

# 2.0 Plan Framework

The Big Darby Accord Plan has been developed to provide a proactive approach to managing development and ensuring the protection and improvement of water quality and aquatic habitat in the Big Darby Creek watershed. The Plan provides guidance for how and which land should be developed, preserved, and protected. The Plan, similar to a comprehensive plan, provides land use and policy guidance for changes in land use over time.

As discussed in the Darby Accord Mission Statement, the Big Darby Accord Plan seeks to balance development with protection of the Big Darby Watershed. In developing the general land use plan, a significant amount of existing conditions data was reviewed and additional analyses were completed. Information reviewed included:

- Natural resources including streams, soils, floodplain, wetlands, vegetation, hydrology and other sensitive resources
- Current policies and plans including land use, zoning, and comprehensive plans
- Water quality trends and impacts associated with existing and proposed land use changes
- Physical conditions such as existing and planned infrastructure (e.g., roads, central sewer systems)
- Current local and state regulations

Review and analysis of available information resulted in the identification of “plan drivers,” or significant factors that affect the amount of development that the area could achieve and still provide protection for the Big

Darby Watershed. These drivers have influenced land use and policy recommendations and represent both opportunities and constraints. The drivers have largely shaped the Plan and will continue to be factors as plan implementation is initiated.

The drivers, described further in the following sections, provide a solid framework for the formation of a conservation strategy, the general land use plan and implementation strategies. Drivers include:

1. *By-Right Zoning – the allowable level of development established by current zoning*
2. *Infrastructure*
3. *Environmental Sensitivity Analysis*
4. *Water Quality and Biology*

## 2.1 By-Right Zoning

Zoning codes and regulations dictate permitted land uses and the maximum amount of development that can occur within a given area. As a result, zoning has one of the largest impacts on existing land use patterns. Zoning regulations within the planning area vary by jurisdiction and are therefore difficult to summarize in a comparative way. For example, low density residential development means one thing to the City of Columbus and something else to an unincorporated area of Franklin County. Today, the Cities of Hilliard, Columbus, and Grove City as well as Prairie and Washington Townships administer their own zoning regulations. The remaining jurisdictions, Brown, Norwich, Pleasant, and the Village of Harrisburg, follow the Franklin

County Zoning Resolution (though Harrisburg is in the process of creating their own code).

### Population Growth

It is worth emphasizing that the current land use and zoning policies allow for a significant amount of future development to occur within the planning area. Additional households will bring an increase in population. A comparison among several reports about population growth reveals a consistent belief that the central Ohio region will continue to grow over the next twenty to thirty years. The exact rate of growth is difficult to determine and often varies among agencies and experts because population growth is dependent on many factors. However, it is reasonable to expect that a certain amount of growth is inevitable. The economies of the central Ohio area continue to expand by attracting more jobs and people to fill those positions. This trend results in an increased demand for housing and services including transportation, schools, community facilities, and other basic services.

The most widely referenced source for population information is the US Census that occurs every ten years. Many other studies use US Census data as a baseline to

Section Outline	PG
2.1 By-Right Zoning	2-1
2.2. Infrastructure Considerations	2-4
2.3 Sensitivity Analysis	2-11
2.4 Water Quality and Biology	2-14

formulate population projections. Ohio County Indicators and Ohio County Profiles, prepared by the Office of Strategic Research, Ohio Department of Development, project population for each county in Ohio through 2030. Population forecasts by the Office of Strategic Research are based on 2000 Census data and are provided in five year increments. Projections are based on assumptions about trends in fertility, mortality, and net migration.

According to the Office of Strategic Research, Franklin County is projected to continue to grow to a total population of 1,326,180 in the year 2030 (Figure 2.1). This represents a 20% increase over year 2000 population levels. Some of the projected growth will occur within the planning area and local zoning and comprehensive plans in the planning area have policies in place to allow for development.

Year	Office of Strategic Research	
	Projected Population	% Change from 2000
2000	1,068,978	0%
2005	1,112,880	0.0%
2010	1,155,910	4.1%
2015	1,195,310	8.1%
2020	1,238,250	11.8%
2025	1,281,760	15.8%
2030	1,326,180	19.9%

**Figure 2.1 Franklin County Population Projections**

Sources: Ohio Office of Strategic Research, 2003.

Jurisdiction	Median Year Structure Built	* Owner Occupied Housing Median Value		% Change	Housing Units		% Change
		1990	2000		1990	2000	
Brown	1977	\$116,600	\$193,900	66.3%	620	709	14.4%
Norwich	1987	\$88,800	\$158,000	77.9%	1,598	1,450	-9.3%
Prairie	1966	\$63,400	\$91,800	44.8%	6,629	6,954	4.9%
Pleasant	1974	\$92,600	\$135,900	46.8%	2,222	2,507	12.8%
Washington	1981	\$162,700	\$109,200	-32.9%	736	464	-37.0%
Grove City	1977	\$74,900	\$119,800	59.9%	7,675	10,712	39.6%
Hilliard	1991	\$72,600	\$157,600	117.1%	4,556	8,957	96.6%
Harrisburg	1940	\$62,000	\$92,000	48.4%	137	140	2.2%
Columbus	1970	\$65,300	\$101,400	55.3%	277,744	323,236	16.4%
Franklin County	-	\$73,300	\$116,200	58.5%	405,418	471,016	16.2%
Ohio	-	\$62,900	\$103,700	64.9%	4,371,945	4,783,051	9.4%

**Figure 2.2 Housing Characteristics**

Sources: US Census, 1990 and 2000. These numbers reflect entire jurisdictions and not just the planning

### Housing

Within Ohio, an increasing trend shows that land in active agricultural use is declining and the amount of agricultural land that is non-cultivated is increasing. Recent development patterns within the planning area reinforce this trend as agricultural lands are being converted to other uses, primarily low-density housing (Growth and Change at the Rural-Urban Interface, 2003). The trend for large-lot residential developments is occurring throughout the planning area as subdivision practices produce 5 to 20 acre lots along rural roads. Existing zoning regulations have helped define the existing landscape and promoted a rural pattern of development that is highly consumptive of land.

According to the US Census, Franklin County is growing faster than the state in housing units. Both Franklin County and the City of Columbus experienced a 16% increase in housing units from 1990 to 2000, well above the 9.4% at the state level. Annexation policies have contributed to increases in housing units for incorporated areas and a loss of housing in unincorporated areas. Housing units in the City of Hilliard almost doubled from 1990 to 2000, marking an explosive growth period for the City and increased demand for services to meet the influx of residents. Recent

initiatives in Hilliard have dramatically curtailed the residential growth rate. Jurisdictions marking decreases in the number of housing units, most likely due to loss of land through annexation, include Washington and Norwich Townships.

Housing units are rising in value and continue to exceed the owner-occupied median value of homes around the state (Figure 2.2). With the exception of Washington Township, all jurisdictions experienced an increase of housing values between 46 and 117%. Housing values show that homes located in the northern part of the planning area, specifically the City of Hilliard, Brown, and Norwich Townships, maintain the highest owner occupied median home values within the planning area. Homes in this area experienced the most increase in value between 1990 and 2000.

### Future Level of Development

As future land uses were considered, it became increasingly important to identify an overall level of growth that would be appropriate for the Franklin County portion of the Big Darby Watershed. Residents expressed a desire to retain the rural character of the area and to encourage a higher standard of development that would protect water quality.

