existing WWH aquatic life use criteria; 25% partially attains existing WWH criteria; and, approximately 3% does not attain WWH criteria (Figure 5). The non attainment segment is the highly urbanized area of Columbus/Bexley. This segment is between two low-head dams and contains known sources of chemical contamination. Both macroinvertebrate and fish assemblages significantly declined in this segment compared to upstream samples. DSW described the fish assemblage as "characterized by a high proportion of environmentally tolerant taxa, low taxa richness and highly elevated incidences of deformities, eroded fins/barbels, lesions, and tumors (DELT) anomalies within the fish assemblage."[4] Partial attainment of WWH criteria was observed for another five miles downstream to south of State Route 104. The only other location that did not fully meet WWH criteria is at the Huber Ridge Waste Water Treatment Plant mixing zone because of a slight decrease of the fish community indices from the norm.

DSW also evaluated ambient biological performance.[5] According to DSW's evaluation, lower Alum Creek received a "fair-good" evaluation for most of its length. In general, lower Alum Creek is considered "good" north of urban Columbus and "fair" from urban Columbus south to Big Walnut Creek. The "non attainment" segment in Columbus/Bexley received a poor-very poor evaluation. There are no segments that received an exceptional evaluation.

Apparently, there are factors that are adversely impacting aquatic life over the entire length of lower Alum Creek. An indication of overall poor water quality is the inability of lower Alum Creek to support populations of pollution sensitive aquatic species. No documented live federal or state endangered species have been found for several years. The shells of one state endangered mussel specie, *Villosa fabalis* (rayed bean), and one threatened specie, *Epioblasma triquetra* (snuffbox), were found near Westerville, but no live specimens were found (Hoggarth et al, 1997). One federal

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[4]Quote taken from page 10 of the 1999 Biological and Water Quality Study.

[5]See Page 6 of the *Biological and Water Quality Study*. DSW established a rating system to communicate the quality of water based on biological criteria. The ratings are exceptional, good, fair, poor, and very poor. "Good" means that the segment meets the WWH criteria; "fair" means that certain characteristics are missing which reflect an imbalance in the aquatic community; "poor-very poor" means that desirable stream attributes are absent.

endangered specie, *Pleurobema Clava* (Clubshell), and nine state endangered species were identified in Big Walnut Creek near its confluence with Alum Creek and Blacklick Creek (Ohio EPA, 2001). It is possible that some of these species exist in the extreme southern part of the creek.

3.2 Physical Habitat Assessment

The quality of the habitat determines the types of aquatic life found in a stream segment. Habitats can impact the diversity of life, and it can exacerbate the effects of poor water quality. The physical habitat assessment used in this document was conducted by DSW in 1996 using the Quality Habitat Evaluation Index (QHEI), a methodology developed by Ohio EPA. In addition to the DSW assessment, field surveys were conducted in 2000 and aerial photographs were reviewed.

Lower Alum Creek is a relatively shallow stream with natural habitat features consisting of several riffle-pool-run sequences. Field surveys indicate that many of the instream natural habitat features are still present. Aerial photographs indicate there is a thin (but substantial) tree canopy on both banks; however, extensive riparian corridors are rare. According to the QHEI scores habitat features should fully support WWH aquatic (Figure 6). QHEI scores of 75 may have the ability to support exceptional warmwater faunas. Such scores were observed in two segments between the Interstate Route 670 bridge and Westerville and south of the Alum Creek Dam spillway. Habitat-deficient areas were identified in Westerville and in Columbus/Bexley (QHEI scores of 52-56.5). The low QHEI scores in the Columbus/Bexley area are mainly due to the existence of low-head dams at Nelson Park and Wolfe Park. Based on habitat features alone, lower Alum Creek has the ability to support a more diverse and healthy assemblage of aquatic life than is observed.

3.3 Water Quality Assessment

The surface water data that was evaluated in this report was generated by DSW and DERR in the mid-1990's. DSW generated a comprehensive set of data for several water quality parameters over the entire length of lower Alum Creek. DSW analyzed water samples for chemical compounds, dissolved oxygen, biochemical oxygen demand, total suspended solids, and nutrients. DERR generated surface water data near unregulated hazardous waste sites. DERR analyzed water samples for metals and several organic chemical compounds. The sampling locations and general results are summarized in Table 3-1 and depicted in Figure 7.

The DSW data indicate that fecal-related bacteria are a principal pollutant in surface water. Fecal coliform, fecal strep, and e. coli, are pervasive in surface water throughout lower Alum Creek. For example, fecal coliform exceeded the Primary Contact

Recreation (PCR) criterion of 2000 colonies/100 ml and the Secondary Contact Recreation (SCR) criterion of 5000 colonies/100 ml at all sampling sites from Westerville to Big Walnut Creek. The concentration and pervasiveness of these bacteria indicate organic enrichment from human and animal waste is a significant problem throughout the lower Alum Creek watershed.

An adverse effect of organic enrichment and bacteria is that these pollutants can cause low dissolved oxygen in the water column. According to the DSW data, low dissolved oxygen was measured below the WWH criterion at several of the sampling stations from the Columbus/Bexley area downstream to State Route 104. Low dissolved oxygen was also detected at two sampling locations north of urban Columbus.

In 1996, the mean total suspended solids (silt) were near the median for wadeable WWH streams throughout lower Alum Creek in 1996. However, data collected by DSW in 2000 indicate that suspended solids may be increasing in the developing areas of north Westerville and in northern Columbus (Vandermeer, P., 2001). This is likely due to the increase of construction in these areas.

Industrial and agricultural pollutants in the water column were detected at low concentrations from Columbus/Bexley downstream to State Route 104. The following volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals and pesticides were detected in surface water: 1,2-dichloroethene (15 ug/l), methylene chloride (4J ug/l), trichloroethene (7J ug/l), chloroform (1J ug/l), xylenes (1J ug/l), copper (25.2 ug/l), lead (3.1 ug/l), cadmium (13 ug/l), zinc (906 ug/l), naphthalene (0.9 ug/l), 1,2,4 trimethylbenzene (1.0 ug/l), bis(2-ethylhexyl)phthalate (2J ug/l) benzene hexachloride (.007 ug/l), dieldrin (.007 ug/l), and endosulfan I (.007 ug/l).[6]

In summary, the principle pollution problem in surface water of lower Alum Creek is organic enrichment, fecal bacteria, and locally low dissolved oxygen. Alum Creek's relatively small size and flow make it vulnerable to the adverse effects of relatively minor discharges of sewage and urban run-off. As noted in Sections 3.1 and 3.2, the adverse effects become much worse in poor habitat areas; for example, increased bacterial contamination and low dissolved oxygen was observed in the impounded water behind the low-head dams. This is likely a key factor in the poor assemblage of aquatic life observed in these areas.

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[6]Concentrations for surface water data are in parenthesis and given in micrograms per liter or ug/l. See Table 3-1 for an explanation of data qualifies (J qualifier). Many sediment sample concentrations given in parenthesis in Section 3.4 are reported in milligrams per kilogram or mg/kg.

3.4 Sediment Assessment

Sediment quality and potential effects of contaminants detected in sediment were evaluated. Sediment samples used in this assessment were collected by DSW and DERR. DSW collected sediment samples at six locations and DERR collected eleven sediment samples near three unregulated hazardous waste sites. Both the DERR and DSW samples were analyzed for VOCs, SVOCs, metals, pesticides, and polychlorinated biphenyls (PCBs). Locations and general results are provided in Figure 8 and in Tables 3-3, 3-4, and 3-5.

Metal analytes were detected at concentrations that are considered elevated at every sampling station according to Ohio EPA guidelines.[7] Elevated metals include arsenic (1.25-55.3 mg/kg), cadmium (0.13-4.41 mg/kg), chromium (9.5-44 mg/kg), copper (19-35.2 mg/kg), lead (26-31 mg/kg), mercury (0.031-0.34 mg/kg), nickel (21.6-43 mg/kg), and zinc (125-358 mg/kg). The most highly elevated metal is cadmium, which is extremely elevated or highly elevated at every sample location from urban Columbus/Bexley to State Route 104. Arsenic was detected at an extremely elevated concentration near the Interstate 70 bridge and at a highly elevated concentration in a sample collected near State Route 161 (Huber Ridge subdivision). Zinc concentrations are highly elevated from Columbus/Bexley downstream to State Route 104.

SVOCs are the principal contaminants detected in the sediment, particularly polynuclear aromatic hydrocarbons (PAHs). SVOCs were detected at every sampling station from State Route 161 to State Route 104. Significant SVOCs detected include anthracene (0.28-13 mg/kg), benzo(a) anthracene (1.2-37 mg/kg), benzo(a)pyrene (1.4-33 mg/kg), benzo(b)fluoranthene (1.4-34 mg/kg), benzo(g,h,i)perylene (0.7-13 mg/kg), benzo(k)fluoranthene (1.2-33 mg/kg), chrysene (1.9-49 mg/kg), dibenz(a,h)anthracene (0.36-15 mg/kg), fluoranthene (3.4-120 mg/kg), indeno(1,2,3-cd pyrene (1.3-20 mg/kg), phenanthrene (1.3-20 mg/kg), and pyrene (2.8-82 mg/kg). A significant increase in SVOC concentrations occurs in urban Columbus/Bexley.

The PCB, Arochlor 1260, was detected in Alum Creek sediment at four locations over a 5-mile distance from urban Columbus/Bexley to State Route 104. Concentrations ranged from 37.9 ug/kg at State Route 104 to 180 ug/kg at a sample location just south of the Interstate 70 bridge.

Pesticides detected in sediment include Dieldrin (9.9-13 ug/kg), Endosulfan I (30-540 ug/kg), Endosulfan II (7.3-72 ug/kg), Methoxychlor (23-46 ug/kg), Endrin (13 ug/kg), 4,4 DDT (7.4-34 ug/kg), 4,4 DDD (8.28 ug/kg), and Chlordane (23 ug/kg). The number of

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[7]The guidelines are Ohio-specific and based on statewide and ecoregional analysis by Dennis Mishne, DSW-EAU, in 1996. Metal concentrations were compared to values listed under the Eastern Corn Belt Plains ecoregion. Mercury was not listed in the guidelines.

pesticides detected at each location tended to increase in urban Columbus/Bexley.

3.4.1 Potential Effects of Sediment Contamination

To assess the potential effects of sediment contamination on aquatic life, the data were compared to the Lowest Effect Level (LEL)and Severe Effect Level (SEL) (Persuad et al., 1993).[8] DSW uses the LEL and SEL as a screening tool to determine the potential for long-term adverse effects to bottom-dwelling benthic organisms. Exceedences of the SEL indicate adverse effects are likely; exceedences of the LEL indicate a potential for adverse effects. Comparisons of chemical sediment concentrations to the SEL and LEL are summarized below and depicted in Figure 9.

- Metals. Only arsenic exceeded the SEL in a sample collected south of the Interstate 70 bridge. Copper, nickel, and zinc exceeded the LEL at every sampling location. Arsenic and lead exceeded the LEL at every sampling location except one. Cadmium exceeded the LEL at every sampling station from the Columbus/Bexley segment downstream. Mercury exceeded the LEL at four sample locations and chromium exceeded the LEL at three locations. This assessment indicates metals may adversely affect benthic organisms throughout the entire length of Lower Alum Creek.

- SVOCs. SVOCs exceeded the LEL at every sampling location from State Route 161 to State Route 104. SVOCs exceeded the SEL in two samples collected by DERR in urban Columbus/Bexley. The compounds that exceeded the SEL are anthracene, benzo(g,h,i)perylene, chrysene, dibenz (a,h) anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene. Based on these data, adverse effects to benthic organisms due to the presence of SVOCs in sediment are likely in the Columbus/Bexley area and possibly elsewhere.

- PCBs. The PCB, Arochlor 1260, was detected at concentrations that exceed the LEL at four sampling locations over a distance of five miles. Therefore, PCBs may have an adverse effect on benthic organisms from urban Columbus/Bexley downstream to State Route 104 and perhaps further.

- Pesticides. Pesticide exceedences of the LEL are sporadic. Pesticides that exceeded the LEL include, Endrin, 4,4 DDT, and Chlordane. Endosulfan I, Endosulfan II, Methoxychlor were not listed in the guideline, but these constituents exceeded the Ecological Data Quality Levels generated by US EPA

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[8]The SEL was calculated based on an assumed total organic carbon concentration of 3%. Total organic carbon ranged from 1.7-3.6% in the samples collected by DSW in 1996.

Region 5 (US EPA, 1999). Most exceedences of the LEL occurred in samples collected south of the Interstate 70 bridge.

Although the LEL and SEL give an indication of the potential effects of individual constituents on benthic organisms, this comparison is not a substitute for a quantitative ecological risk assessment that would take into consideration cumulative effects of all the constituents detected in sediment. Additional data would need to be acquired in order to quantify the ecological and human health risks.

4.0 Potential Sources of Pollution

Available information was reviewed on facilities that have handled hazardous wastes, applied for water discharge permits, or had a history of unregulated discharges in the lower Alum Creek watershed to identify potential sources of pollution. Field surveys and personal interviews were conducted to update the status of some of these sites.

4.1 Sources of Organic Loading

The pervasive bacterial contamination in lower Alum Creek and its tributaries indicate that there are several non-point sources of organic animal waste throughout the watershed. Probable non-point sources include urban run-off, leaking septic systems, home aerators, commercial aerators, and farm run-off. According to the Franklin County Board of Health there are 450 home aerators and 50 commercial entities with aerators that discharge to lower Alum Creek (Korecko, 2001).

Three major point-sources of organic loading were identified in lower Alum Creek: (1) the Columbus Combined Sanitary-Stormwater Overflow Tanks; (2) Huber Ridge Waste Water Treatment Plant; and, (3) Delaware County Alum Creek Waste Water Treatment Plant. Brief descriptions of these point-sources are provided below.