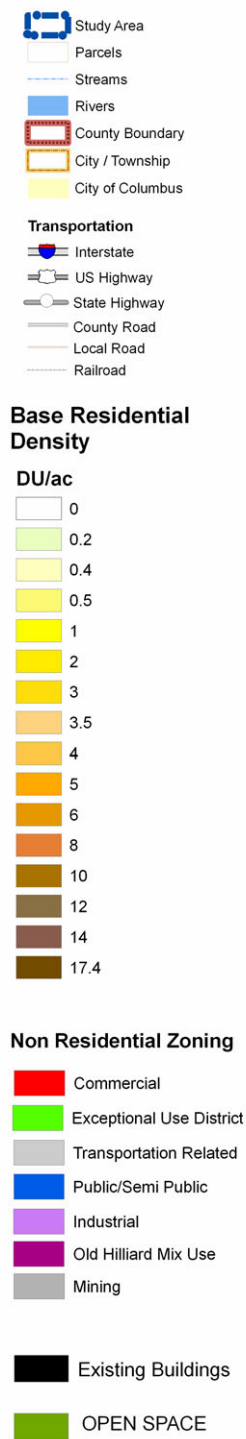
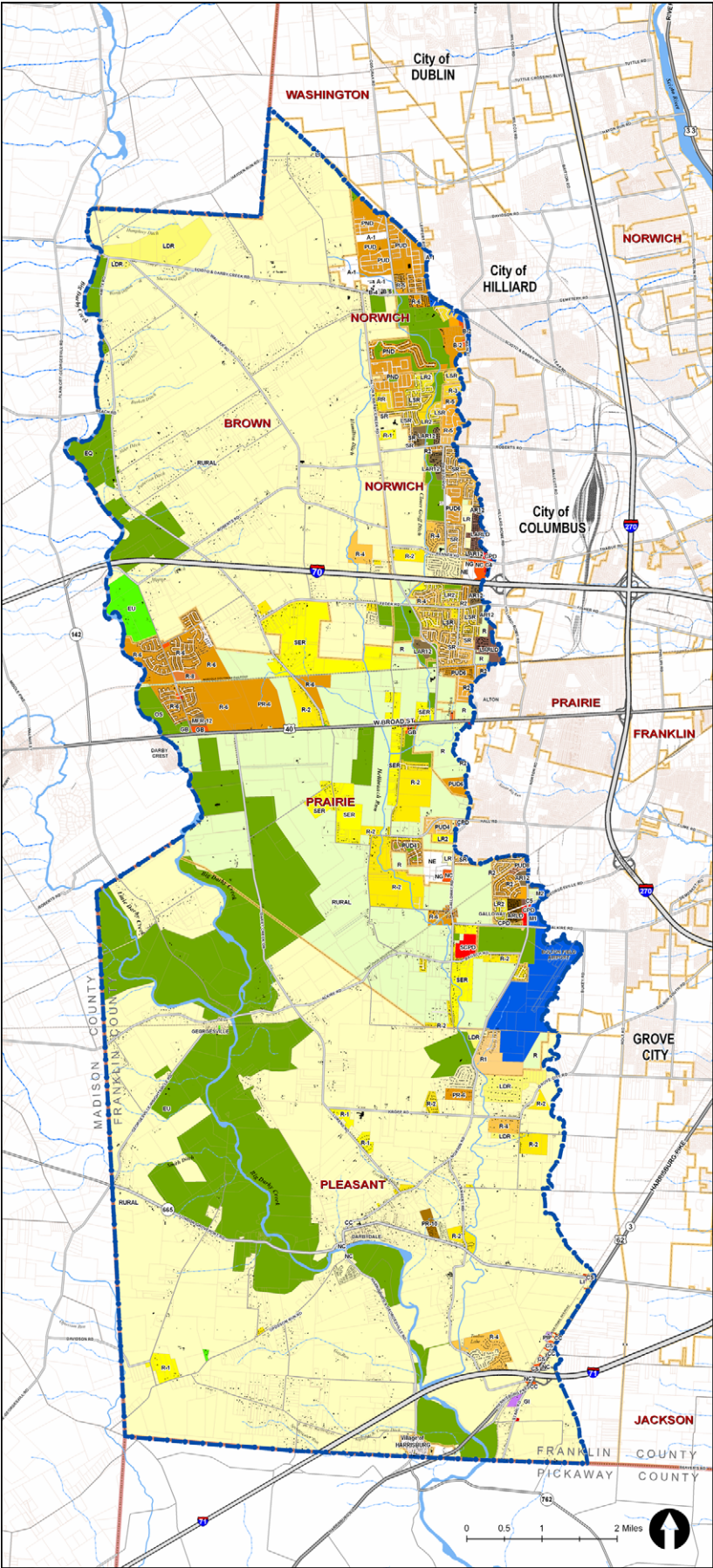


Figure 2.3 Density Map



Accord jurisdictions have endorsed the concept of allowing for a similar level of overall development within the planning area that is currently allowed under the existing zoning. Referred to as “By-Right Zoning,” this concept recognizes the zoning densities that are in place today as a baseline for overall future development. Current zoning policies related to density, shown in Figure 2.3, favor a low density development pattern distributed across the planning area. Pockets of higher density are located along the eastern edge and along West Broad Street. Further analysis reveals that if the current policies were carried, approximately 20,000 dwelling units could be developed within the planning area in a dispersed pattern; the Accord Plan proposes a similar level of development, but in a pattern that is more manageable, sustainable, and environmentally sensitive.

The proposed plan, described in Section 3.0, focuses density in a areas along the eastern edge of the planning area adjacent to the Cities of Hilliard and Columbus and suggests a higher density “Town Center” between I-70 and US 40 (West Broad Street). The Town Center location is based on the availability of central sewer service, existing road infrastructure, and reduced concentrations of environmentally sensitive resources.

Based on analysis, it is estimated there are 19,000 existing housing units within the planning area today. Based on a conservative assumption of 2.58 people per household, this equates to an existing population of approximately 49,000. As stated above, current policies allow for

additional growth of approximately 20,000 dwelling units, or 51,000 additional people. Overall, when combined, the long-term build based on the by-right concept is approximately 100,000 people. Development potential will be constrained by environmental and infrastructure considerations, including the ability to properly permit and regulate non-centralized sewer systems. New standards, policies, and programs identified elsewhere in this plan will be needed to properly manage new development in a way that enhances quality of life for people and the environment.

## 2.2 Infrastructure Considerations

Access to adequate facilities is an essential ingredient in identifying appropriate growth areas. Two major factors have surfaced as primary infrastructure considerations: sewer capacity and service area, and existing and planned roadway infrastructure.

### *Sewer Service*

The Accord planning area lies within the City of Columbus’ Regional Facility Planning Area (RFPA), as designated by the Ohio EPA’s (OEPA) 208 Plan, which also identifies the City as the Designated Management Agency (DMA) responsible for providing sewer service within this area. All sewages collected by the City of Columbus within this area would be conveyed to and treated at the Southerly and Jackson Pike wastewater treatment plants, which discharge directly to the Scioto River. As a separate incorporated area, the City of Hilliard has a sewer service contract with the City of Columbus. Under the terms of that contract, Hilliard owns and maintains sewer lines within their

municipal boundary but relies on Columbus for wastewater treatment.

Within the Accord planning area, the 208 Plan also identifies an area surrounding Lake Darby Estates, immediately west of and overlapping with a portion of the town center, as a sub-Regional Facilities Planning Area and designates Ohio American Water as the DMA for that area. Ohio American Water operates a wastewater treatment plant that is exclusive to the designated sub-regional area and that discharges directly to Big Darby Creek.

Another DMA within the Accord planning area is the Franklin County Sanitary Engineer’s Department, which operates several smaller wastewater treatment facilities scattered throughout the planning area, including a new 0.3 Million Gallon per Day (MGD) Wastewater Treatment Plant near the unincorporated Village of Darbydale. The facility became operational in the summer of July 2005 and serves the unincorporated Village of Darbydale, the Oak Hills Mobile Home Park (MHP), the Community Gardens MHP, the Pleasant Acres MHP, and the Darbydale Elementary School. In addition, the Franklin County Sanitary Engineer will serve the Timberlake subdivision through the Darbydale WWTP, thereby allowing the previously operating Timberlake WWTP to be eliminated. The service area for the Darbydale WWTP is set forth in the Ohio EPA Director’s Final Findings and Orders (DFFO), which was issued to the County Commissioners for sewage treatment problems in the Darbydale area. Only those specific properties enumerated within the Orders will be served, expanded to include the Timberlake subdivision.



The Village of Harrisburg has approached Franklin County regarding the possibility of sewage service through the Darbydale WWTP. The County Sanitary Engineer has noted that the WWTP has sufficient capacity to serve the existing village but, in doing so, would reduce the capacity of the plant to service other areas. It is anticipated that the County will agree to provide service to the Village and would coordinate with the Ohio EPA to ensure conformance with the provisions of the 208 Plan regarding the expanded service area.

Under the 208 Plan, neither Ohio American Water nor the County Sanitary Engineer is permitted to provide sewer service beyond their presently designated service area without the appropriate authorization. Figure 2.4 shows the sewer service areas for the planning area.

In addition to the authorities responsible for providing central sewer service within the Accord planning area, the Franklin County Board of Health is responsible for the permitting and oversight of on-lot septic systems, also referred to as household sewage treatment systems (HSTS) or household sewage disposal systems. HSTS applications are predominantly leach field or home aerator type systems. In either case, there is often a physical connection between that system and stormwater drainage, such as a roadside ditch or field tile.

***Sewage Treatment Alternatives***  
Development within the Accord planning area can be serviced through various means of sewage treatment. Despite the current zoning, the location of a development site, physical limitations of soil types and

groundwater depth, and the type and density of the development all have an impact on the form of sewage treatment that is appropriate and possible.

#### *Connection to an Existing Central Sewer System*

The City of Columbus owns and maintains the Big Run sanitary trunk sewer, which is located along Broad Street and terminates near the eastern boundary of the Accord planning area. The City also owns the Roberts-Millikin sanitary sub-trunk sewer located along Roberts Road which also terminates near the eastern boundary of the planning area. Both of these sewers are shown on Figure 2.4.

The current capacity of each of these sewer lines is a limiting factor in the amount of development that can occur in these areas. If any additional capacity in those systems becomes available in the future it will also affect the timeframe of when development occurs.