- Combined Sanitary-Stormwater Overflow Tanks. Combined sanitary-storm water overflow tanks are located at the southeast corner of Alum Creek Drive and Main Street. This is a sewage collection system in which sanitary sewage and storm water is collected in a single pipe. During significant precipitation events the combined sewers may fill beyond their capacity and the excess water is collected in tanks for primary treatment prior to overflows into Alum Creek. Approximately 30 million gallons of mixed storm water and sewage overflow from the tanks per year (Ohio EPA, 1999). The 1996 *Biological and Water Quality Study* noted an adverse impact on the macroinvertabrate community and a slight impact on fish immediately downstream from the tanks. There was also a general decrease in water quality downstream from the tanks.

- Huber Ridge Waste Water Treatment Plant. This is the second largest discharger of waste water in the Alum Creek watershed. It has a design flow of 1.03 million gallons of wastewater per day (mgd) from a suburban development in northeast Franklin County (Ohio EPA, 1999). The plant was upgraded in 1994, which improved the overall water quality in this area. The 1996 *Biological and Water Quality Study* noted a slight impact to macroinvertabrates and fish near the mixing zone but not a significant decrease in the overall water quality.

- Delaware County Alum Creek Waste Water Treatment Plant. Delaware County received an NPDES permit in 1999 to discharge an average of 10 million gallons per day of treated waste water into Alum Creek. Discharge from this plant began in June 2001 and is now the largest discharger of treated waste water in Alum Creek. The new discharge pipe is located on the west bank of Alum Creek in Westerville, just south of Alum Creek Park. The additional organic and nutrient loading may have some adverse effects because of the marginal fish and macroinvertebrate assemblages in that area, and the intensive land development planned for Westerville (Ohio EPA, 1998).

In addition, several sanitary sewers overflow into storm sewers that enter lower Alum Creek (Korecko, 2001). The locations of these storm water sewer outfalls are depicted in Figure 10. Note that low dissolved oxygen concentrations tend to be associated with the sanitary-storm sewer outfalls.

4.2 Potential Sources of Chemical Compounds Detected in Sediment

The sources of chemical compounds detected in sediment are mainly non-point; that is, chemicals enter the waterway from spills, dumping, urban run-off, and industrial run-off into ditches, culverts, tributaries, and storm sewers. Sediment sampling data indicates an increase in sediment contamination near storm water outfalls and ditches that drain urban/industrial areas and old landfills. Landfills and industrial facilities that were identified as potential sources are described in the following sections.

4.2.1 Landfills

A total of ten old inactive landfills was identified in the Alum Creek watershed (Figure 11). Eight of the landfills are located near each other in southern Columbus from the Interstate Route I-70 bridge to just south of State Route 104. The other two landfills are located near Westerville. Existing information indicates that all of these landfills accepted hazardous wastes and substances. A brief description of these landfills is provided below. See Table 4-1 for a summary of this information.

- The Columbus City Dump: The Columbus City Dump is the northernmost landfill of a series of four landfills that are located south of downtown Columbus on the west bank of Alum Creek (Figure 12). Ohio EPA completed two state preliminary assessments of this landfill: the first in 1985 and the second in 1997. No environmental samples were collected during either of these assessments. There is information that industrial wastes were disposed of there, but the quantity and types are not known. Currently, the property is owned by Franklin County.

- Integrity Drive South Drum Dump: Integrity Drive South Drum Dump is located between Columbus City Dump and Anchor Landfill on the west bank of Alum Creek. This is a landfill that operated in conjunction with Anchor Landfill. Ohio EPA completed a state preliminary assessment of this site in 1993 and discovered several drums of hazardous waste. In 1995, US EPA conducted a time-critical removal action of 600 discarded drums and a sludge pit. Ohio EPA completed a federal integrated assessment later that year and completed an expanded site inspection in 1997. The total area of this site is 27 acres. Contaminants detected at the site include VOCs, SVOCS, metals, pesticides, and PCBs. These contaminants were detected in soil, surface water and sediment on site and in Alum Creek sediment. Currently, 11.5 acres of the property are owned by JJ Investments and 15.6 acres are owned by the Bentz Foundation.

- Anchor Landfill: The Anchor Landfill is located immediately south of the Integrity Drive South Drum Dump site. In 1994, Ohio EPA completed a federal integrated assessment for the landfill. In 1996, an expanded site inspection was completed. The area of Anchor Landfill is 37 acres. Sample results indicate that SVOCs, pesticides, and PCBs were detected in on-site soils, seeps, and in Alum Creek sediment. According to the Integrated Assessment Report, Anchor Landfill utilized the trench and fill method in which the alluvium and till was excavated and then filled in with waste; therefore, waste may have been buried below the water table. Currently, the property is owned by Pemoga Development Co. Pemoga uses the property to treat petroleum contaminated soil. After treatment, the soil is spread over the top of the landfill. The facility has a storm water permit for this industrial activity.

- Up Alum Creek, Inc. Property (a.k.a. Forex Site). This site is located immediately south of Anchor Landfill and has an area of 9.5 acres. Old aerial photographs indicate waste was disposed at this property at the same time Anchor Landfill was in operation. It appears this property received overflow waste from the Anchor Landfill. Up Alum Creek, Inc. property is therefore separated from the Anchor Landfill because of separate property ownership. Portions of the Up Alum Creek, Inc. property were sampled during the Anchor Landfill Integrated

Assessment. Sample results indicate the site is contaminated with similar constituents detected on Anchor. Several leachate seeps were noted adjacent to Alum Creek at this site.

- New Columbus Landfill: The New Columbus Landfill is one of four landfills located in this general area (see Figure 12). US EPA completed a site inspection in 1981. Ohio EPA completed a state preliminary assessment for the landfill in 1985, and US EPA completed a screening site inspection (SSI) HRS Pre-score in 1989. Ohio EPA updated the state preliminary assessment in 1997. Solid and industrial waste was disposed in an old gravel pit at this site. Leachate samples were collected during the 1981 inspection but the results are not available. No environmental samples were collected during any of the other assessments. Drainage is directly to Alum Creek via storm drains. The 1997 preliminary assessment noted two leachate outbreaks. The original area of the landfill is 33 acres; however, 13 acres were acquired by Ohio Department of Transportation for the State Route 104/Refugee Road right-of-way, and the waste was removed. The other 20 acres were purchased by Columbus Auto Shredding, Inc. in 2001. Columbus Auto Shredding has built a facility on top of the landfill. Ohio EPA's Division of Solid and Infectious Waste observed the waste brought up when the pilings were driven through the landfill. According to their observations most of the waste material brought up appeared to be construction debris (Snyder, 2001).

- City Landfill Corporation: The City Landfill Corporation is located east of the New Columbus Landfill on the west bank of Alum Creek. Ohio EPA completed a state preliminary assessment for the landfill in 1985, and US EPA completed an SSI HRS Pre-score in 1989. Ohio EPA updated the state preliminary assessment in 1997. No environmental samples were collected during any of these assessments. The 1997 preliminary assessment noted several barrels and exposed waste adjacent to Alum Creek. The barrels contained an "ash-like material." The area of the site is 15 acres and is owned by Louis and Harriet Zuckermann.

- Welch Landfill. Welch Landfill is located on the east bank of Alum Creek across from the City Landfill Corporation site. Ohio EPA completed a state preliminary assessment of the landfill in 1985, and US EPA completed an SSI HRS Pre-score in 1989. Ohio EPA updated the state preliminary assessment in 1998. Ohio EPA collected soil and sediment samples at the Welch Landfill during the 1998 preliminary assessment. Low levels of SVOCs were detected in onsite soils and in the sediment of a small intermittent stream. Lead was detected in one soil sample on-site at a concentration of 1,390 mg/kg. The city of Columbus is the owner of the property.

- Franz Landfill: Franz Landfill is located south of State Route 104 on the east bank of Alum Creek. No assessments have been completed for this landfill. Ohio EPA file information indicates that the landfill accepted municipal solid wastes and industrial wastes from at least 1971 to 1974. In 1974, it was cited for being in violation of Chapter 3734 the Ohio Revised Code, Solid Waste Regulations. The city of Columbus now owns the 45-acre parcel that contains the Franz Landfill and is part of the Columbus metropolitan park system (The Creeks).

- Westerville Landfill (a.k.a. Park Meadow Road Landfill): Westerville Landfill is located on the east bank of Alum Creek in Westerville (Figure 13). Ohio EPA completed a state preliminary assessment of the landfill in 1993. The area of the site is 33 acres. Ohio EPA sampled onsite soil and sediment in drainage ditches. Sampling results indicate that several SVOCs are in the on-site soils and in the drainage ditches. No samples were collected in Alum Creek. In 1999, Westerville received Ohio EPA permission to cap the landfill and relocate a tributary to Alum Creek. The cap was placed on the landfill in the fall of 2000.

- Butterfield Landfill: The Butterfield Landfill is located north of Westerville in Delaware County (Figure 12). The site is 1.5 miles east of Alum Creek, adjacent to a tributary of Alum Creek upstream of the Westerville Reservoir, which is a potable water source for Westerville. Ohio EPA completed a state preliminary assessment for the Butterfield Landfill in 1992. A federal preliminary assessment was completed in 1993 and an integrated assessment was completed in 1994. In 1998, Ohio EPA collected additional environmental samples. Sampling results indicate low levels of VOCs at leachate seeps on-site. No contaminants were identified in the tributary to the Westerville Reservoir.

4.2.2 Industrial Facilities

There are approximately 200 facilities in the lower Alum Creek Watershed listed in Resource Conservation and Recovery Information System (RCRIS), and 33 facilities with industrial storm water discharge permits[9]. There are no records available concerning discharges to Alum Creek or its tributaries for most of these facilities. All of the facilities that have a record of significant discharges in the watershed are located in an industrial area two miles west of lower Alum Creek in Columbus (Figure 14). This is an old industrial area containing a large railroad yard and several industrial operations. Surface water from these facilities drained to American Ditch or to storm sewers that

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[9] Specific locations and information regarding individual facilities can be obtained by accessing US EPA's Enviromapper data base (http://maps.epa.gov/enviromapper) or by contacting Ohio EPA. Facilities with storm water permits are listed in Table 4-3.

drain beneath Maryland Avenue.[10] Many of the pollutants found in Alum Creek sediment occur in American Ditch; therefore, American Ditch is identified as a significant migration pathway of chemical pollutants. Facilities that have a record of discharges of industrial pollutants to American Ditch or to the Maryland Avenue storm sewer are described below. This information is also summarized in Table 4-2.

- ASARCO. Ohio EPA completed a state preliminary assessment of the ASARCO facility in 1994, and a federal integrated assessment was completed in 1995. The integrated assessment recommended an expanded site inspection be completed, but Ohio EPA asked US EPA to reconsider because ASARCO entered Ohio's Voluntary Action Program (VAP).[11] ASARCO was a zinc smelting facility that ceased operations in 1986. Surface water runoff from ASARCO was treated and then directed to American Ditch; however, the treatment was not adequate to prevent releases of metallic waste and acids. The Integrated Assessment attributed the zinc and cadmium contamination found in Alum Creek sediments to ASARCO via American Ditch. Because of the pollutant load from ASARCO to American Ditch, Ohio EPA required ASARCO to obtain an NPDES permit for its discharge. ASARCO was issued a permit but is currently disputing the permit requirements (DSW, 2001).

- Joyce Iron & Metal. Joyce Iron and Metal is a scrap metal salvage yard. It is listed as a transporter in RCRIS. In 1987, Ohio EPA responded to a complaint of PCB oil violations at the facility. PCB oil was found in soil and in a storm water ditch. At that time storm water from Joyce Iron and Metal flowed onto ASARCO property and then to American Ditch. The PCBs were cleaned-up under a state consent order. The cleanup level was set at 25 parts per million or mg/kg.

- Unico Alloys. Unico Alloys is listed as a large quantity generator in RCRIS. DERR completed a state preliminary assessment of this facility in 1990. Unregulated solvent releases to soil and surface water occurred at this site. Over 1000 ppm of trichloroethene was detected in soil and surface water. In 1994, Unico Alloys reported a spill of 30 gallons of ink wastes that likely migrated to American Ditch. In 1996, VOCs were detected in the ground water beneath the site. Ground water is currently being addressed through an enforcement action by Ohio EPA's Division of Hazardous Waste Management.

- AKZO Noble Coating: AKZO manufactures solvent-based industrial coatings.

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[10] Prior to 1996, American Ditch drained into a combined sanitary-storm sewer beneath Maryland Avenue. In 1996, American Ditch was re-routed to the north of Maryland Avenue during the construction of Interstate 670 (see Figure 13).

[11] ASARCO entered Ohio's VAP in 1995 and has not yet submitted a "no further action" letter.

The property was formerly owned by Hanna Chemical Coatings. AKZO was listed as a treatment, storage, and disposal facility until 1989. It is currently listed as a large quantity generator in RCRIS. In 1993, Ohio EPA gave final approval for the closure of two hazardous waste storage areas. AKZO has a history of RCRA violations and spills. Solvents and heavy metals (cadmium, lead, mercury, and chromium) were detected on-site near the closure sites. In 1996, AKZO discovered several leaking underground storage tanks that contaminated the underlying soil with solvents. According to Ohio EPA files, the soil was reportedly cleaned-up in accordance with Ohio Bureau of Underground Storage Tank Regulations.

- <u>Bliss Street Rail Yard</u>. Ohio EPA completed a state preliminary assessment for the Bliss Street Rail Yard in 1995. The site was used for cleaning and maintaining railroad cars. Soil sampling results indicate lead, trichloroethene, and 1,1,2,2 trichloroethane are in the soil. One ground water sample contained 1,1,2,2 trichloroethane. The site has been redeveloped into an office park. According to the consultant's report to the landowner, most of the slag and contaminated soil were removed during development. No other information is available.

- <u>All City Wrecking</u>. This is an auto salvage operation that has been the subject of several complaint investigations. According to Ohio EPA file information, gasoline and other automobile fluids are dumped on a concrete pad with a catch basin. The fluids are directed to an oil-water separator. Storm water and overflow from the separator flows in a ditch through ASARCO property to American Ditch. The on-site soil is reportedly black and soaked with oil. Storm water runoff from this facility may contribute to the contamination in American Ditch and ultimately Alum Creek.

- <u>Frank Enterprises</u>. Ohio EPA completed a state preliminary assessment of Frank Enterprises in 1990 and completed an addendum to the assessment in 1994. The facility manufactured organic chemicals. In 1986, an explosion occurred at the facility that resulted in the release of an estimated 3.5 tons of 50 different types of chemicals. Chemicals either soaked the in soil or flowed into a nearby storm sewer, probably the Maryland Avenue storm sewer. The total extent of the contamination was not determined. Soil samples collected in 1990 indicate VOC, SVOC, and metal contamination. Currently, all but 0.5 acres of the property is covered by an on-ramp from Leonard Avenue to Interstate Route I-670.

- <u>Plaskolite</u>. Plaskolite had two documented spills of methyl methacrylate: the first in 1979 and the second in 1991. The volume of material spilled in 1979 is unknown. In 1991, 500 gallons of methyl methacrylate was spilled during a heavy rainstorm. The spilled methyl methacrylate reportedly washed to American Ditch. The extent of contamination is not known.

5.0 Summary and Recommendations

This Phase I Geographic Initiative is a compilation of existing information on the environmental condition of lower Alum Creek with an emphasis on unregulated sources of pollution. The 1999 Biological and Water Quality Study of Alum Creek by Ohio EPA-DSW was used to determine the overall health of the stream. The basis of this study is biological, water quality, and habitat data collected in 1996. The Report concluded that lower Alum Creek is in fairly good health north of urban Columbus but declines in urban Columbus/Bexley. The stream does not fully recover until south of State Route 104. Figure 15 depicts the most impacted stream segment identified in Lower Alum Creek and some of the major sources of the impairment.

Surface water data indicates that bacteria pose the greatest threat to human health through direct contact. This is indicated by pervasive high fecal coliform counts that exceed primary and secondary contact recreation criteria throughout lower Alum Creek. Bacteria also impacts aquatic life in areas by lowering dissolved oxygen concentration in the water. Bacterial plumes and low dissolved oxygen were worse in the impounded water behind low-head dams and near sewage outfalls. The cause of the high bacteria counts are human and animal waste that enter the stream. The principal sources of sewage are several sanitary-storm sewer overflow outfalls, Columbus CSO tanks, Delaware County WWTP, and the Huber Ridge WWTP. In addition, non-point sources of fecal matter (ie, urban runoff, livestock, leaking septic systems, aerators, and etc.) likely contribute a significant volume of organic waste. A few industrial pollutants and pesticides were detected in surface water at low concentrations. These chemicals were mainly detected near the Maryland Avenue outfall and at culverts, drainage ditches, and leachate seeps adjacent to the old landfills south of the Interstate 70 bridge.

Sediment data indicates prevalent PAH contamination throughout lower Alum Creek. In addition, the PCB, Arochlor 1260, several pesticides, and toxic metals were detected in sediment, from urban Columbus/Bexley downstream to State Route 104. Sediment data was compared to the SEL and LEL to determine potential effects of contamination to benthic organisms. Based on these comparisons, sediment contamination likely has an adverse effect on benthic organisms in Alum Creek. There is insufficient data to determine the magnitude and extent of sediment contamination, or to quantify the potential human health and environmental risks. According to existing data, identified sources of the chemical compounds detected in sediment are urban/industrial runoff to American Ditch/Maryland Avenue storm sewer outfall and the landfills between Interstate 70 and State Route 104. Other sources than the ones identified are suspected because of the prevalence of metals, SVOCs, and PCBs throughout the southern reach of Alum Creek. Any drainage ditch, culvert, or storm sewer outfall could be a conduit for the transport of chemical contaminants.

Based on the findings in this GI, specific recommendations for additional investigations, assessments and remediation are provided below:

- Assess the potential unregulated sources of surface water and sediment contamination. Potential sources of pollution that have not been thoroughly assessed include Franz Landfill, Welch Landfill, City Landfill Corporation, New Columbus Landfill, Westerville Landfill, Up Alum Creek, Inc., Columbus City Dump, and American Ditch. These sites need to be further assessed in order to determine if they contributed and/or continue to contribute the chemical contamination detected in Alum Creek. Franz Landfill, Westerville Landfill, and Up Alum Creek, Inc. will also be assessed for inclusion in the federal CERCLIS data base. Previous state and federal investigations at the Integrity Drive South Drum Dump and Anchor Landfill indicate that they may be sources of pollution in Alum Creek. The stream near these landfills should be more fully evaluated in order to obtain the necessary information to make risk management decisions.

- Identify all potential sources of surface water/sediment contamination. Sediment data indicates that there may be other sources of chemical compounds than were identified with existing information. In order to identify these sources surface water/sediment samples need to be collected at storm water outfalls, ditches, and tributaries that drain industrial sites throughout the watershed, with emphasis on the stream segment south of the Interstate Route 670 bridge to State Route 104). If industrial pollutants are identified in the samples, then an attempt should be made to identify the specific source(s) and assess those sites.

- Define the magnitude and extent of sediment contamination and assess the risk to human health and the environment from the Interstate Route 670 bridge to Big Walnut Creek. Sediment samples were not collected to define the magnitude and extent of contamination from individual sources. Subsequently, there is insufficient information available to make risk management decisions. Current data indicates PCBs, metals, and PAHs are prevalent in sediment, especially in the most biologically impaired segments. The human health and environmental risk due to the presence of these substances needs to be determined and corrective actions taken, if warranted.

- Remove the low-head dams at Nelson Park, Academy Park, and State Route 104. The existence of these dams appears to be a significant cause of aquatic life impairment. Removal of these dams will allow Alum Creek to eventually restore its natural habitat of run-riffle-pool segments, which will ultimately improve the water quality in this segment. This is a relatively inexpensive and easily implemented action that would benefit aquatic life in Alum Creek; reduce environmental and human health risk; and, increase the aesthetic appeal of the creek near Wolfe, Nelson, and Academy Parks.

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Figures

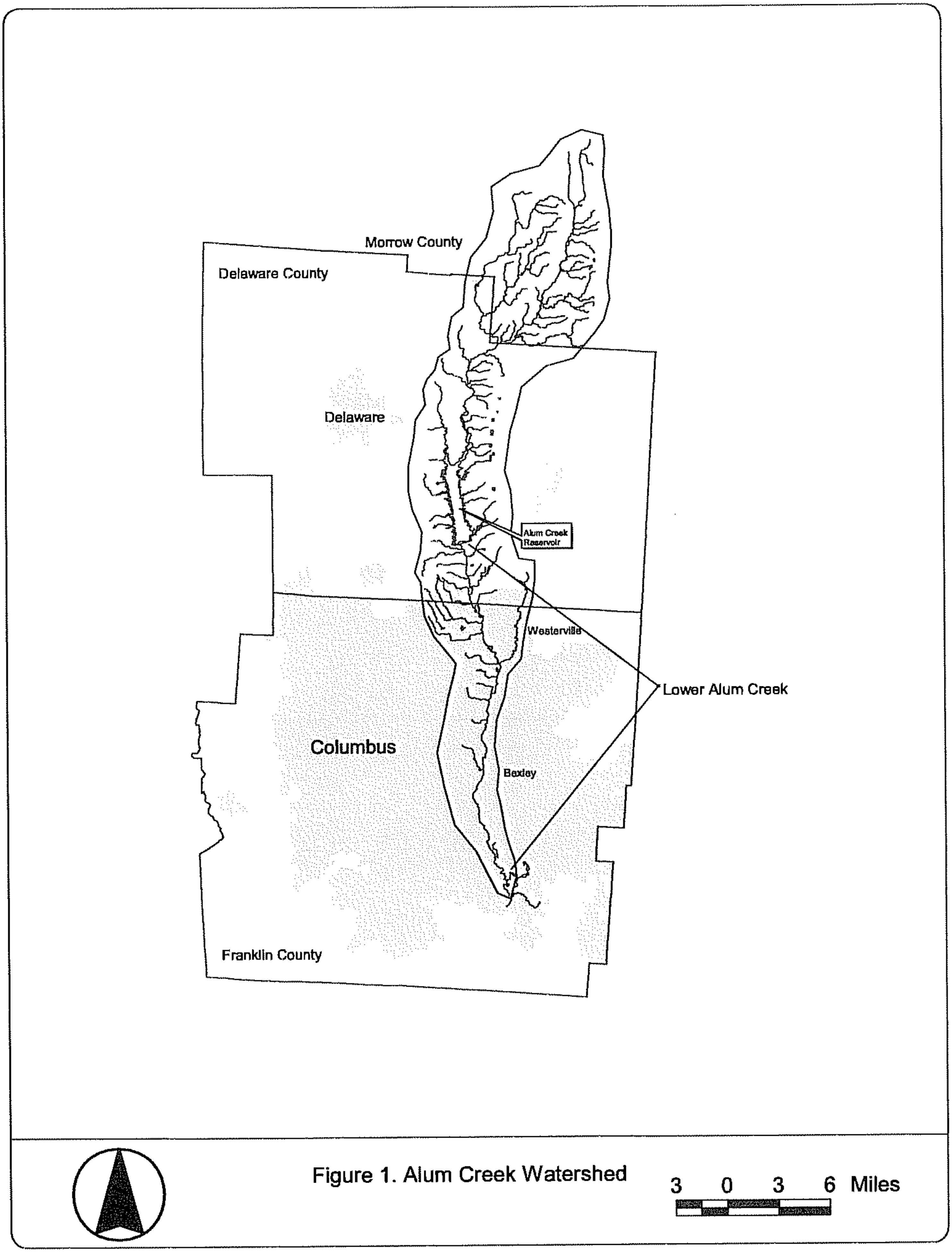
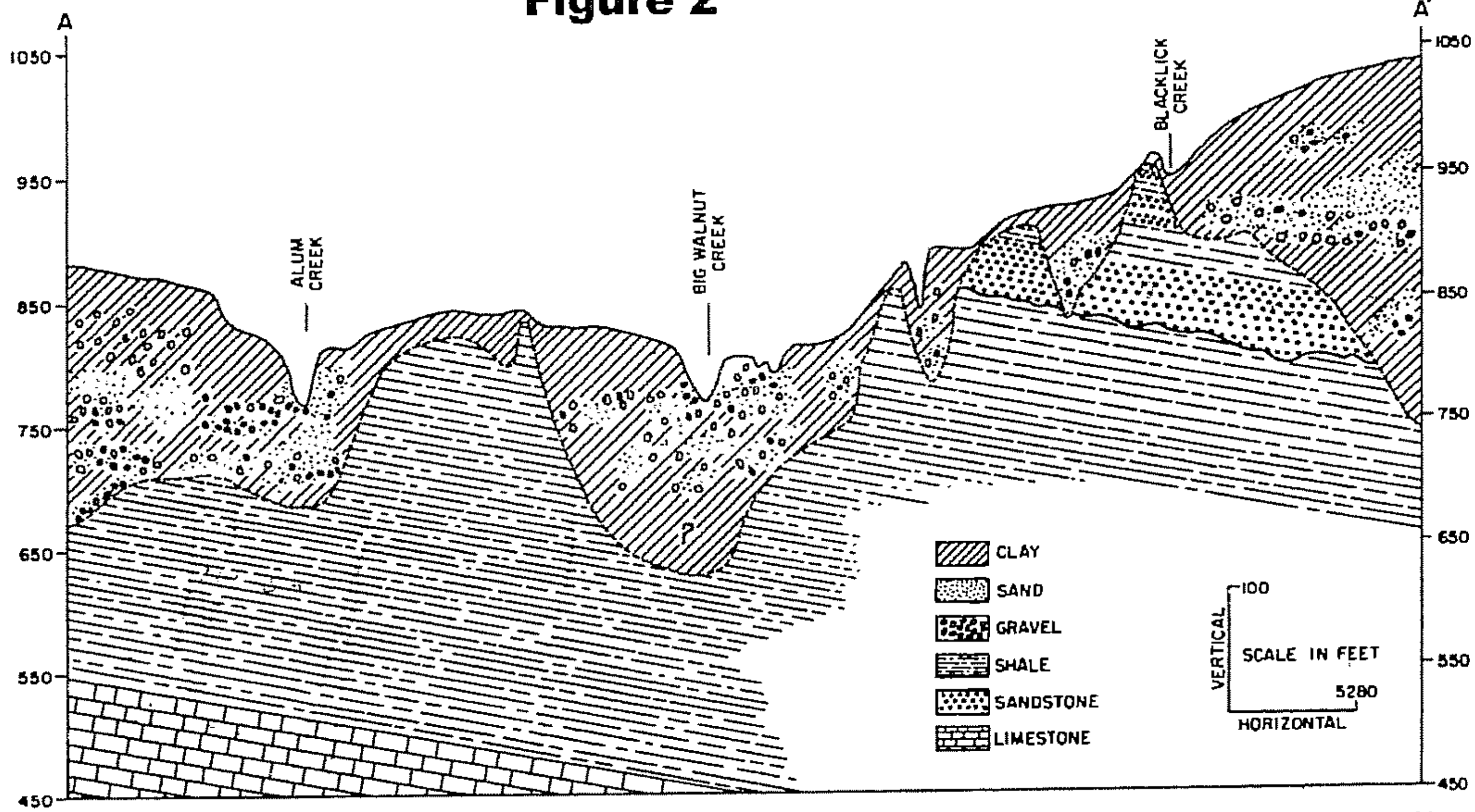