An initial capacity analysis of each of these sewer systems was conducted to determine the extent to which additional development within the planning area could be accommodated within the constraints of those systems. The City of Columbus has determined that the capacity of the Big Run sanitary trunk sewer would currently allow for receiving 5,000 additional equivalent dwelling units from the Town Center portion of the planning area. The Columbus sewer system may also have additional capacity for some areas closer to the existing system, currently annexed or zoned for development, in a manner consistent with the Accord general land use plan.

Central sewer service would also be provided in a manner consistent with the general land use plan to the Hilliard Growth area and LEED area. Analysis performed for the Roberts Millikin sanitary sub-trunk sewer shows an ability to provide sewer service 2,000 equivalent dwelling units in the Hilliard growth area. This system could also provide capacity for approximately 1,400 equivalent dwelling units in what has been referred to as the LEED area east of Alton and Darby Creek Road and south of Roberts.

#### *Development of Community-based Alternative Sewage Treatment Systems*

For areas beyond that which would be served by a central sewer system, a separate option for treatment is necessary. To avoid the future proliferation of HSTS within the planning area, efforts are underway to identify community-based applications that would offer a regional approach to providing sewer service. The intent of these applications would be to collect sewage from a regional area for transport to a location that is viable for lagoon and land application types of sewage treatment, avoiding a direct discharge to any watercourse. Presently, separate technical and regulatory committees formed of local officials and experts in alternative treatment systems are convening to consider the details of the standards and regulatory requirements related to these types of systems. The goal is to identify a community-based authority to own and operate these systems, using an existing DMA from the 208 Plan as that authority. Appendix F includes draft recommendations put forth by the Alternative Wastewater Treatment Technical Committee.

*Application of on-lot systems*

Inevitably, there will continue to be some form of development within the Accord planning area that includes individual on-lot systems. The committees referenced above are also looking at this issue and considering standards and regulations governing on-lot systems. Presently, these systems are under the authority of the Franklin County Board of Health and would remain under that authority.

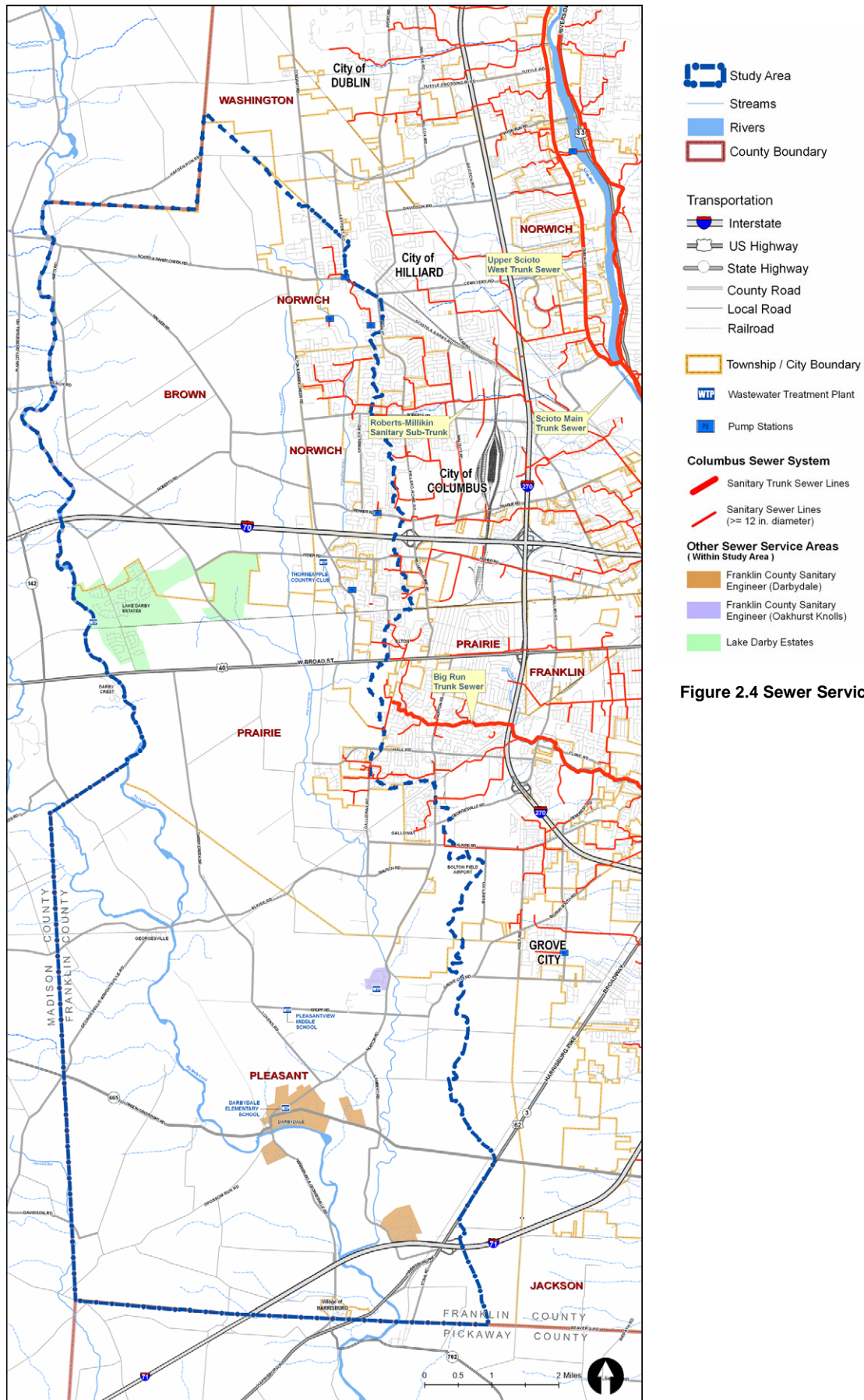


Figure 2.4 Sewer Service Areas Map

## Transportation

This plan does not include a detailed transportation analysis or modeling of traffic impacts. However, a review of planned transportation projects is helpful in understanding future impacts related to new development.

The roadway system within the Accord planning area is primarily composed of two-lane rural roads. This is particularly the case for the roadway systems west of the Cosgray Road/Alton & Darby Creek Road corridors. As annexations and developments have progressed westward and reached the Cosgray Road/Alton & Darby Creek corridor, roadway widening and intersection improvements have begun to take place along Cosgray Road and Alton & Darby Creek Road – and along north-south and east-west roadways east of this corridor.

A common approach to transportation planning applies a “planning level” assessment when relating 24-hour traffic volumes to the ability of a roadway to properly accommodate the traffic demands. This assessment relates traffic demands to level-of-service. Level-of-service (LOS) is based on a grading system which ranges from “A”, or perfect operation, to “F”, failing. An LOS “E” indicates that a facility is operating basically at capacity and the addition of more traffic will cause the facility to fail. When improvements are considered for the transportation system, the goal is to achieve an LOS “C” or “D” in the peak design hour through the 20-year life of the facility.

For planning level assessments, the 24-hour average daily traffic (ADT) relates to a service level as shown in Figure 2.6.

Based on analysis of data, none of the current ADTs on the two-lane roadways approach the 10,000 vehicle threshold. Therefore, the two-lane roadway system in the planning area is basically operating at a “C” level of service or better overall. This is not to say that there aren’t some capacity problems at individual intersections. As intersection capacity problems begin to occur, the responsible public agencies have been adding turn lanes at intersections and installing traffic signals in some instances. A number of transportation improvement plans are identified on Figure 2.5 that were noted in the Franklin County Thoroughfare Plan, the 2006-2009 Transportation Improvement Plan (TIP), and the 2030 Transportation Plan.

The 2006-2009 TIP includes only two projects relative to the planning area that relate to minor widening and safety improvements to Scioto Darby Creek Road – along with improvements at the intersection of Scioto Darby Creek Road with Alton & Darby Creek Road.



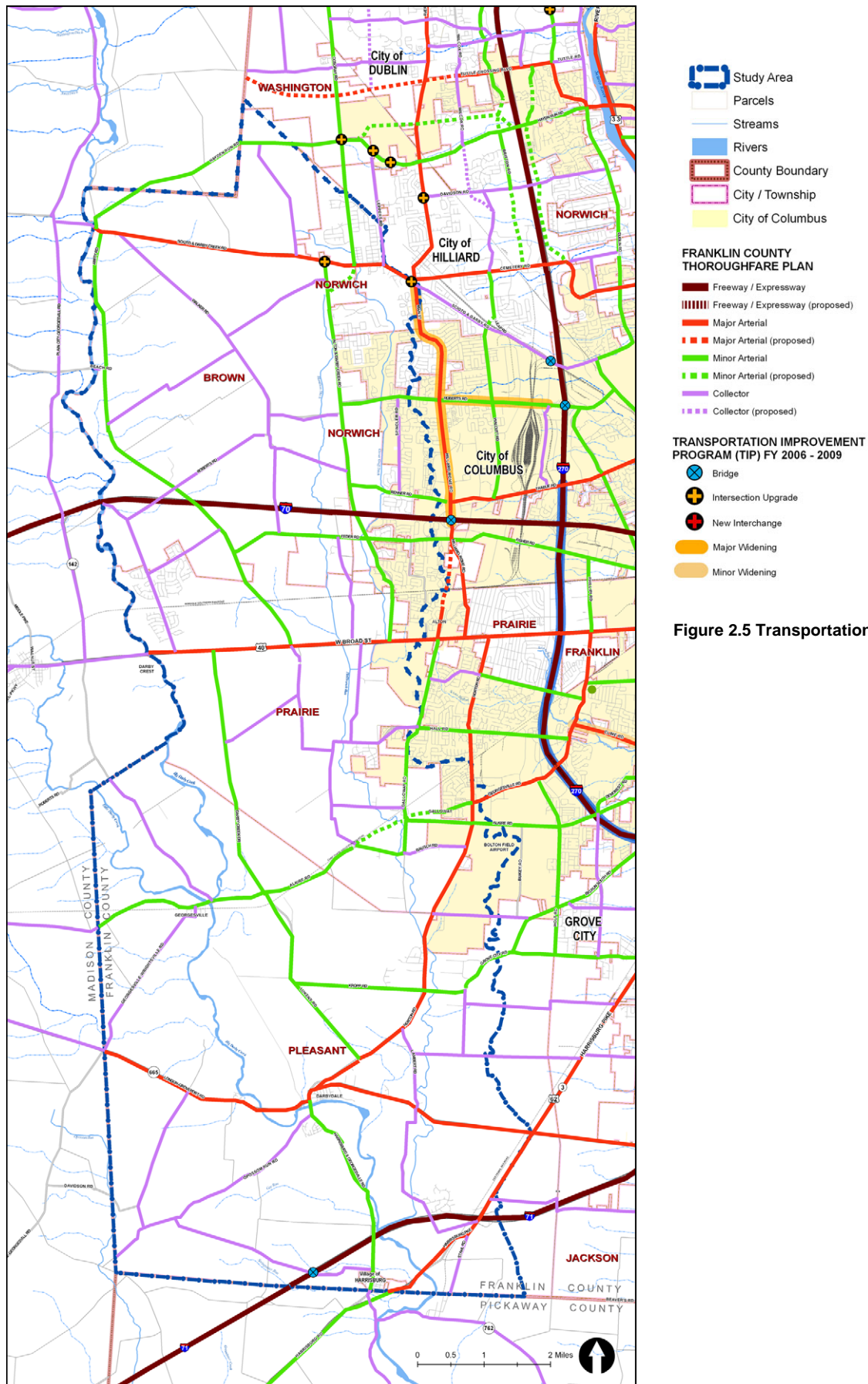


Figure 2.5 Transportation Map

Type of Facility	Max ADT @ LOS "C"	Max ADT @ LOS "D"	Max ADT @ LOS "E"
2-lane Roadway <sup>2</sup>	10,000	10,000 to 15,000 <sup>4</sup>	15,000
4-lane Roadway <sup>3</sup>	20,000	25,000 to 35,000 <sup>4</sup>	33,000 to 41,000 <sup>4</sup>
6-lane Roadway <sup>3</sup>	30,000	35,000 to 45,000 <sup>4</sup>	50,000+ <sup>4</sup>

**Figure 2.6 General Planning Level Average Daily Traffic LOS Thresholds**

\*Assumes peak hour traffic is approximately 9% of daily traffic with approximately a 60/40 directional split.

<sup>2</sup>The threshold varies depending on the presence of a left turn lane at intersections or other access points.

<sup>3</sup> Assumes necessary turn lanes at intersections.

<sup>4</sup>The threshold varies depending on the volume of cross-road traffic needing to access the facility.

There are numerous projects listed in the 2030 Transportation Plan. Most of these projects relate to the Cosgray Road/Alton & Darby Creek Road corridor and areas to the east. Of significance are the proposed extensions of Alton & Darby Creek Road north and south, the connection of Alton & Darby Creek Road with Cosgray Road, and a couple of new roads related to the southern extension of Elliott Road. Improvements are called for at the intersections of Walker Road with Roberts and Amity Roads, and safety improvements are called for along Alkire Road and Norton Road.

It should be noted that interchange upgrades are called for on I-270 at Cemetery Road, Roberts Road, and Georgesville Road, and on I-70 at Hilliard-Rome Road. These interchanges are already over capacity and severe congestion occurs. Of particular significance to the Accord planning area, the Hilliard-Rome Road interchange on I-70 realizes excessive traffic demands since it is the only interchange between Big Darby Creek and I-270. Significant additional developments west of the Alton & Darby Creek Road corridor will increase traffic demands on the east-west feeder roads (e.g. Feder and Renner Roads) and on already overloaded Hilliard-Rome Road.

A more detailed discussion of infrastructure policy considerations is included in Sections 4.0 and 5.0.

Hydro-geologic	Hydrologic	Ecologic
Groundwater and Surface Flow Exchange	Wetlands	Threatened and Endangered Species
Soils	Floodplains	Land Cover (Woodlands)
Groundwater Pollution Potential		Stream Attainment Levels

**Figure 2.7 Environmental Sensitivity Analysis Resources**

## 2.3 Sensitivity Analysis

The process for developing an evaluation system to identify environmentally sensitive areas in the planning area was a necessary first step in creating a land use plan. Existing landscape features, both natural and man-made provided a starting point to formulating future land use scenarios and were considered as the foundation for the land use alternatives developed during the planning process. Because of their complex qualities and their valued function in the watershed, environmentally sensitive areas are considered suitable candidates for open space, parks, or other preserved lands. The Big Darby Watershed is valued for its habitat systems, water quality, and ecology. Protecting these systems and ensuring their sustainability and improvement is a baseline consideration for the environmental sensitivity analysis and an overall goal of the Big Darby Accord Plan.

The environmental sensitivity evaluation process consulted a number of resources collected from multiple sources including an extensive amount of geographic information system (GIS) data. A list of the base GIS data that has been compiled as part of this planning effort is provided in the Appendix. To simplify and organize an evaluation system, the key resources shown in Figure 2.7 were considered as part of the environmental sensitivity analysis.

Environmentally sensitive areas were identified using the following three step resource-based evaluation method:

*Step 1: GIS Data Layer Analysis*

*Step 2: Qualitative Assignment*

*Step 3: Merge and Join*

### Step 1: GIS Data Layer Analysis

Hydro-geologic, hydrologic, and ecologic resources were evaluated and in some cases further analyzed for specific information. Identifying areas that exhibit high and moderate degrees of ground and surface water flow exchange and groundwater pollution potential required a closer analysis of DRASTIC data from the Ohio Department of Natural Resources (ODNR). DRASTIC uses a numerical rating and weighting system that is combined with the seven factors to calculate a ground water pollution potential index or relative measure of vulnerability to contamination. DRASTIC factors include:

- D – depth to water
- R – depth to recharge
- A – aquifer media
- S – soil media
- T – Topography (% slope)
- I – Impact to Vadose zone media
- C – Conductivity to the aquifer

Other analyses were conducted to extract highly erodible soils and soils with hydric components. Land cover, particularly wooded areas greater than three acres were identified as key areas for habitat and potential linkages in a green network that would contribute to overall ecosystems in place.

In isolation wooded areas may appear unimportant; however, this analysis is oriented toward creating future land use scenarios of which wooded areas and tree cover are considered valued components. Additional analyses were conducted to identify water quality factors that relate to environmental sensitivity. It is important to note that not all habitat and water quality factors translate to identifiable features on the landscape such as a wetland or floodplain. For example, aquatic life use attainment ratings for the Big Darby, Little Darby, Clover Groff, Hamilton and Hellbranch are identified and recognized, but are not specifically listed as factors because they are qualitative. However, the environmental sensitivity process does recognize the importance of protecting the aquatic environment through multiple avenues including the identification of floodplains and riparian setback zones and through the policy recommendations.

FEMA published floodplains are present along major stream corridors including Big Darby Creek, Little Darby Creek, Hellbranch Run, Clover Groff and the Hamilton Ditches (herein after referred to as Clover Groff and Hamilton Runs). To address stream corridors without FEMA floodplains, a calculated beltwidth has been applied to provide an offset from the centerline of the stream.