Figure 1. Alum Creek Watershed

Figure 2



GENERALIZED GEOLOGIC SECTION BENEATH THE SOUTHERN PORTION OF BIG WALNUT CREEK BASIN

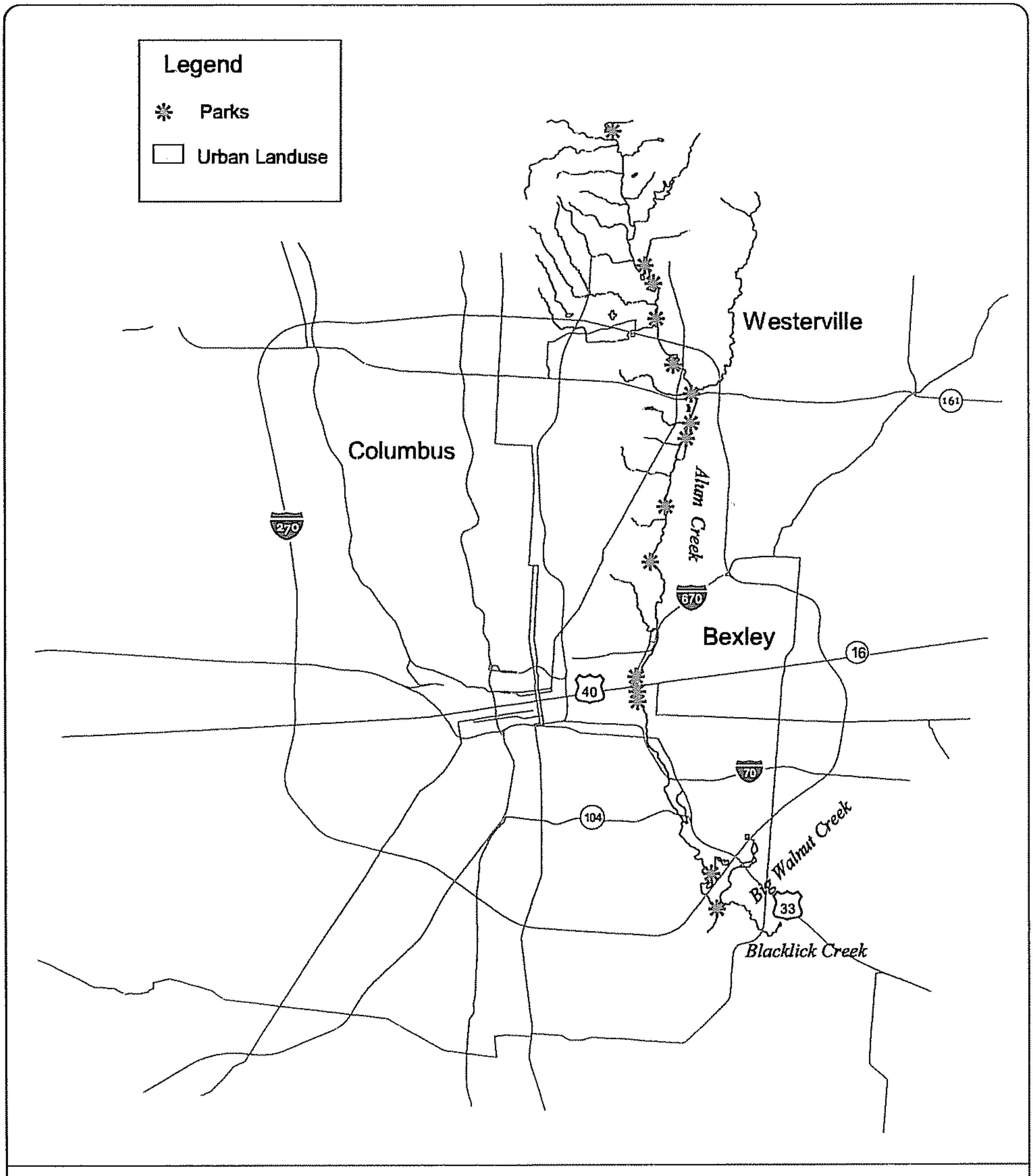


Figure 3. General Landuse

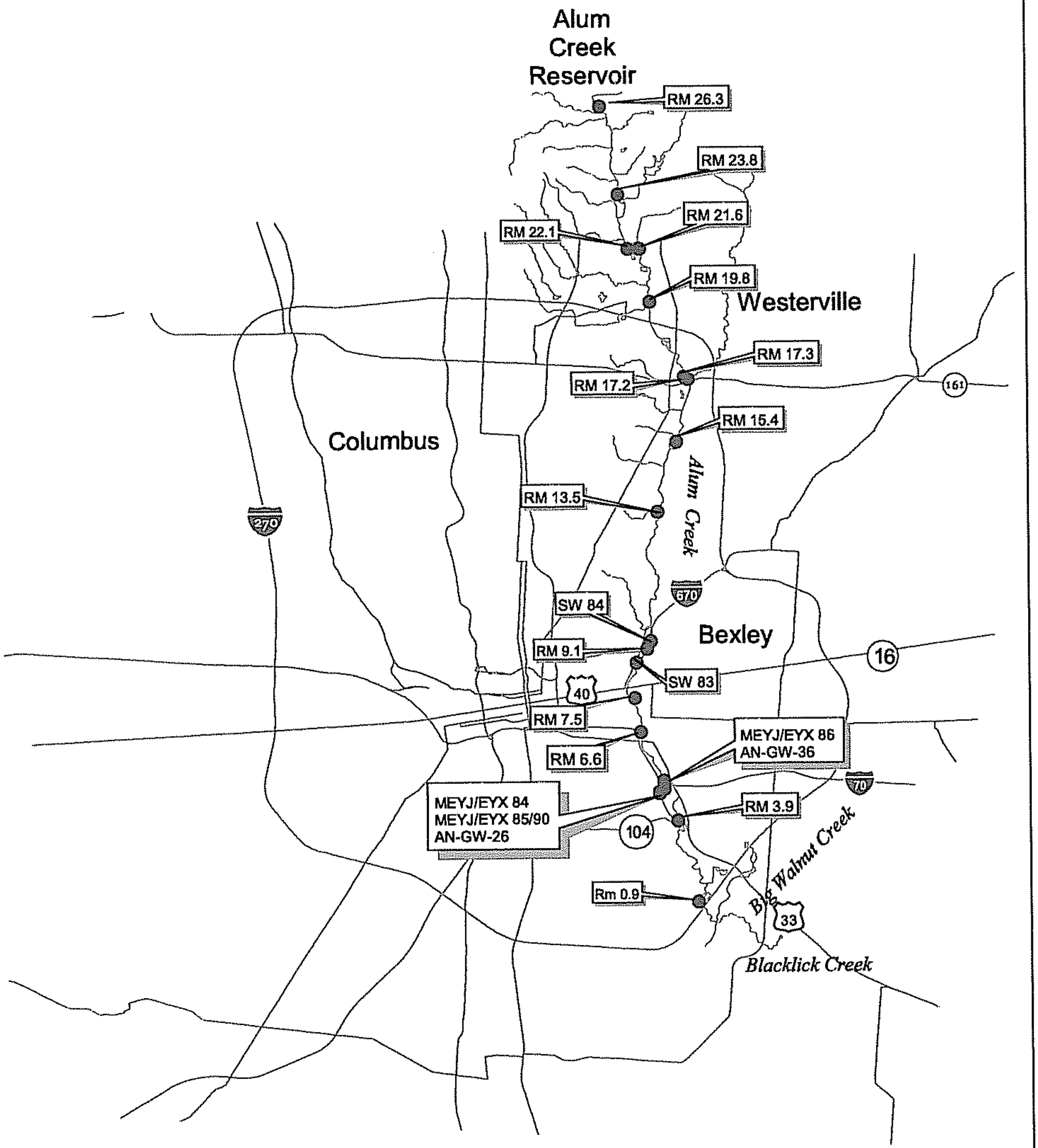


Figure 4. Surface water sampling locations in Alum Creek.

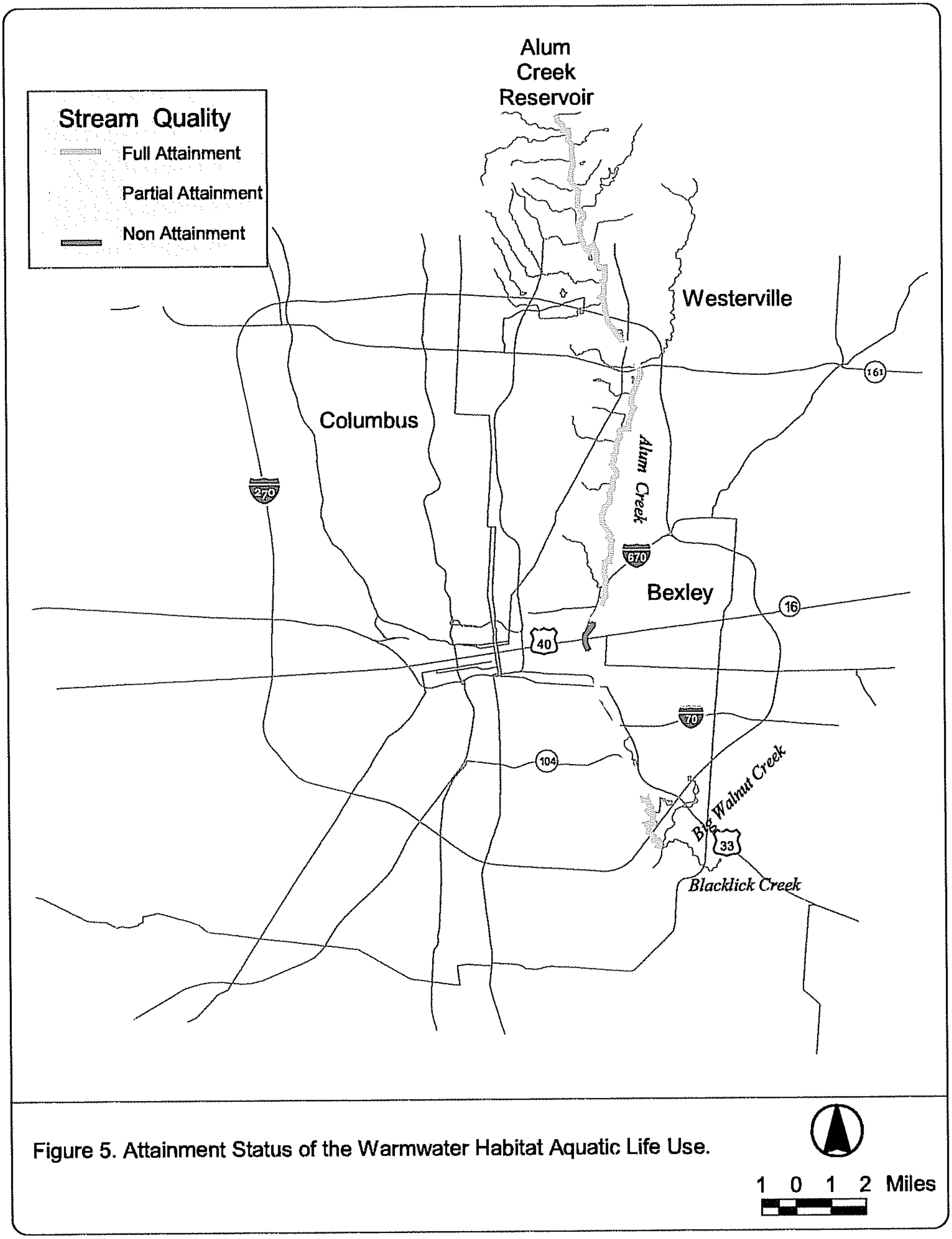


Figure 5. Attainment Status of the Warmwater Habitat Aquatic Life Use.

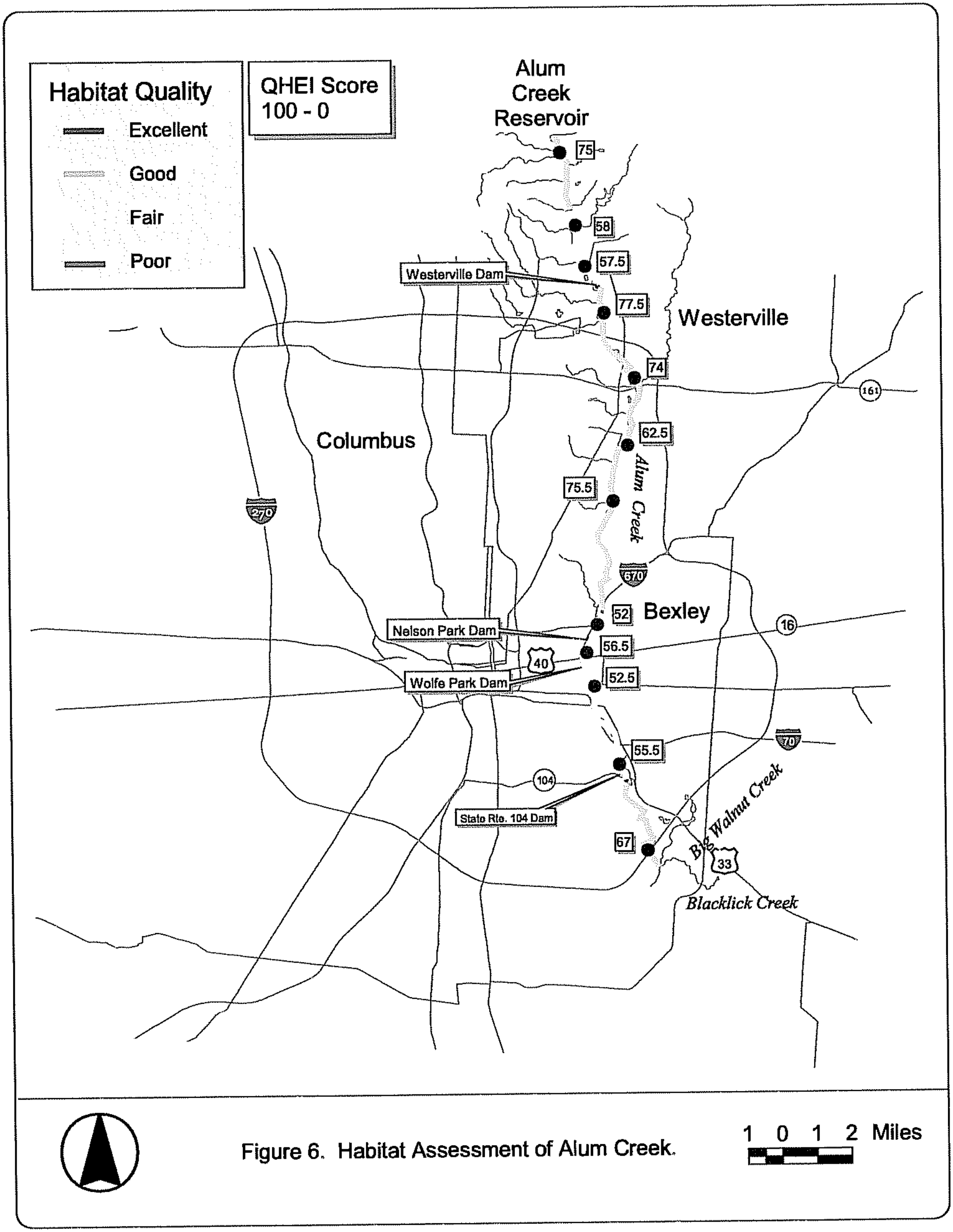


Figure 6. Habitat Assessment of Alum Creek.