	High	Medium	Low
	Category 1	Category 2	Category 3
<b>Hydrogeologic</b>			
High Degree of Flow Exchange	H		
Moderate Degree of Flow Exchange		M	
High Groundwater Pollution Potential	H		
Highly Erodible Soils	H		
Areas with Hydric Soils			L
<b>Hydrologic</b>			
Wetlands	H		
FEMA 100 Year floodplain Boundary	H		
Beltwidth Calculated Buffer Zone	H		
FEMA 500 Year floodplain Boundary			L
<b>Ecologic</b>			
Federal, State Endangered	H		
State Threatened	H		
Species of Special Concern	H		
Wooded Areas 3 Acres or Greater		M	
Wooded Areas 0.5 to 2.99 Acres			L

**Figure 2.8 Environmental Sensitivity Analysis Components and Categorization**

### Step 2: Qualitative Assignment

The key resource data layers were assigned a qualitative value of high, medium, or low, shown in Figure 2.8. A qualitative assignment was necessary to prioritize the environmentally sensitive areas in the planning area for their value in maintaining a healthy watershed and to begin to recognize degrees of sensitivity as they relate to proposed future land uses.

A highly sensitive value is associated with resources that relate to protecting water quality, both surface and groundwater, or critical habitat areas (threatened, endangered, or species of concern) for plant and wildlife habitat recognized by Federal or State agencies. Areas that exhibit a high degree of flow exchange or a high groundwater pollution potential due to hydro-geologic characteristics were ranked high. Linear features such as floodplains or beltwidths are also assigned a high value for their recognized value in maintaining healthy waterways, providing habitat areas in streams and along water ways, and minimizing flood damage and personal property loss.

Areas with a moderate degree of flow exchange between ground and surface water were assigned a medium sensitivity. In addition, wooded areas of three or more acres were assigned a medium value to emphasize their importance in providing habitat areas and creating a network of green corridors.

Those features assigned a low environmentally sensitive value relate to Hydric soils, land within the 500 year floodplain (beyond the 100 year floodplain boundary), and wooded areas between one half and three acres. Hydric soils compose a significant amount of land within the planning area and are a limiting factor for certain types of development. Soil type becomes of particular importance when dealing with alternative sewage treatment or on-lot septic systems and, therefore, should be addressed through the site development review and approval process. Hydric soils are not well-suited for septic systems because they encumber the treatment process and limit filtration of effluent. This process has identified hydric soils to understand how they relate to other environmentally sensitive

areas. Development policies and regulations for best management practices and non-central sewer systems further address hydric soils.

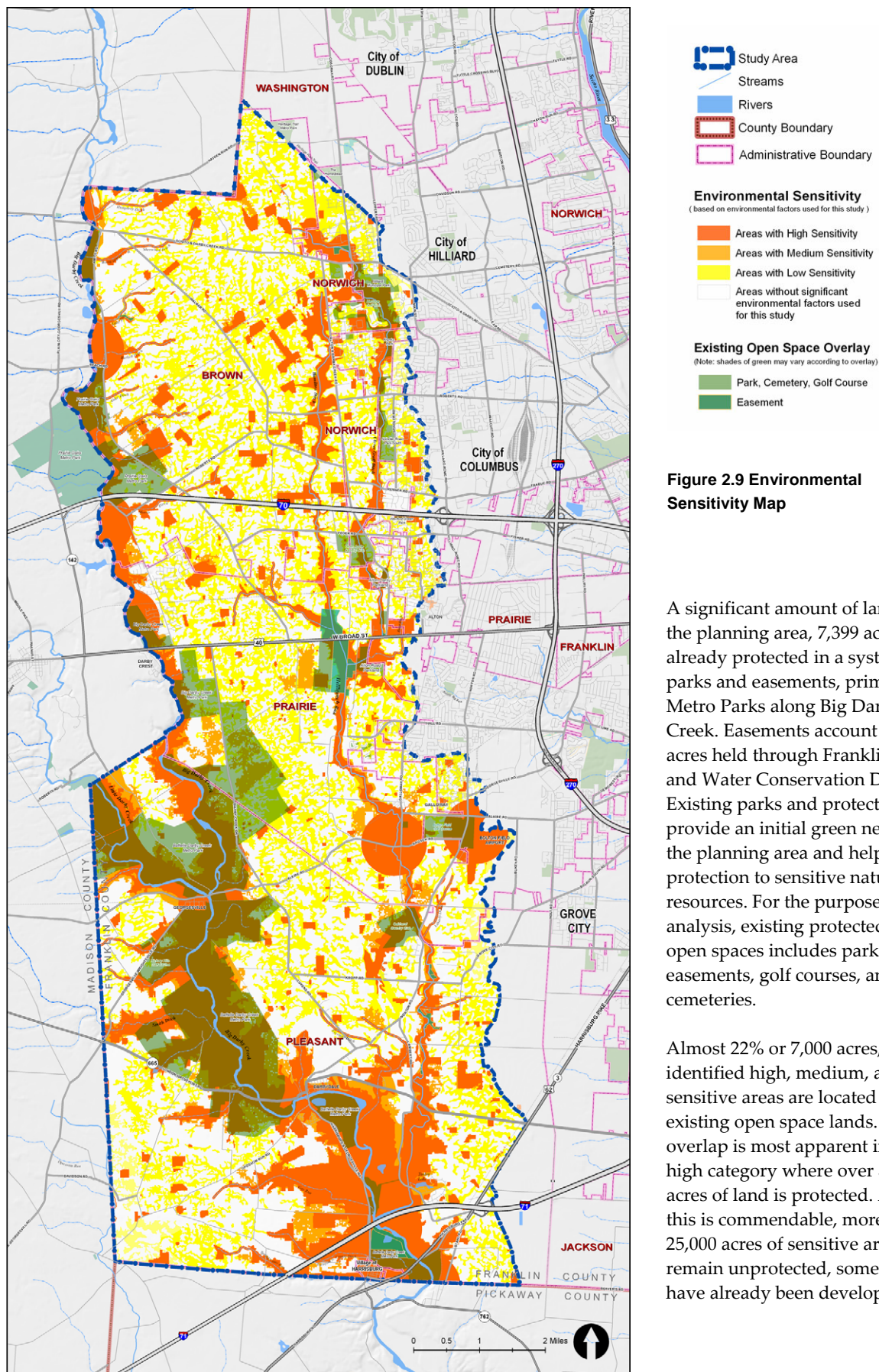
All high, medium, and low environmentally sensitive areas should be considered as having important values worthy of preservation. The presence of environmental factors also correlates to potential problematic impacts for development.

### Step 3: Merge and Join

The final step in the environmental sensitivity analysis created a composite map identifying all high, medium and low areas shown in Figure 2.9. Due to the existing predominantly low density development pattern, it was decided that existing development patterns should not be excluded from the environmental sensitivity process. Areas that are already developed may be suitable for mitigation techniques or other preservation efforts to enhance or protect identified sensitive resources.

Overall, 32,351 acres of environmentally sensitive areas were identified, covering 60% of the planning area. Of those resources identified through this process, about half are highly sensitive. The majority of those features in the high category are associated with high potential for groundwater and surface water flow exchange and high groundwater pollution potential. When combined, the high and medium sensitive areas account for about 19,000 acres within the planning area, or 35% of the planning area. The majority of resources within the low category are attributed to areas with hydric soils.





**Figure 2.9 Environmental Sensitivity Map**

A significant amount of land within the planning area, 7,399 acres, is already protected in a system of parks and easements, primarily Metro Parks along Big Darby Creek. Easements account for 145 acres held through Franklin Soil and Water Conservation District. Existing parks and protected lands provide an initial green network for the planning area and help provide protection to sensitive natural resources. For the purpose of this analysis, existing protected lands or open spaces includes park lands, easements, golf courses, and cemeteries.

Almost 22% or 7,000 acres, of the identified high, medium, and low sensitive areas are located within existing open space lands. This overlap is most apparent in the high category where over 5,000 acres of land is protected. Although this is commendable, more than 25,000 acres of sensitive areas remain unprotected, some of which have already been developed.

## 2.4 Water Quality and Biology

Generally speaking, Ohio measures the health of its streams by examining the number and types of fish and macroinvertebrates living within the water environment and sets specific standards for ensuring streams are meeting the requirements to sustain these life forms. The biological condition of streams is a direct indicator of the impact of surrounding landscape influences. This section discusses goals and programs tied to the improvement of water quality and aquatic life use attainment within the various watercourses in the planning area. Watercourses, including subwatershed boundaries and other hydrological resources are shown in Figure 2.10.

The term ‘healthy stream’ is used to describe a watercourse that meets a certain level of aquatic life use attainment and includes a diversity of qualifications. The concept of stream health can be generally distilled into four basic parameters: chemical water quality, morphology, habitat quality, and riparian and watershed quality. These parameters are interrelated and their combined effect influences the quality and diversity of the biotic communities (fish and macroinvertebrates) within the stream. In addition, the overall health of a stream is a determining factor in the amount of pollution the stream can assimilate without becoming a toxic environment for the biota within.

When addressing the issue of healthy streams within the Accord planning area, evidence shows a decline in the biological diversity of the aquatic ecosystem of Big Darby Creek and non-attainment of several key water quality parameters within the Hellbranch Run Watershed, which comprises a significant portion of the planning area.

Prior investigations into the biological diversity of the Big Darby Watershed have considered several indicators of stream health, including specific fish species, mussel communities, and macroinvertebrates. The composition of each of these communities is an indicator of the health of a stream, and declining populations and diversity of each can provide an indication of declining water quality. The trends in aquatic habitat are captured in the compiled scores for the Index of Biological Integrity (IBI) for fish, and the Invertebrate Community Index (ICI) for macroinvertebrates, throughout the watershed. Another method of assessing stream quality is the Qualitative Habitat Evaluation Index (QHEI), which is utilized to determine the relative quality of the physical habitat provided by the stream. This assessment evaluates the geomorphological condition of the stream by looking at channel substrate, morphology, and riffle structure, as well as assessing the associated riparian corridor and adjacent floodplain.

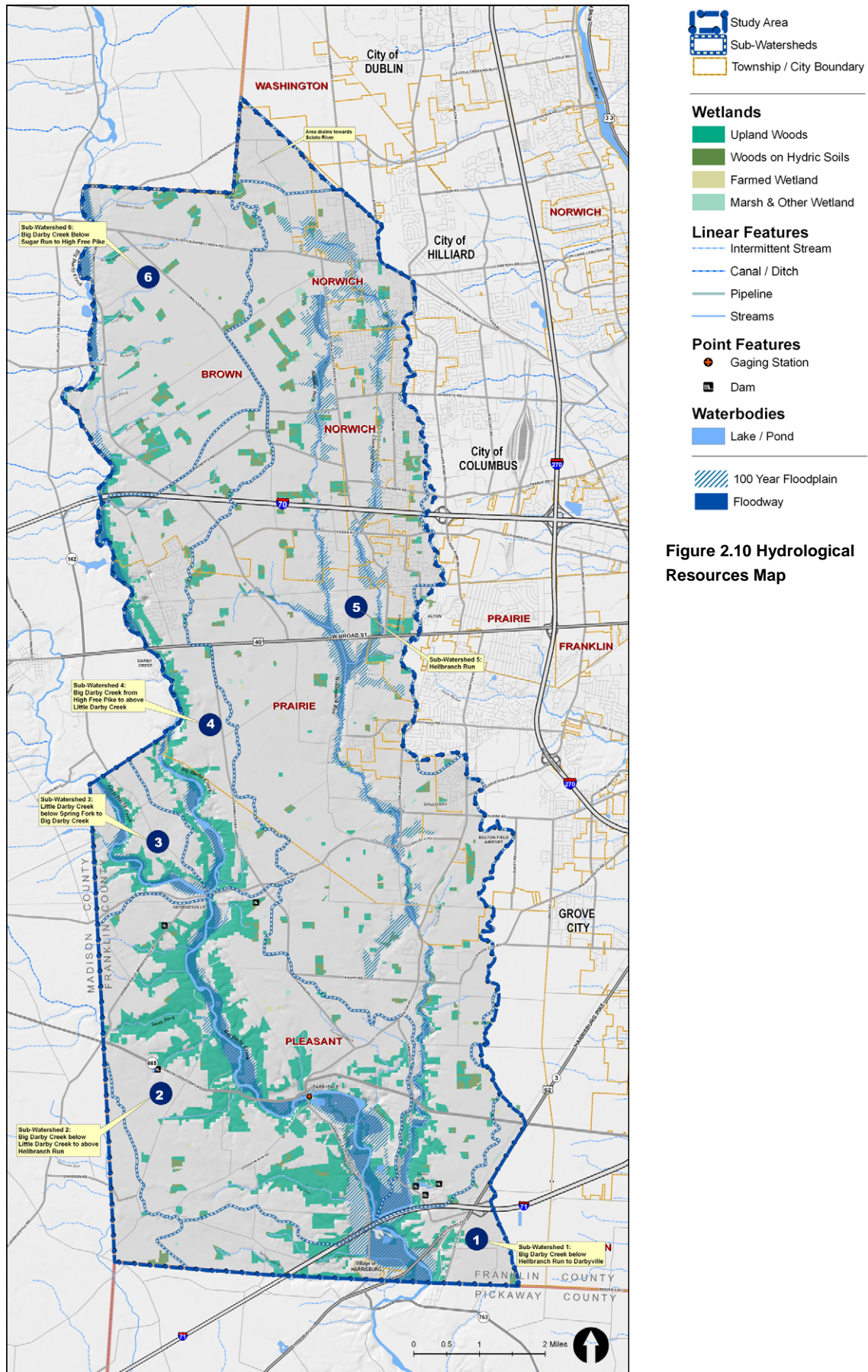


**Long-ear Sunfish**

*Source: Metro Parks/Mac Albin*

The Ohio EPA has performed extensive investigations and studies related to the water quality conditions to the Big Darby Watershed. These efforts culminated in the publication of the Total Maximum Daily Load (TMDL) report for the watershed (OEPA, 2006). The TMDL focuses on specific pollutant conditions and loadings in identifying the extent to which impairment existed throughout the watershed. The Hellbranch Run Watershed, which comprises approximately 46% of the Accord planning area, was identified within the TMDL as a significant source of Total Suspended Solids (TSS) and nutrient pollutants to Big Darby Creek.





**Figure 2.10 Hydrological Resources Map**

### **Description of Watercourse Impairment**

The Hellbranch Run Watershed has been identified as being impaired and fails to meet certain water quality criteria. The Hellbranch Run Watershed is comprised of two main tributary streams: Clover Groff Run and Hamilton Run. These tributary streams are in close proximity to the expanding suburban areas of western Columbus; however, there is still a significant presence of agricultural land use within these watershed areas. Both watercourses have been hydrologically modified in the past, attributed to a ‘ditching’ process that is commonly associated with agricultural land use within the State of Ohio. The ditching process includes a straightening, widening, and deepening of the stream channel to increase flow capacity and facilitate the use of field tile to drain the adjoining farm fields. In addition, the wooded riparian corridor along these tributary streams is degraded by land use activities that encroach upon the channels. Physical degradation of Clover Groff and Hamilton Runs is reflected in the generally low QHEI scores assessed by the Ohio EPA for the greater portion of these streams, especially within the headwater areas.

One consequence of the ditching process is a channel loses the functional components that contribute to aquatic habitat. Furthermore, a channel that is capable of conveying larger storm events is also subject to degradation through channel bank erosion and ‘downcutting’, a process that only advances the ditching process by lowering the channel gradient and expanding the width of the channel. Conversely, an over-wide channel can be subject to aggradation as sediments conveyed in stormwater runoff are deposited

within the channel bottom due to a lack of velocity and energy to carry that material. The processes associated with channel degradation are a primary source of sediment loading in a stream system, as confirmed by findings of the Ohio EPA’s TMDL related to the Hellbranch Run Watershed.

Degradation of the physical habitat and riparian areas along streams within the Hellbranch Run Watershed, coupled with sediment and nutrient runoff from agricultural and urban land use practices within the watershed, has an observable negative effect on fish and macroinvertebrate communities. This effect is apparent in the generally lower ICI and IBI scores assessed by the Ohio EPA within Clover Groff Run, Hamilton Run, and the upper Hellbranch. The scores show a general trend of improvement as the watercourses move downstream towards the confluence with Hellbranch Run and Big Darby Creek, where there is a wider, more intact riparian buffer and less channel modification.

ICI and IBI scores calculated for the portion of Big Darby Creek within the planning area indicated that the majority of the stream is meeting a category of Exceptional Warmwater Habitat (EWH). There is information suggesting a downward trend in QHEI scores for portions of the middle Big Darby Creek and that the diversity and overall population of mussel species is declining (Darby Creek Watershed Inventory, 2005). Findings associated with the declining mussel communities suggest that this decline is possibly attributed to a decline in fish population and increasing water



**Clover Groff (ditching)  
at Roberts Road**

Source: *The Nature Conservancy / Anthony Sasson*

turbidity and smothering of the channel bottom due to sedimentation within the channel (Discussions with Dr. Tom Watters, OSU).

### **Aquatic Life Use Attainment**

Based upon the findings of the *Biological and Water Quality Study of the Big Darby Creek Watershed, 2001/2002* (OEPA, 2004), the Ohio EPA has placed aquatic life use designations upon various watercourses within the Accord planning area. Furthermore, through the TMDL process, the Ohio EPA has identified portions of those watercourses that are in attainment, partial attainment, or non-attainment of that use designation. Each category of use attainment that pertains to watercourses within the planning area is described below (TMDL, 2006). Figure 2.11 illustrates water quality issues in the planning area.