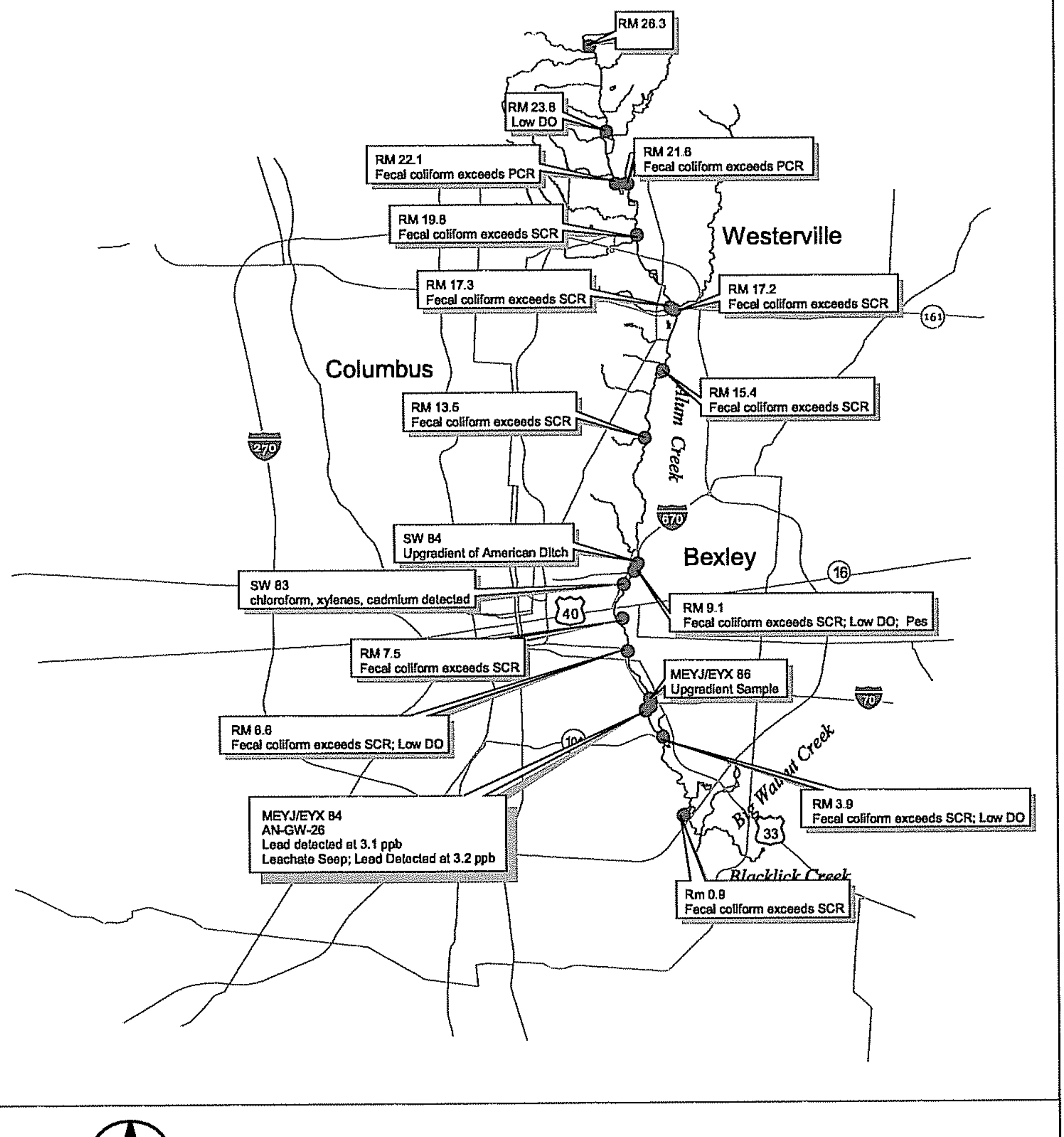


Figure 7. Surface water quality of Alum Creek.

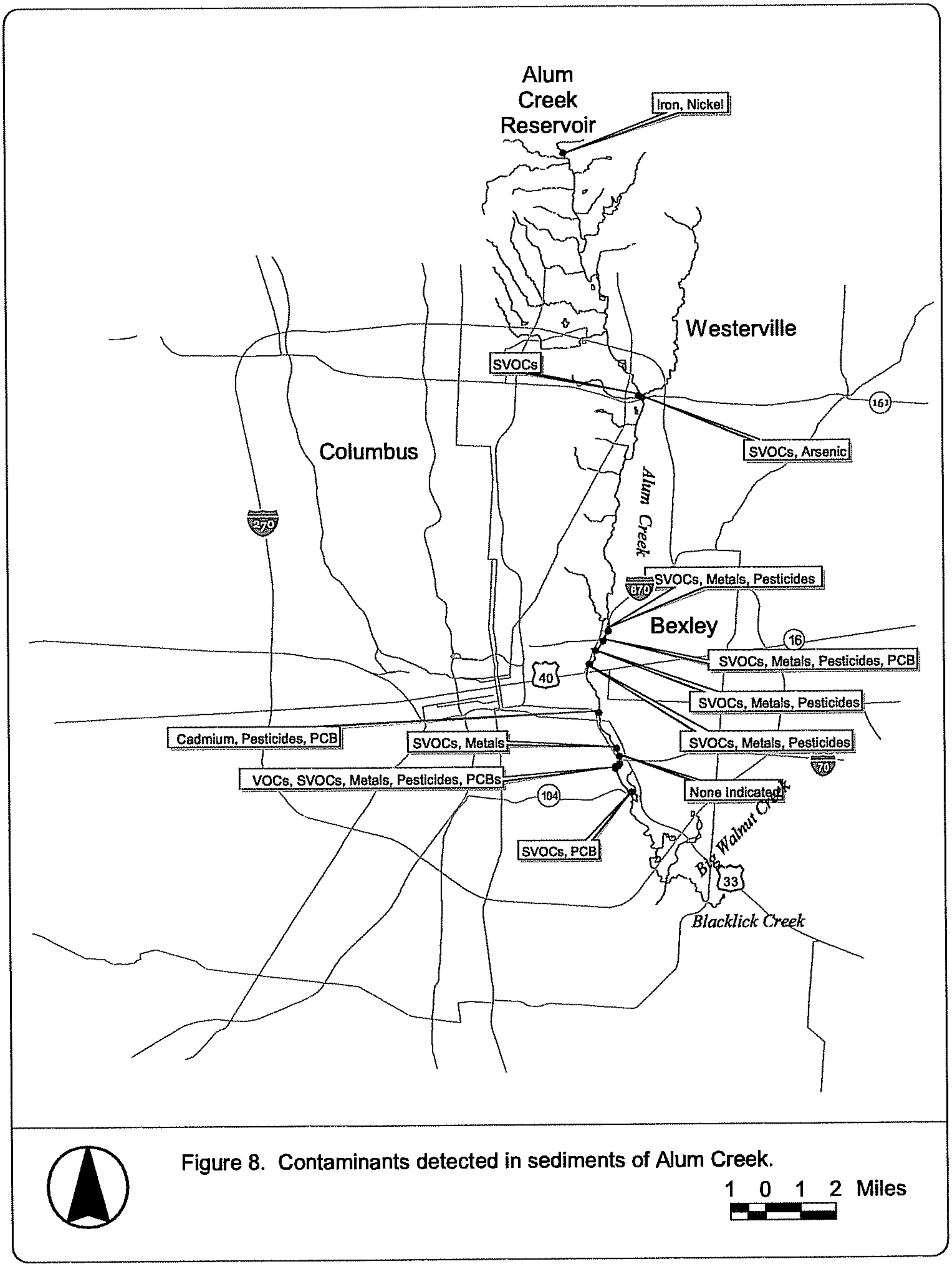


Figure 8. Contaminants detected in sediments of Alum Creek.

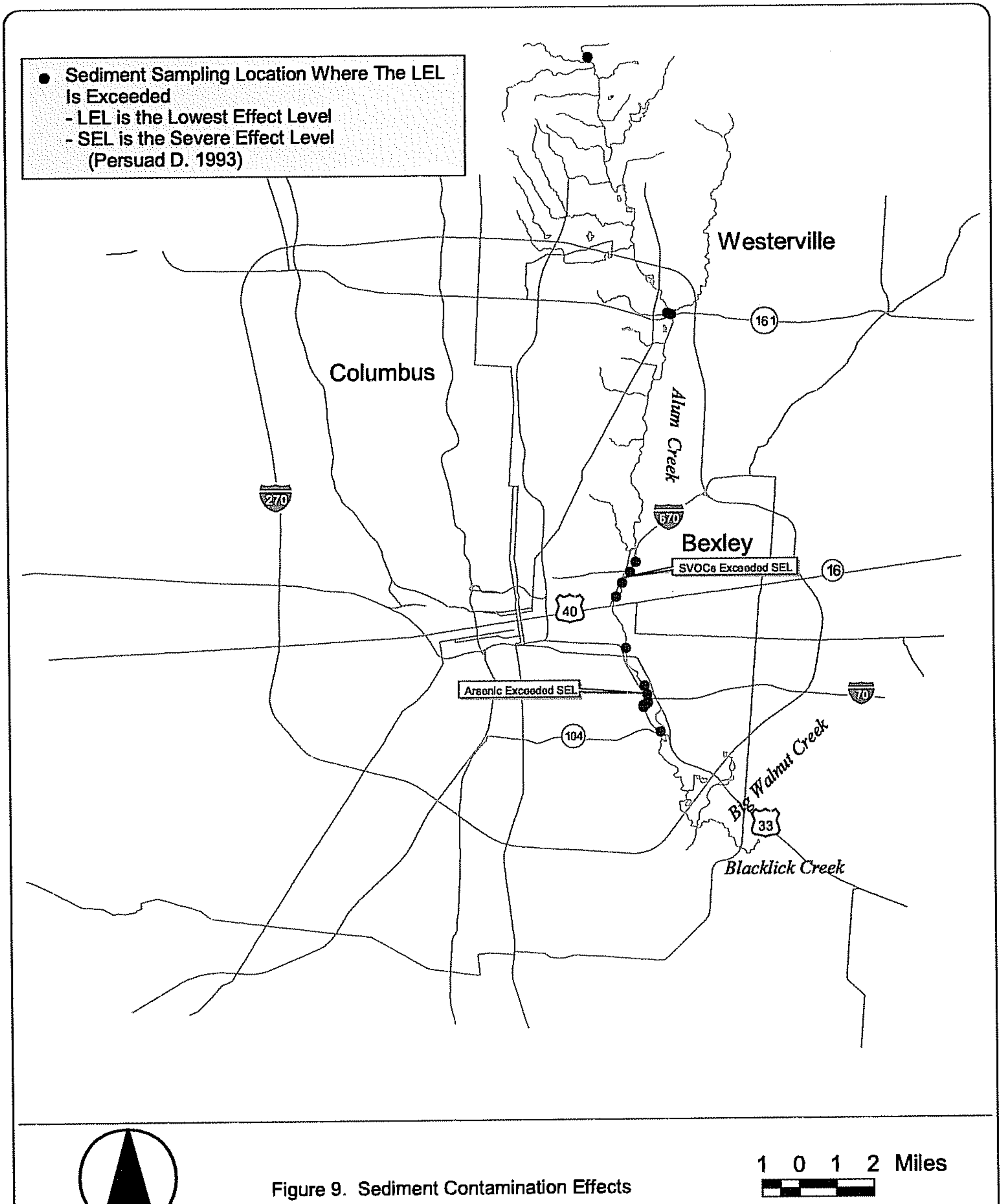


Figure 9. Sediment Contamination Effects

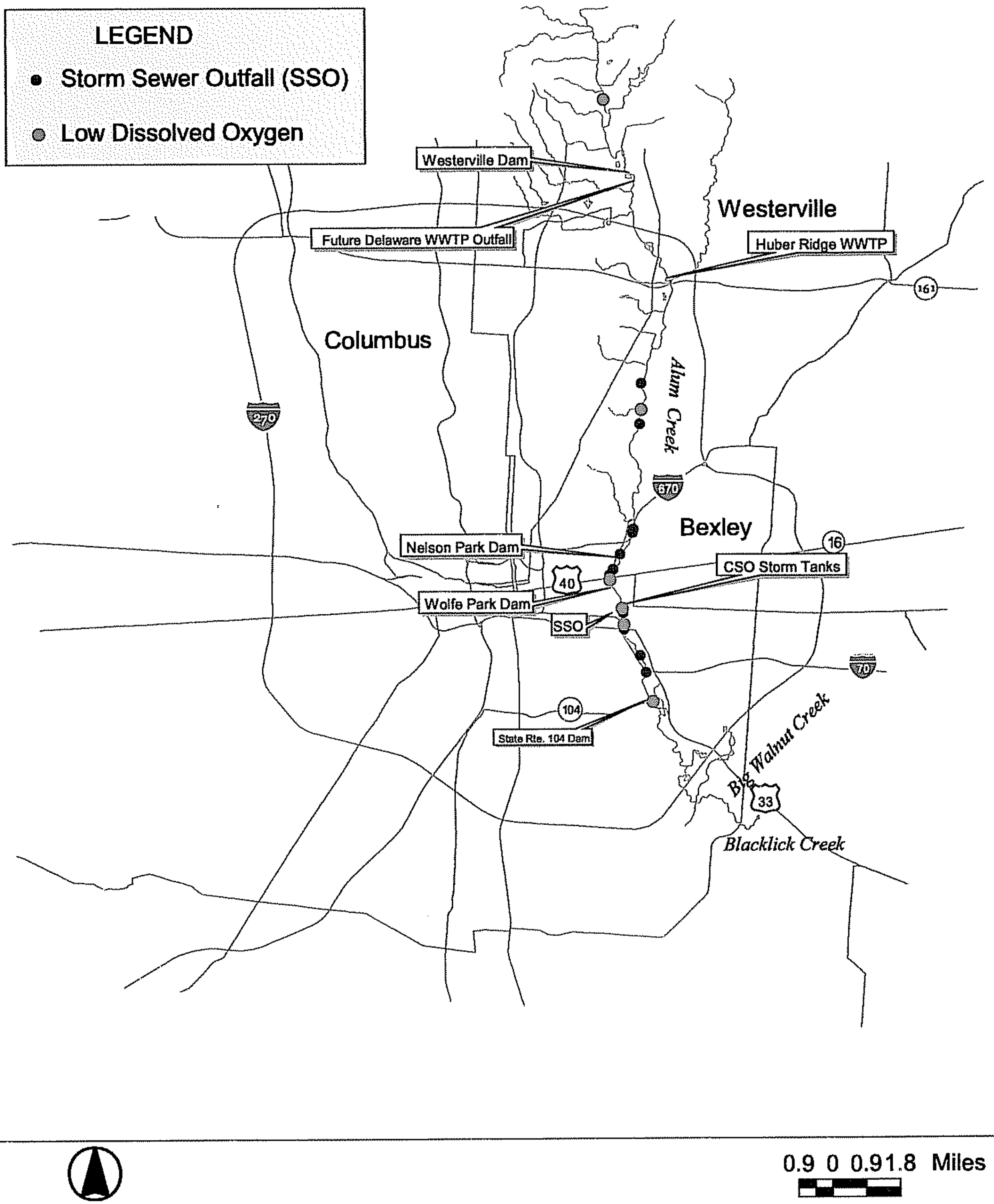


Figure 10. Sources of Organic Loading and Surface Water Effects.

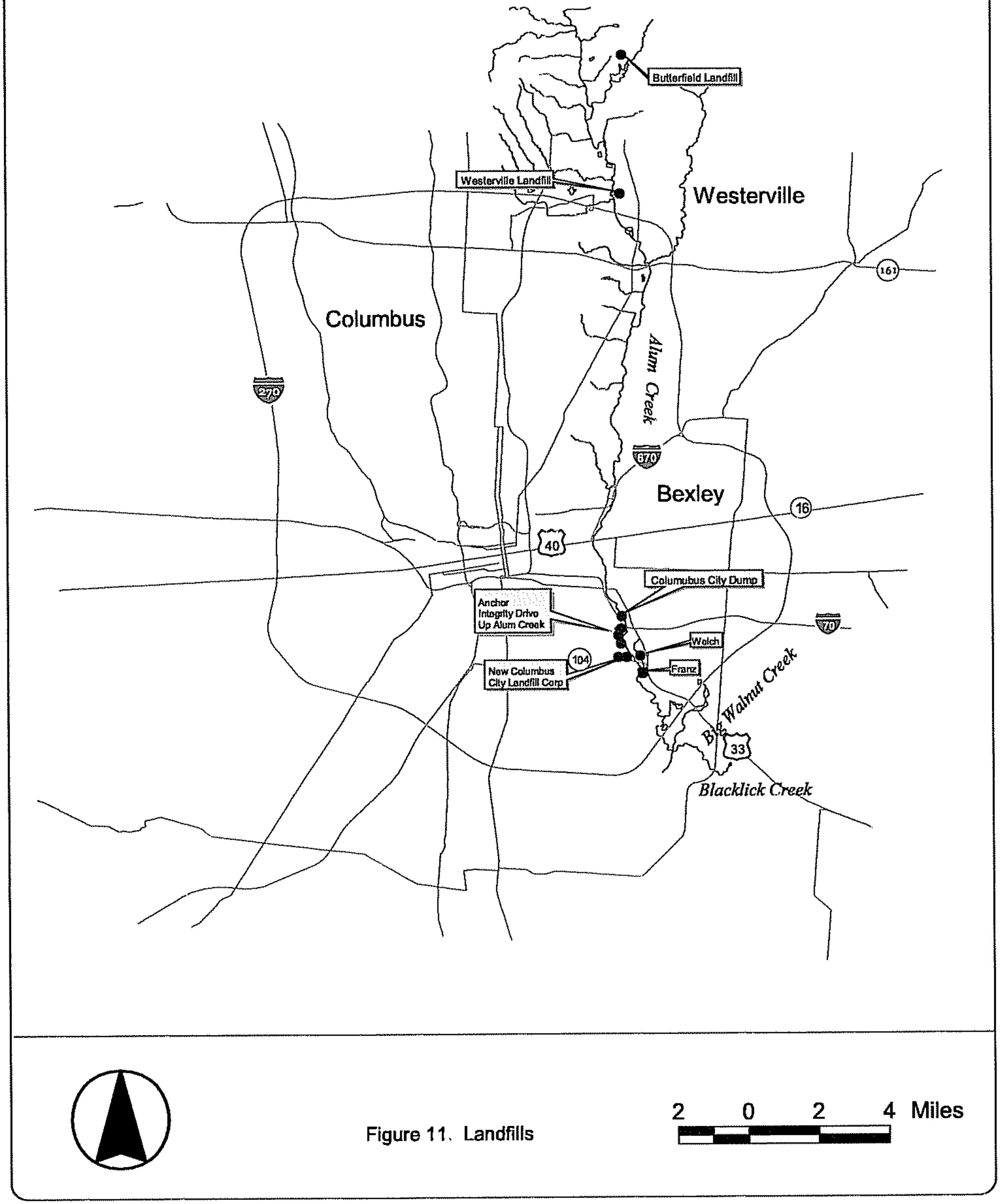


Figure 11. Landfills

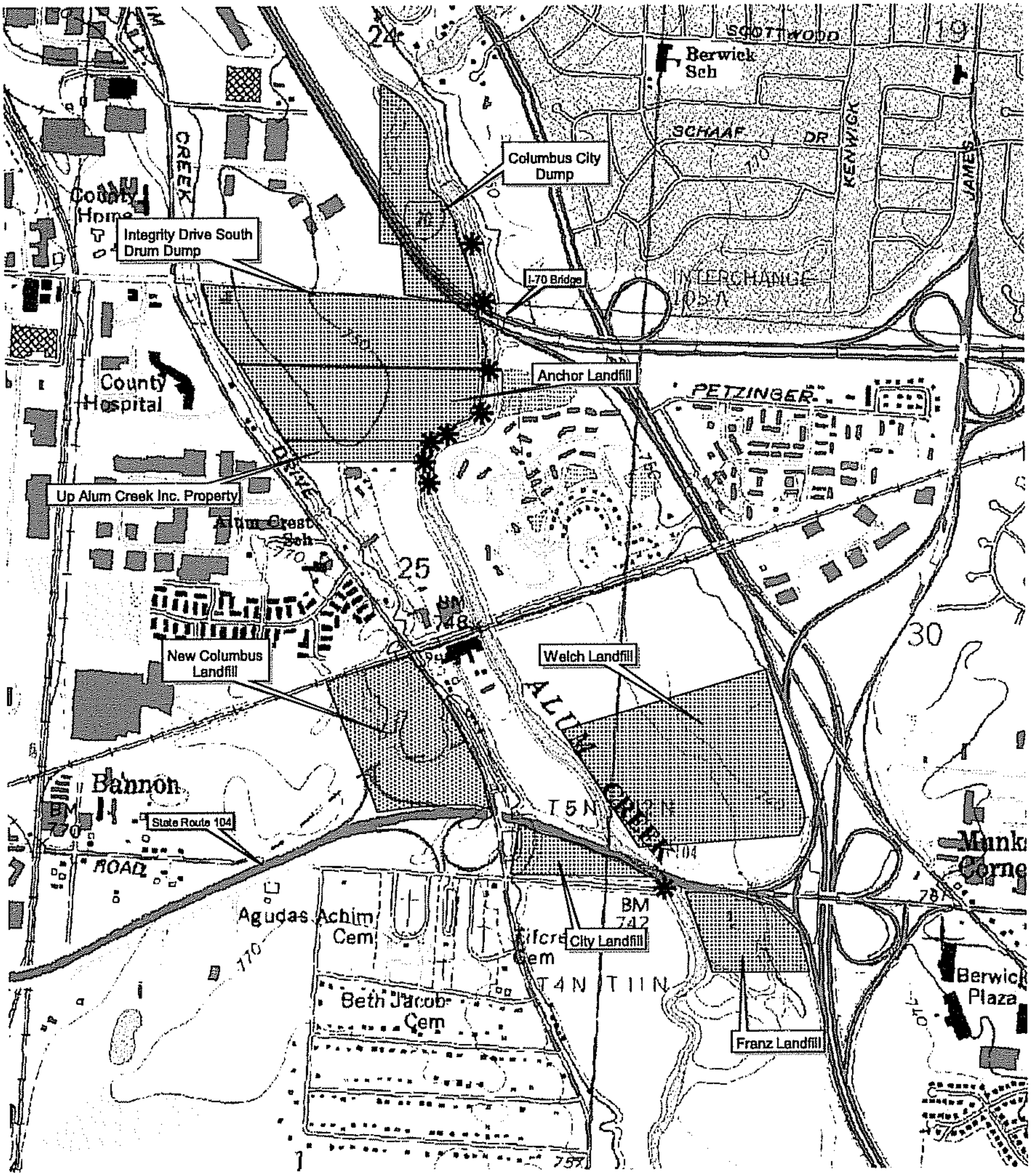
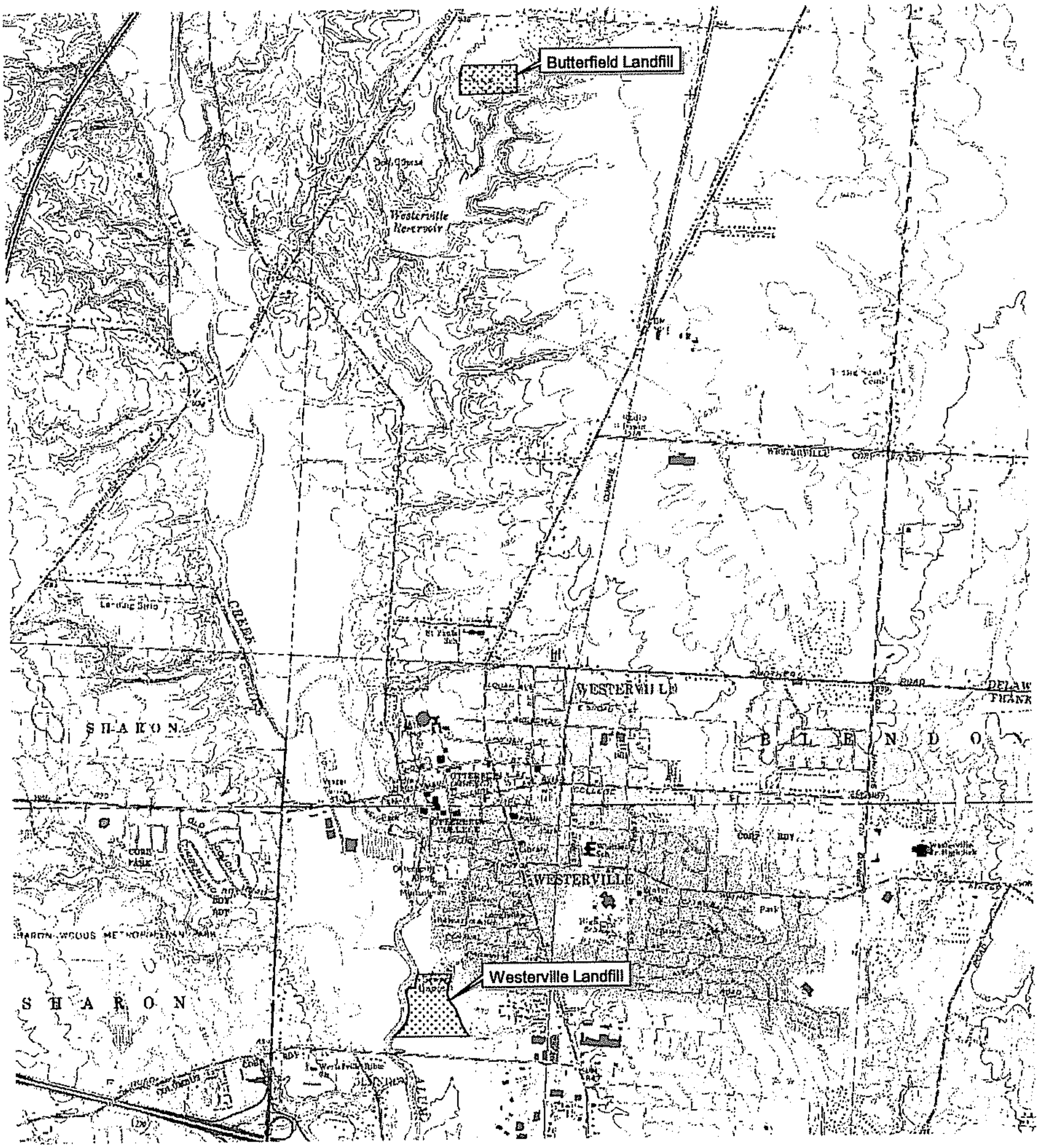