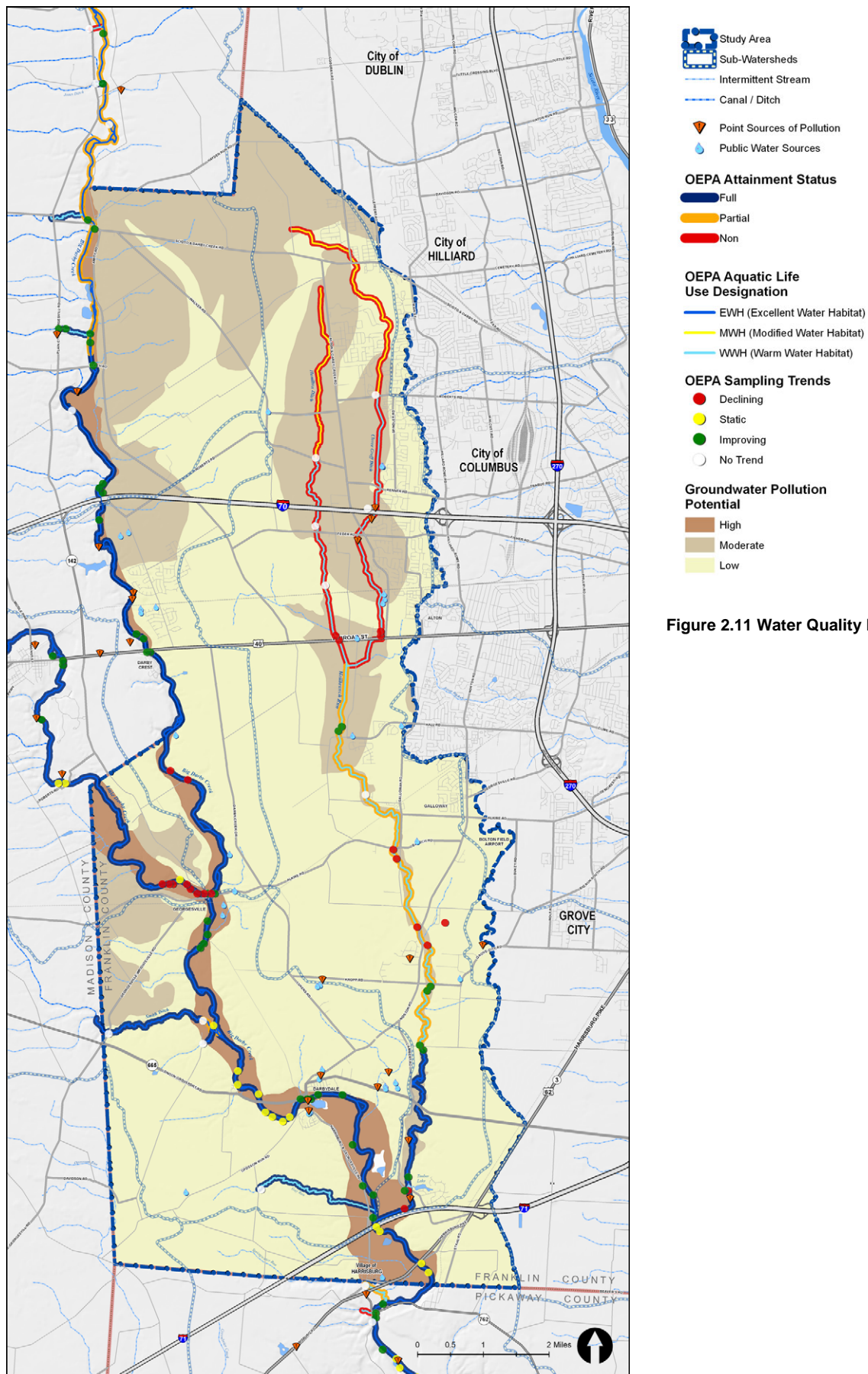


Figure 2.11 Water Quality Map

Stream Name	Aquatic Like Use Designation	Level of Use Attainment		
		Full	Partial	Non
Hellbranch Run Watershed				
Clover Groff Run	MWH – upstream of Roberts Road			X
	WWH – downstream of Roberts Road to the confluence			X
Hamilton Run	MWH – upstream of Widener Road			X
	WWH – downstream of Widener Road to the confluence			X
Hellbranch Run	WWH – upstream of Beatty Road		X	
	EWH – downstream of Beatty Road to the confluence	X		
Big Darby Creek Watershed <sup>1</sup>				
Main Stem <sup>2</sup>	EWH		Upstream of Fitzgerald Run (RM 45.0)	
		Downstream of RM 45.0		
Smith Run	EWH	X		

**Figure 2.12 Summary of Aquatic Life Use Designation and Attainment**

<sup>1</sup> Watercourses within the Big Darby Accord that are directly tributary to Big Darby Creek

<sup>2</sup> Only the portion that discharges through Franklin County

Source: OEPA TMDL, 2006; Big Darby Watershed Inventory, 2005

**Warmwater Habitat (WWH):** An aquatic life use designation that is characterized by the “typical” warmwater assemblage of aquatic organisms for Ohio’s rivers and streams. This use represents the principal restoration target for the majority of water resource management efforts in Ohio.

**Modified Warmwater Habitat (MWH):** An aquatic life use designation that applies to rivers and streams that have been subjected to extensive, maintained, and essentially permanent hydromodification such that the biocriteria for the WWH use is non-attainable, and where the activities have been sanctioned and permitted by State or Federal law. In these watercourse, the representative aquatic assemblages are generally composed of species which are tolerant to low dissolved oxygen, silt, nutrient enrichment, and poor habitat quality.

**Exceptional Warmwater Habitat (EWH):** An aquatic life use designation that is reserved for waters that support “unusual and exceptional” assemblages of aquatic organisms that are characterized by a high diversity of species, particularly those that highly intolerant and/or rare, threatened endangered or special status (e.g., declining species). This designation represents a protection goal for water resource management efforts dealing with Ohio’s best water resources.

Figure 2.12 provides a list of the various major watercourses studied within the planning area, the designated life use attainment for each, and the finding pertaining to attainment (Big Darby Watershed Inventory, 2005/TMDL, 2006).

There are several small tributary streams within the planning area that are directly tributary to Big Darby Creek. The Ohio EPA, in their assessment of the Big Darby Watershed has not provided an aquatic life use designation for those watercourses, except for Smith Run, and no attempt is made here to provide an assessment of the habitat conditions associated with those channels. Each has only a small watershed area in comparison to those that are identified in Figure 2.12. Furthermore, Little Darby Creek is not separately included in this assessment due to the fact that only a small portion of that watershed is within the Accord planning area.

### ***Impairment Summary***

The aquatic life use designations and the extent to which they are attained play a significant role in determining where changing land uses and restoration opportunities can have the most significant positive impact on water quality. Significant impairment has been documented in the upper portion of the Hellbranch Run Watershed, associated with both the Hamilton and Clover Groff Runs.

Conservation-related land uses can have the most beneficial impact on impaired streams. Examples of these practices and their practical benefits to water quality are described below.

1. Preserving existing agricultural lands in perpetual conservation areas or easements for conversion to native grass and woodlands can reduce the amount of sediments and nutrients commonly associated with stormwater runoff from that land use.
2. Preservation and enhancement of riparian stream corridors provides an enriched habitat environment and introducing vegetative cover would provide stream stability characteristics.
3. Conservation development practices that include open space set asides and stormwater Best Management Practices (BMP), promoting groundwater recharge, and providing structural measures for capturing pollutants will help promote water quality improvements.
4. Implementing agriculture BMP's can mitigate the impacts of agricultural drainage (field tiles), sediments, and nutrients commonly associated with agricultural lands.

A key driver of the Accord Plan is to achieve the aquatic life use designation for each watercourse, upgrading streams designated as MWH to WWH where practicable. To achieve that, it is believed that stream restoration activities within the Hellbranch Run Watershed, particularly along Clover Groff Run and Hamilton Run will be needed. Sustainment of the EWH designation for the main stem of the Big Darby Creek is also a goal of water quality initiatives within the planning area. For this reason, attention must be paid to the smaller watercourses that are directly tributary to Big Darby Creek in the western portion of the planning area.

### ***Water Quality Goals***

Establishing and maintaining healthy streams required the identification of a land use scenario that over time would help address issues of non-attainment of aquatic life use designations within the Hellbranch Run Watershed and preservation of areas of attainment throughout the planning area.

The first step in this process, the environmental sensitivity analysis identified areas that were to be protected from urbanization, which constitute preferred areas for conservation and possible restoration. Primary influences that determined the resulting general land use plan related to water quality include:

1. *Protecting floodplains and stream corridor protection zones throughout the planning area and preserving them as naturalized riparian corridors.*
2. *Avoiding areas of high groundwater/stream baseflow interaction and pollution potential zones, as defined by the Ohio Department of Natural Resources (ODNR) DRASTIC mapping.*

3. *Protecting larger contiguous forested areas.*
4. *Implementing conservation development with a 50% open space requirement.*

Next, hydrological modeling provided a detailed analysis of the impact of land use scenarios on the pollutants identified by the TMDL as being factors in water quality impairments within the planning area. The purpose of the analysis was to determine how urbanizing land uses affect the pollutant loadings to the receiving streams and to better understand the benefits of conservation land use practices. Efforts related to the hydrological modeling process are described in the Appendix.