Figure 12: Lower Seven Landfills Closeup

✱ Sediment Sampling Locations

0.2 0 0.2 0.4 Miles



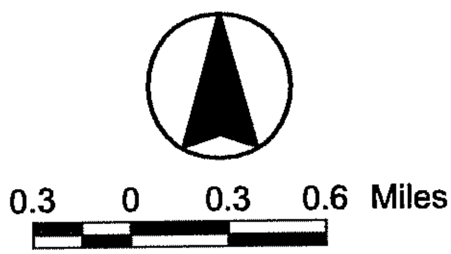


Figure 13. Westerville/Butterfield Landfills

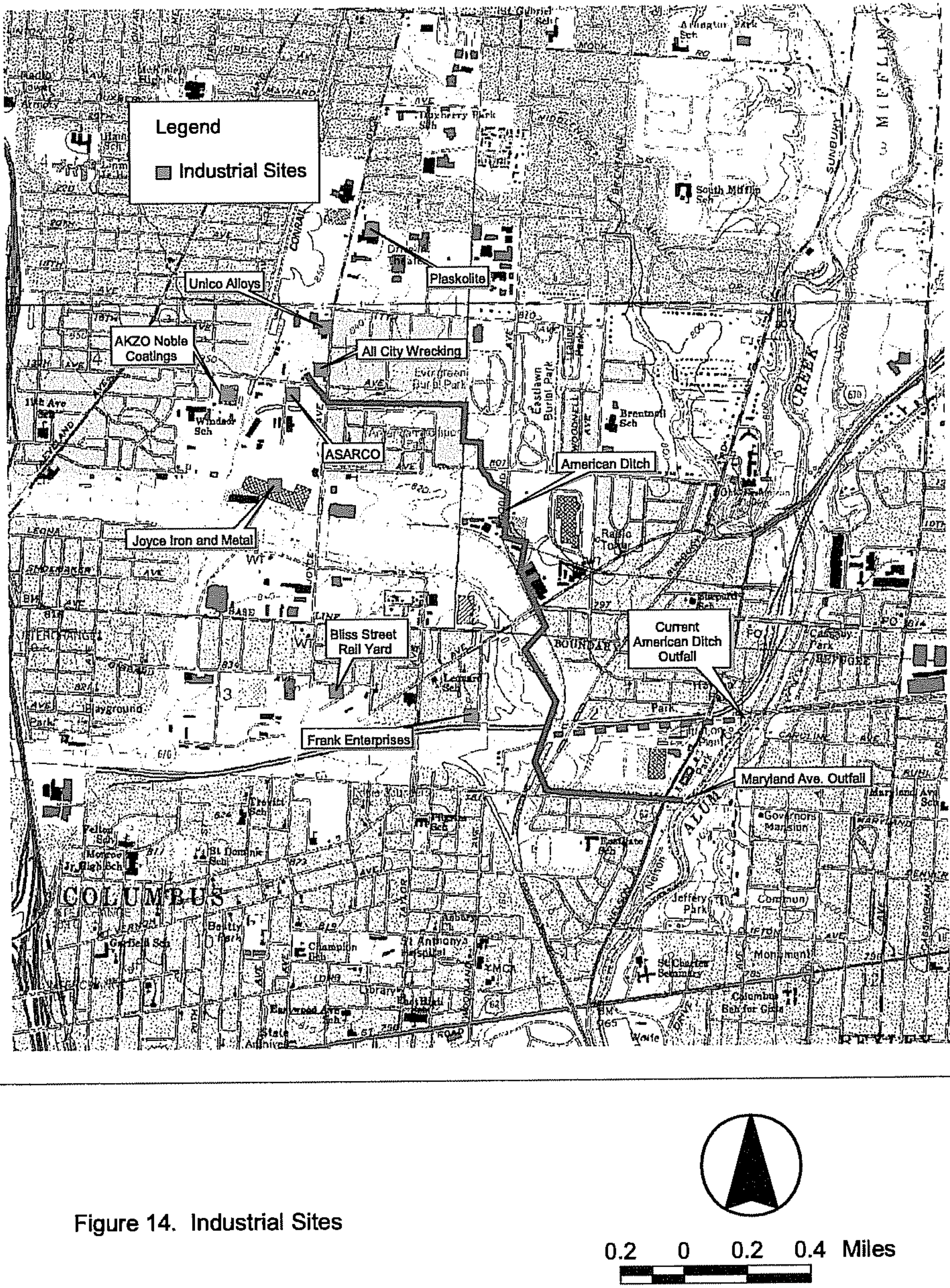


Figure 14. Industrial Sites

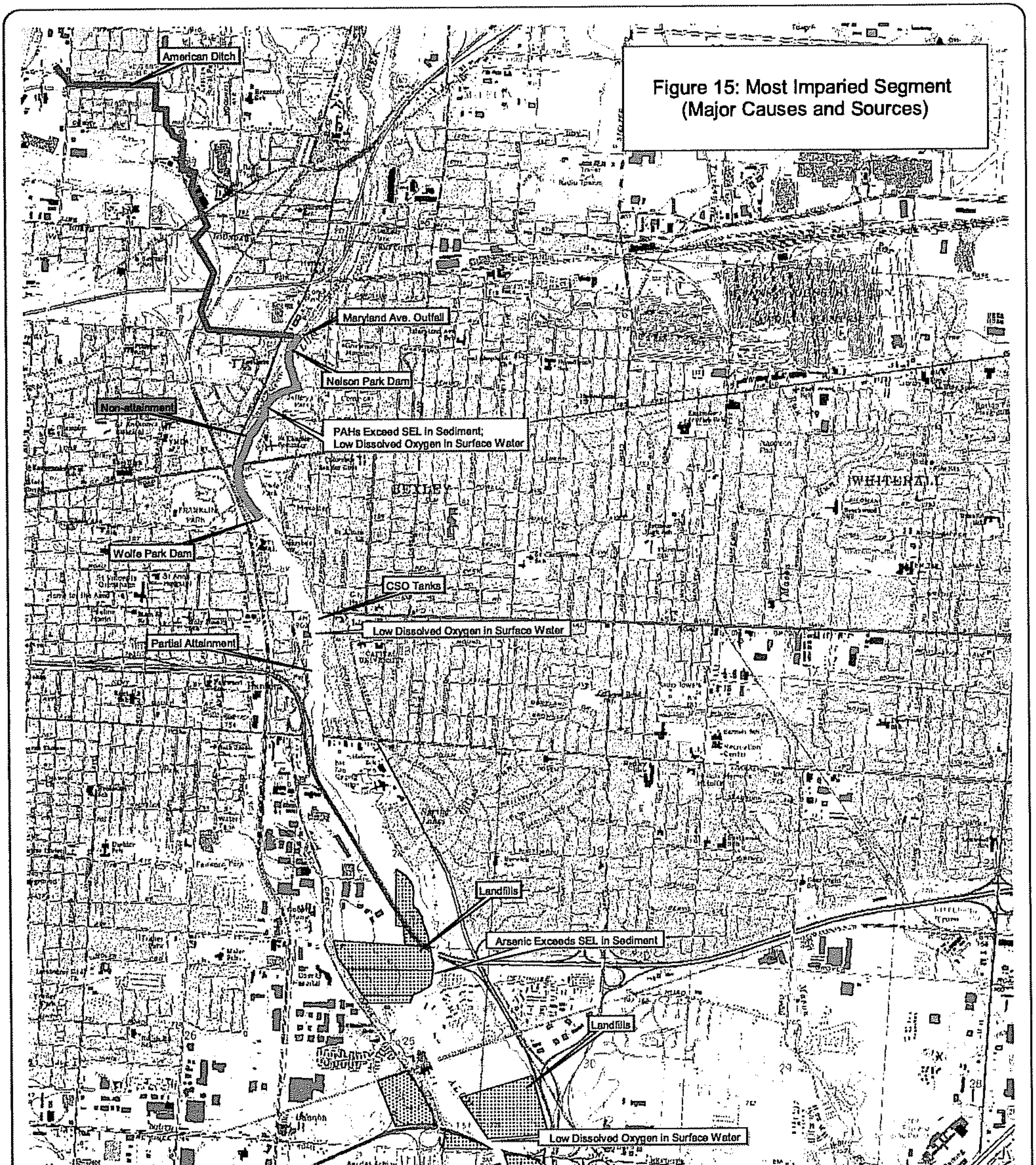


Figure 15: Most Imparied Segment
(Major Causes and Sources)

Tables

Table 3-1
Surface Water Sample Summary
Lower Alum Creek, Ohio

Sample ID	Division	Purpose	Significant Results
RM 26.3	DSW	Ambient	Low DO; d-BHC
RM 23.8	DSW	Ambient	Fecal Coliform Exceeds PCR
RM 22.1	DSW	Ambient	Fecal Coliform Exceeds PCR
RM 21.6	DSW	Ambient	Fecal Coliform Exceeds SCR
RM 19.8	DSW	Ambient	Fecal Coliform Exceeds SCR
RM 17.3	DSW	Ambient	Fecal Coliform Exceeds SCR; b-BHC
RM 17.2	DSW	Ambient	Fecal Coliform Exceeds SCR
RM 15.4	DSW	Ambient	Fecal Coliform Exceeds SCR
RM 13.5	DSW	Ambient	Fecal Coliform Exceeds SCR
RM 9.1	DSW	Ambient	Fecal Coliform Exceeds SCR; Low DO; SVOCs, Pesticides
RM 7.5	DSW	Ambient	Fecal Coliform Exceeds SCR
RM 6.6	DSW	Ambient	Fecal Coliform Exceeds SCR; Low DO
RM 3.9	DSW	Ambient	Fecal Coliform Exceeds SCR; Low DO
RM 0.9	DSW	Ambient	Fecal Coliform Exceeds SCR
SW 84	DERR	ASARCO	None
SW 83	DERR	ASARCO	Chloroform, Xylenes, Cadmium
MEYJ/EYX 84	DERR	Integrity Drive	Lead
MEYJ/EYX 85	DERR	Integrity Drive	1,2 DCE; TCE
MEYJ EYX 86	DERR	Integrity Drive	None
AN-GW-26	DERR	Anchor Landfill	Lead
AN-GW-36	DERR	Anchor Landfill	1,2 DCE; TCE

PCR: Primary Contact Recreation
SCR: Secondary Contact Recreation
DO: Dissolved Oxygen
BHC: benzene Hexachloride
DCE: Dichlorothene
TCE: Trichloroethene

Table 3-2
Sediment Sample Summary Information
Lower Alum Creek, Ohio

Sample ID	Location	Year	Division	Purpose	Significant Results
RM 26.3	Africa Road	1996	DSW	Ambient	Metals
RM 17.4	Huber Ridge	1996	DSW	Ambient	SVOCs
RM 17.2	Huber Ridge	1996	DSW	Ambient	SVOCs, Metals
RM 9.1	Maryland Avenue	1996	DSW	Ambient	SVOCs, Pesticides, Metals, PCB
RM 6.6	Livingston Avenue	1996	DSW	Ambient	SVOCs, Pesticides, Metals, PCB
RM 3.9	State Route 104	2000	DSW	Ambient	SVOCs, Pesticides, Metals, PCB
SE 73	Jeffery Park	1995	DERR	ASARCO IA	SVOCs, Pesticides, Metals
SE 74	Maryland Avenue	1995	DERR	ASARCO IA	SVOCs, Pesticides, Metals
SE 75	Cassady Park	1995	DERR	ASARCO IA	SVOCs, Pesticides, Metals
AN-SE 30	North of I 70 Bridge	1994	DERR	Anchor Landfill IA	SVOCs, Pesticides, Metals
AN-SE 32/39	Anchor Landfill	1994	DERR	Anchor Landfill IA	SVOCs, Pesticides, Metals, PCB
AN-SE 23/25	UAC, Inc. Seeps	1994	DERR	Anchor Landfill IA	SVOCs, Pesticides, Metals, PCB
AN-SE 28	South of UAC, Inc.	1994	DERR	Anchor Landfill IA	SVOCs, Pesticides, Metals, PCB
MEYJ/EYX 81	North of I 70 Bridge	1995	DERR	Integrity Drive IA	SVOCs, Pesticides, Metals,
MEYJ/EYX 78/83	Culvert	1995	DERR	Integrity Drive IA	SVOCs, Metals
MEYJ/EYX 80	Northern Anchor	1995	DERR	Integrity Drive IA	SVOCs, Metals
MEYJ/EYX 77	South of Anchor	1995	DERR	Integrity Drive IA	SVOCs

UAC, Inc: Up Alum Creek, Inc. Property

Table 3-3
Significant Metal Concentrations in Sediment (mg/kg)
Lower Alum Creek, Ohio

Metal	Effect Level		Sample Location								
	LEL	SEL	Africa Road (DSW)	Huber Ridge (DSW)	Cassady Park (DERR)	Maryland Ave. (DSW)	Maryland Ave. (DERR)	Jeffery Park (DERR)	Livingston Ave. (DSW)	Anchor Landfill (DERR)	Route 104 (DSW)
Arsenic	6	33	1.25	21.4	12.6	15.3	11.0	8.6	7.69	**55.3**	11.2
Cadmium	0.6	10	0.13	0.59	ND	4.41	4.1	2.4	1.17	2.2	1.33
Chromium	26	110	44	24	12.9	31	14.0	9.5	18	15.8	28.2
Copper	16	110	23	23	30.5	34	31.2	22.8	19	35.2	32.1
Lead	31	250	32	26	38.8	50	48.9	33.6	65	131	76
Mercury	0.17	2	0.031	0.037	0.28	0.12	0.34	0.33	0.095	0.19	.096
Nickel	16	75	43	33	28.1	31	31	19.6	23	21.6	26.2
Zinc	120	820	127	125	160	351	358	205	175	284	197

(DERR) = Sample Collected by Division of Emergencey and Remedial Response
(DSW)=Sample Collected by Division of Surface Water
LEL: Lowest Effect Level (Persuad et al, 1993)
SEL: Severe Effect Level (Persuad et al, 1993)
Underline: Concentration exceeds the LEL
Bold: Concentration Exceeds the SEL
ND: Not Detected in Sample

Table 3-4:
Significant Semi-Volatile Organic Compound Concentrations in Sediments (mg/kg)
Lower Alum Creek, Ohio