The last step to establishing and achieving healthy streams involved investigating the use of stormwater BMPs related to land use conditions and established water quality targets within the TMDL. Each BMP has unique benefits and drawbacks related to sustainment and function.

The planning area is comprised of two distinct watersheds: 1) the entire Hellbranch Run Watershed; and 2) the remaining areas to the west and within Franklin County that are directly tributary to Big Darby Creek. Within the TMDL document, the western areas are distributed amongst three separate subwatershed areas, identified as BDC 4, BDC 5, and BDC 6.

Figure 2.13 identifies the pollutant parameters and reductions that are stipulated in the TMDL report for the Hellbranch Run Watershed. Due to the fact that this watershed is a significant component of the Accord planning area and that only

Pollutant	Calculated Loadings (kilograms/year) <sup>1</sup>		
	Existing	Target	% Reduction to Meet Target
Total Suspended Solids (TSS)	3,051,200	152,560	95
Total Phosphorus (TP)	15,266	2,805	82

**Figure 2.13 Summary of Target Pollutant Load Reductions – Hellbranch Run Watershed**

<sup>1</sup> All values are average annual values over the duration of the planning period, published in the TMDL; non-point source loadings only.

portions of the other TMDL-identified sub-watersheds are within the planning area boundary, only the information for Hellbranch Run is presented with the understanding that the water quality initiative within Accord will be influenced by those values.

#### ***Discussion of Current Water Quality Initiatives***

There are several existing policies, regulations, and on-going environmental protection initiatives that affect the level of development that can occur in the watershed. Each of these resources has at least one of the three essential components of environmental protection related to water quality: riparian corridor protection (stream setbacks); stormwater and floodplain management, and; conservation development. The resources listed have influenced policy recommendations in this plan.

#### **Hellbranch Overlay (Columbus)**

In 2002, the City of Columbus adopted the 'Hellbranch Overlay' (Columbus Code 3372.7), a codified standard for stormwater management that applied to all land development within the city limits and within the Hellbranch Run Watershed. The provisions of the overlay remain in effect even with the City's implementation of the revised Stormwater Drainage Manual, which applies city-wide. Based on discussions with the City of Columbus, they would apply the more stringent criteria to any future development within the overlay area.

#### **External Advisory Group (OEPA)**

In late 2003, the Ohio EPA engaged in an initiative to develop water quality criteria for an area identified as the Environmentally Sensitive Development Area (ESDA). The initiative is a component of an on-going update to the 208 Water Quality Management Plan for the central Scioto River basin, which includes Franklin County and the Big Darby Watershed, which is described below. The ESDA is a portion of the Big Darby Watershed and is located within the western limits of Franklin County. The Ohio EPA required that these initiatives be developed and enacted prior to the extension of centralized sewer services into this area.

The initiative required Columbus, who would ultimately provide the central sewer service, to convene an External Advisory Group (EAG) that would consider recommended criteria for riparian buffers, stormwater management, conservation development and adequate public facilities. The EAG was comprised of representatives from the municipal jurisdictions within the ESDA, along with other stakeholders, such as The Nature Conservancy, Darby Creek Association, The Ohio State University and the Building Industry Association (BIA). The result of the EAG process was a November 2004 report that outlined consensus and non-consensus recommendations related to these issues. [Note: the EAG was unable to address the issue of adequate public facilities in the timeframe that they were allotted].

#### **Stormwater Drainage Manual (Columbus)**

The City of Columbus recently released and is enforcing the provisions of their revised Stormwater Drainage Manual, dated March 2006. The drainage manual contains policies pertaining to stream corridor protection, floodplain preservation, and stormwater management. With regard to stormwater management, the manual has detailed provisions for stormwater controls related to both the quantity and quality of stormwater runoff released from a development site. The manual provides design criteria for the structural components of a stormwater system, such as curb inlets and storm sewer pipes, as well criteria for features related to post-construction water quality, such as extended detention basins and bioretention facilities.



### NPDES Phase II (Franklin County)

Phase II of the National Pollutant Discharge Elimination System (NPDES) program is being implemented by Franklin County to include unincorporated areas within the County, including the various townships within the Accord planning area. The Cities of Hilliard and Grove City are also participating Phase II communities, and the City of Columbus is a Phase I community.

The NPDES initiative within Franklin County is being conducted in cooperation between the County engineer's office and the Franklin Soil and Water Conservation District (FSWCD). This initiative is intended to develop stormwater management standards including water quality considerations consistent with those mandated by the Ohio EPA through their statewide general permit for stormwater discharge. Furthermore, through the NPDES program, the County is investigating the regulation of certain on-lot home septic systems as 'illicit discharges' when those systems fail to function as intended.

The NPDES program and the State of Ohio's general permit for stormwater discharge address requirements related to both construction-phase and post-construction water quality. The portion of the general permit that addresses construction-phase activities includes a requirement for a Stormwater Pollution Prevention Plan (SWPPP) containing provisions for erosion and sediment control for areas denuded during construction. The post-construction requirements identify the necessary components of a permanent on-site stormwater management facility that provide for long-term water quality.

Fundamentally, the post-construction standards require the implementation of some sort of structural BMP for all development sites larger than one acre. For larger development sites, greater than five acres, the standards are more specific and require a BMP facility with a prescribed water quality volume and residence (drawdown) time for the intercepted stormwater runoff. Presently, the Ohio EPA is in the process of updating the NPDES permitting process for areas within the Big Darby Watershed.

### 208 Plan (OEPA)

The Ohio EPA is currently engaged in an update to the 208 Water Quality Management Plan for the central Scioto River basin. The 208 Plan is comprised of criteria and standards related to providers of central sewer service. The plan establishes the municipal jurisdictions and other entities responsible for providing sewer service and the service areas they are responsible for. As mentioned above, the plan update included the EAG process that established recommendations for water quality initiatives that would need to be implemented by the recognized service providers prior to extending service into the ESDA. The draft revised 208 Plan contains an Appendix (9-3) that outlines specific water quality provisions for Big Darby Creek. Furthermore, that appendix has even more specific water quality criteria related to the portion of the watershed within Franklin County, reflecting the consensus recommendations of the EAG process.

### Stormwater Permit (OEPA)

The 208 Plan itself is not a regulatory tool for implementing water quality standards. As such, the Ohio EPA has created a draft revised stormwater general permit that is specific to the Big Darby

Watershed and makes reference to the water quality criteria from the 208 Plan and is also based on the water quality goals established by the TMDL report. The Ohio EPA is authorized to regulate stormwater discharges under the statewide NPDES program permit. The conditions of the permit apply when land disturbing activities occur in excess of one acre, at which time the applicant must submit a Notice of Intent (NOI) to the Ohio EPA along with technical information demonstrating compliance with both construction phase and post-construction water quality standards, described previously. Currently, the revised stormwater permit is in draft form and the Ohio EPA is considering comments submitted during the public comment period.

### Hellbranch Watershed Forum

The Hellbranch Watershed Forum (HWF) is an on-going initiative that involves a local stakeholder group that is similar to the one identified within the EAG and is being partially funded by the US Army Corps of Engineers. The FSWCD is serving as the local sponsor for the project and is leading the local stakeholder group. The HWF has been developing policy recommendations related to riparian buffer protection, and stormwater and floodplain management. These recommendations have been provided to the Accord for consideration and are summarized in the Hellbranch Watershed Action Plan document. The recommendations have been developed in cooperation with the engineering consultant to the HWF, Fuller, Mossbarger, Scott & May Engineering, Inc. (FMSM) and represent a consensus process among the local stakeholder group that makes up the HWF.

### **TMDL Report (OEPA)**

The TMDL (Total Maximum Daily Load) Report for Big Darby Creek Watershed represents a significant water quality initiative. The information presented previously regarding the Hellbranch Run Watershed is the basis for the water quality modeling performed as part of the Accord planning effort. The specific pollutants and stipulated reduction goals in the TMDL are the foundation for stormwater BMPs that are recommended within the Accord planning area.

### ***Adaptive Management***

The overall goal to improve and maintain water quality within the Accord planning area is a long-term process that will require the use of adaptive management techniques. Currently, the Ohio EPA TMDL, Section 208 water quality planning, permits for wastewater and stormwater discharge, and various environmental policies are used to guide development. With the implementation of the Accord Plan, development will be guided by new standards intended to help reach the goals of TMDL. Despite these various measures of oversight and enforcement, a broader program related to the evaluation and monitoring of the watershed and specific stormwater management features that may be implemented is needed to realize an adaptive management approach.



**Big Darby Creek**  
Source: Metro Parks/Mac Albin