Compound	Effect		Sample Location							
	LEL	SEL	Huber Ridge (DSW)	Cassady Park (DERR)	Maryland Ave. (DSW)	Maryland Ave. (DERR)	Jeffery Park (DERR)	Livingston Ave. (DSW)	Anchor Landfill (DERR)	Route 104 (DSW)
Anthracene	0.220	11.1	ND	0.28J	0.9	**13**	4.1J	0.7	0.66	ND
Benzo(a)anthracene	0.320	44.4	1.6	1.2	3.9	37	12	2.8	2.1	3.3
Benzo(a)pyrene	0.370	34.2	1.8	1.4	4.2	33	10	2.9	2.1	3.2
Benzo(b)fluoranthene	------	------	2.2	1.4	5.2	34	12	3.4	2.4	4.4
Benzo(g,h,i)perylene	0.170	9.6	1.6	1.4	3.1	**13**	2.2J	2.2	0.7	2.7
Benzo(k)fluoranthene	0.240	40.2	1.9	1.2	4.5	33	10	2.5	2.0	2.8
Chrysene	0.340	13.8	2.4	1.9	5.8	**49**	**15**	3.7	2.5	4.8
Dibenz(a,h)anthracene	0.060	3.9	ND	ND	1.0	**15**	ND	0.8	0.36J	1.1
Fluoranthene	0.750	30.6	4.5	3.4	11.8	**120**	**36**	7.6	3.8	8.9
Indeno(1,2,3-cd)pyrene	0.200	9.6	1.6	1.3	3.2	**20**	6.2	2.4	0.88	3
Phenanthrene	0.560	28.5	1.5	1.3	6.6	20	28	4.2	3.2	4.2
Pyrene	0.490	25.5	3.6	2.8	9.1	**82**	**28**	5.9	3.4	7.2

DSW: Samples Collected by Ohio EPA's Division of Surface Water
DERR: Samples Collected by Ohio EPA's Division of Emergency and Remedial Response
LEL: Lowest Effect Level (Persuad et al, 1993)
SEL: Severe Effect Level (Persuad et al, 1993); based on 3% total organic carbon
ND= Not Detected in Sample
J Qualifier = Estimated value, usually detected below sample quantitation limit
Bold Concentration Value: Concentration exceeds SEL

Table 3-5
Significant Pesticides/PCB Concentrations in Sediment (ug/kg)
Lower Alum Creek, Ohio

Chemica	Effect Level		Sample Location							
	LEL	SEL	Huber Ridge (DSW)	Cassady Park (DERR)	American Ditch (DSW)	American Ditch (DERR)	Jeffery Park (DERR)	Livingston Ave. (DSW)	Anchor Landfill (DERR)	Route 104 (DSW)
Dieldrin	2	2730	ND	ND	ND	ND	ND	13	9.9P	ND
Endosulfan I*	0.175	---	ND	30P	ND	540DP	190	ND	ND	ND
Endosulfan II*	0.104	---	ND	ND	ND	72	42DP	ND	7.3	ND
Methoxychlor*	3.59	---	ND	ND	0.023	ND	ND	ND	46	ND
Endrin	2.67	3900	ND	ND	ND	ND	ND	ND	13	ND
4,4 DDD	5.53	180	ND	ND	ND	ND	ND	ND	ND	8.28
4,4 DDT	1.19	360	ND	ND	ND	34P	ND	ND	7.2P	ND
Chlordane	4.5	180	ND	ND	ND	ND	ND	ND	23	20.8
PCB-1260	5	720	ND	ND	57	ND	ND	93	180	37.9

DSW: Samples Collected by Ohio EPA's Division of Surface Water
DERR: Samples Collected by Ohio EPA's Division of Emergency and Remedial Response
LEL: Lowest Effect Level (Persuad et al, 1993)
SEL: Severe Effect Level (Persuad et al, 1993); assumes total organic carbon of 3%
ND: Not Detected in Sample
* These pesticides were not evaluated by Persuad. The LEL given is the ecological data quality level (EDQL) from US EPA-Region 5.

Data Qualifiers
D=Compound identified in an analysis at a secondary dilution.
P=Greater than 25% difference between the two GC columns for the detected concentrations. The lower of the two results is reported

Table 4-1
Identified Landfills
Lower Alum Creek, Ohio

Name	Latitude Longitude	Area (acres)	Federal Assessments Type (Year)	State Assessments Type (Year)	Documented Release?	Comments
Butterfield Landfill	40 10 07 82 56 03	15	PA (93) IA (94)	PA (92) Site Invest (98)	Yes	Surrounded by residential developments. Leachate seeps contain hazardous substances.
Westerville Landfill	40 06 40 82 56 20	33	None	PA (93)	Yes	PAHs detected in surface soil. The city of Westerville capped the landfill in 2000 & changed drainage.
Columbus City Dump	39 56 14 82 56 04	35	HRS Prescore (89)	PA (85) PA(97)	No	Partially covered by I70.
Integrity Drive Dump	39 55 55 82 56 15	27	IA (95) ESI (97)	PA (93)	Yes	US EPA removed 600 drums and a sludge pit in 1995. Several hazardous substances detected.
Anchor Landfill	39 55 51 82 55 56	37	PA (93) IA (95) ESI (96)	PA (91)	Yes	PCS treatment/disposal facility. Soil used for cap material. Several hazardous substances detected
Up Alum Creek	39 55 46 82 56 10	9	None	None	Yes	Samples collected on-site during the Anchor IA; leachate. Several hazardous substances detected.
Welch Landfill	39 55 15 82 55 28	29	HRS Prescore (89)	PA (85) PA (98)	Yes	Ohio EPA sampled soils/sediment on-site; PAHs & metals detected.
City Landfill Corp.	39 55 16 82 55 54	15	HRS Prescore (89)	PA (85) PA (97)	No	Barrels w/ ash-like material observed near creek bank.
New Columbus Landfill	39 55 12 82 56 06	33	Site Inspection (81) HRS Prescore (89)	PA (85) PA (97)	No	13 acres of landfill material removed due to construction of State Route 104. Columbus Auto Shredding facility is being built on top.
Franz Landfill	39 54 59 82 55 19	45	None	None	No	Cited for violating solid waste regulations in 1974. Part of Smith Farm Park.

PA: Preliminary Assessment
HRS: Hazard Ranking System
PCS: Petroleum Contaminated Soil
IA: Integrated Assessment
ESI: Expanded Site Inspection

Table 4-2
Potential Industrial Sources to Maryland Ave. Storm Sewer
Lower Alum Creek, Ohio

Facility Name	Latitude Longitude	State/Federal Assessments (year)	Regulatory Status	Contaminants Released	Migration Pathway	Comments
ASARCO	39 59 45 82 58 05	State PA (94) Fed. IA (95)	Ohio VAP	Metals	American Ditch	Entered Ohio's VAP in 1995. Currently disputing NPDES requirements for storm water run-off to American Ditch.
Joyce Iron & Metal	39 59 30 82 58 09	None	RCRA Transporter	PCBs, Petroleum	American Ditch	PCBs in soil. PCB clean-up to under 25 ppm completed in 1990.
AKZO Nobel Coating	39 59 51 82 58 19	None	RCRA LQG RCRA Closure	VOCs, metals	American Ditch	Formerly Hanna Chemical Coatings. RCRA violations. Completed RCRA closure of two units. UST tank farm removal in'96; 9 tanks had leaks.
Unico Alloys	39 59 56 82 57 58	State PA (90)	RCRA LQG RCRA Closure	VOCs	American Ditch	Ground water contaminated with chlorinated VOCs. Ongoing enforcement to address ground water
Frank Enterprises	39 58 45 82 57 15	State PA (90) Addenda (94)	None	VOCs, SVOCs, metals	Storm Sewer	Exploded in 1986 & released 3.5 tons of various chemical compounds. No longer in operation. Most of the site was covered over by I 670 interchange.
Bliss Street Rail Yards	39 58 57 82 58 13	State PA (95)	None	VOCs & Metals	Storm Sewer	Delisted in 1996 from Master Sites List. Redeveloped into an office park.
All City Auto Wrecking	39 59 49 82 57 59	None	None	Petroleum, Metals, Solvents	American Ditch	Unregulated dumping of automobile fluids and batteries. Subject of numerous complaints.
Plaskolite	40 00 12 82 57 48	None	None	Methyl Methacrylate	American Ditch	Two documented spills of methyl methacrylate.

IA: US EPA Integrated Assessment
RFI: RCRA Facility Investigation
PA: Preliminary Assessment
RCRA: Resource Conservation Recovery Act
RCRA LQG: Large Quantity Generator of Hazardous Waste
SI: Site Investigation
Ohio VAP: Ohio Voluntary Action Program

TABLE 4-3 STORM WATER PERMIT HOLDERS IN LOWER ALUM CREEK WATERSHED

COMPANY NAME	FACILITY NAME	LOCATION	CITY	ZIP	SIC1	SIC2	PERMITNO	SIC3
NESTLE DAIRY SYSTEMS	NESTLE DAIRY SYSTEMS	1700 EAST 17TH AVENUE	COLUMBUS	43219	3551		OHR001530	
JOYCE IRON AND METAL COMPANY	JOYCE IRON AND METAL COMPANY	1283 JOYCE AVENUE	COLUMBUS	43219	5093		OHR001988	
TRIM SYSTEMS LLC	TRIM SYSTEMS LLC	1533 ALUM CREEK DRIVE	COLUMBUS	43209	3714		OHR001040	
WORTHINGTDN INDUSTRIES INC	WORTHINGTON INDUSTRIES INC	1205 DEARBORN DRIVE	COLUMBUS	43085	3399	3316	OHR001146	3443
SHRIVER ANODIZING INC	SHRIVER ANOOIZING INC	915 NORTH TWENTIETH STREET	COLUMBUS	43219	3471		OHR001090	
CONSOLIDATED FREIGHTWAYS	COL	2885 ALUM CREEK DRIVE	COLUMBUS	43207	4213		OHR001683	
NORFOLK SOUTHERN CORPORATION	COLUMBUS INTERMODAL JOYCE	1855 WATKINS ROAD	COLUMBUS	43204	4011			
NORFOLK SOUTHERN CORPORATION	COLUMBUS RIPTRACK	2450 FAIRWOOD AVENUE BUILDING C	COLUMBUS	43207	4011			
NORFOLK SOUTHERN CORPORATION	COLUMBUS BULK TRANSFER	1875 FREBIS AVENUE	COLUMBUS	43206	4011			
OBERFIELDS INC	OBERFIELDS INC	1165 ALUM CREEK DRIVE	COLUMBUS	43209	3271		1224-0183	
OVERNITE TRANSPORTATION COMPANY	OVERNITE TRANSPORTATION COMPANY	3400 REFUGEE ROAD	COLUMBUS	43232	4212		0006-0085	
CENTRAL TRANSPORT INC	CENTRAL TRANSPORT INC	2450 SOBECK ROAD	COLUMBUS	43232	4212	4213	1050-0010	
FEDERAL EXPRESS CORPORATION	FEDERAL EXPRESS GOO	1640 ALUM CREEK ORIVE	COLUMBUS	43209	4513		0016-0239	
ANHEUSER-BUSCH INC	ANHEUSER-BUSCH INC	700 SCHROCK ROAD	COLUMBUS	43229	2082		0125-0002	
ANDERSON CONCRETE CORP	PLANT 3	6101 WESTERVILLE ROAD	WESTERVILLE	43081	3273		0623-0019	
OHIO AUTOMOTIVE REBUILDERS SUPPLY INC	OHIO AUTOMOTIVE REBUILDERS SUPPLY INC	2389 REFUGEE PARK	COLUMBUS	43207	5015		0968-0824	
BARNEBEY & SUTCLIFFE CORPORATION	BARNEBEY & SUTCLIFFE CORPORATION	835 NORTH CASSADY AVENUE	COLUMBUS	43219	2819			
RODENSTOCK NORTH AMERICA	RODENSTOCK NORTH AMERICA	2150 BIXBY ROAD	LOCKBOURNE	43137	3851			
WORTHINGTON INDUSTRIES INC	WORTHINGTON INDUSTRIES INC	1205 DEARBORN DR	COLUMBUS	43085	3443	3544	OHR001146	
OHIO STEEL INDUSTRIES	OHIO STEEL INDUSTRIES	2575 FERRIS RD	COLUMBUS	43224	3499	3084	OHR001540	
ALL CITY AUTO WRECKING INC	ALL CITY AUTO WRECKING INC	1441 JOYCE AVE	COLUMBUS	43219	5015			
CONSDLIDATED FREIGHTWAYS	CONSOLIOATED FREIGHTWAYS - COL	2885 ALUM CREEK DR	COLUMBUS	43207	4213		OHR001683	
BARNEBEY SUTCLIFFE CORP	BARNEBEY SUTCLIFFE CORP	835 N CASSADY AVE	COLUMBUS	43219	2819			
ANHEUSER-BUSCH INC	ANHEUSER-BUSCH INC	700 SCHROCK RD	COLUMBUS	43229	2082			
LIEBERT CORPORATION	LIEBERT CORPORATION	1050 DEARBORN DRIVE	COLUMBUS	43229	3585	3577		
TOP CAT CONCRETE	TOP CAT CONCRETE	3296 PARIS CT	WESTERVILLE	43081	3273			
YENKIN-MAJESTIC PAINT CORP	YENKIN-MAJESTIC PAINT CORP	1920 LEONARD AVE	COLUMBUS	43219	2821	2851		
OBERFIELOS INC	PLANT 3	1165 ALUM CREEK DRIVE	COLUMBUS	43209	3272			
OBERFIELDS INC	PLANT 4	1221 ALUM CREEK DR	COLUMBUS	43209	3271			
OVERNITE TRANSPORTATION CO INC	OVERNITE TRANSPORTATION CO	3400 REFUGEE RD	COLUMBUS	43232	4212			
BRON SHOE CO	BRON SHOE CO	1313 ALUM CREEK DR	COLUMBUS	43209	3471	3479		
KOKOSING MATERIALS INC	WOLFPACK PLANT # 10	3101 REFUGEE ROAD	COLUMBUS	43232	2951			
KOKOSING MATERIALS INC	WESTERVILLE PLANT # 13	6189 WESTERVILLE ROAD	WESTERVILLE	43081	2951			