A properly developed comprehensive plan identifies future land use scenarios and preferred development patterns only after identifying the locations of natural features (i.e., streams, soil types, mineral deposits, etc.), the potential development constraints (i.e. wetlands, floodplains, steep slopes, etc.), and the anthropogenic sources (i.e., point source pollution, non-point source pollution, etc.) that may threaten the natural environment. The following section fulfills this requirement to support the recommendations contained in the East Bethlehem Township Comprehensive Plan.

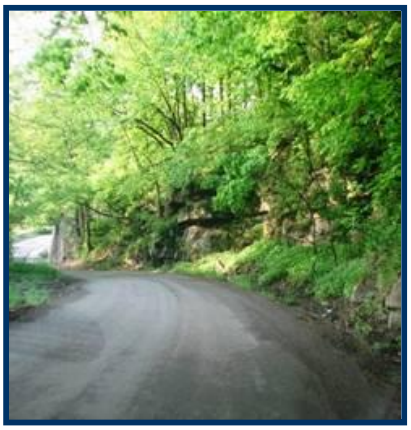
Climate

Climate is defined as the "average weather" over a period of time, usually 30 years (World Meteorological Organization, 2006). The mean temperature for Washington County is 53.0 Fahrenheit (°F) with a maximum mean monthly temperature of 73.8 (°F) in July and a mean monthly low of 30.4 (°F) in January. Precipitation averages about 37.67 inches per year and is fairly evenly distributed throughout the year. July is the wettest month with an average of 3.87 inches per year and February is the driest month with 1.40 inches per year. Snowfall averages 14.5 inches per year with most of it falling between December and March.

Land Characteristics

Topography / Steep Slopes

Erosion, landslides, and increased storm water runoff can occur by developing on steep slopes, defined as slopes over 25 percent. Map 3.1: Surface Features illustrates the locations of steep slopes in East Bethlehem Township. Most of the locations are located along Black Dog Hollow Road and along the northern portion of State Route 88 as it crosses through the township.



Steep Slopes (Mackin, 2007)

Geology

Pennsylvania is divided into many physiographic provinces, which are regions in which all parts are similar in geologic structure, climate, relief, and have a unified geomorphic history. The bedrock of an area, along with the hydrologic cycle, is responsible for changes in elevation, topographic slopes, and waterway locations. The orientation of bedrock is influential in determining an area's soils, vegetative communities, and availability of sunlight. East Bethlehem Township is situated in the Waynesburg Hills Section of the Appalachian Plateaus Province.

Table 3.1: East Bethlehem Township Bedrock Geology

Period	Formation/Group	Description	General Location
Permian and Pennsylvanian	Waynesburg	Cyclic sequences of sandstone, shale, limestone, and coal; commercial coals present; base is at bottom of Waynesburg coal	Portions along Sandy Plains Road and Morey Road
Pennsylvania	Monongahela	Cyclic sequences of limestone, shale, sandstone, and coal; commercial coals present; base is at bottom of Pittsburgh coal	Throughout the Township

Soils

Soil characteristics are extremely important in determining suitable locations for development. The availability of on-lot sewage systems and construction of roads and buildings all depend on the type of soil. Dormont-Culleoka is the only soil association found in East Bethlehem Township.

Table 3.2: East Bethlehem Township Soils

Soil Association	Description	General Location
Dormont-Culleoka	Moderately well drained and well drained, deep and moderately deep, gently sloping to very steep slopes; on hilltops, ridges, benches, and hillsides	Most abundant soil association in the Project Area

Hydric Soils

As defined by the Natural Resources Conservation Services, the definition of a hydric soil is a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part (USDA, 2004). Hydric soils are important to identify because they indicate where potential wetlands may be located. Hydric soils have severe surface and subsurface draining problems, resulting in significant development limitations, including restricting the placement of septic systems.

There is one true hydric soil in Washington County- Purdy Silt Loam, which is not found in the Project Area. However, 21 other soils in the Project Area could support wetlands if the proper hydrology exists.

Prime Agricultural Soils

Prime Agricultural Soils are prevalent throughout the Township with denser deposits located near Black Dog Hollow Road and Sandy Plains Road. Map 3.3: Agricultural Resources shows the location of these soils.

Agricultural Resources

Using the Southwestern Pennsylvania Commission Land Use Land Coverage Data (LULC), active farms were identified and mapped. Agricultural land is defined as land being covered by hay, wheat, grass, or other vegetation of the like. In East Bethlehem Township, approximately 15 percent of the land is classified as Agricultural land according to SPC Land Use Classification system.

Agriculture (Mackin, 2007)

Active Farms

Existing farming activities were identified at the parcel level by the Washington County Planning Commission and classified as active farms (2005). The County created this inventory due to the importance of agricultural lands to the rural character of Washington County. Active farms in East Bethlehem Township are shown on Map 3:3: Agricultural Resources.

Agricultural Security Areas

The Agricultural Security Area (ASA) program began as a tool for strengthening and protecting agriculture in Pennsylvania. Participating farmers are entitled to special consideration from state and local agencies and protection from nuisance challenges to encourage continued agricultural use of land. The program establishes the authority for municipalities to identify areas of 250 or more acres to be voluntarily enrolled, the area may be owned by more than one person and does not have to be contiguous. The property has to be viable agriculture land; cropland; pasture, or woodland (Pennsylvania Department of Agriculture, 2006).

As of October 2007, there were approximately 61,000 acres enrolled in the ASA program in Washington County. East Bethlehem Township has one ASA that is a total of 69 acres.

Clean and Green

The Clean and Green (ACT 319) program is a state program designed to preserve agriculture and forest land. The purpose of ACT 319 is to provide a tax benefit to owners of agricultural or forest land by taxing land on the basis of its "use value" rather than its market value. This act provides preferential assessment to individuals who agree to maintain their land solely devoted to agricultural use, agricultural reserve, or forest reserve use.

In Washington County there were 377,425 acres enrolled in the Clean and Green Program. Specific data for East Bethlehem Township was not available before conclusion of this plan.

Mineral Resources

Coal

The Project Area is located within the Main Bituminous Coal Field of Pennsylvania (DCNR, 2004). Extensive areas of operating surface and deep mines, old stripping areas, and reclaimed areas are dispersed throughout the landscape. Coal that is or has been mined within Washington County is primarily high volatile bituminous coal.

Most of the Upper Freeport Reserve has been mined in the Township. Portions of the Pittsburgh reserve in Fredericktown and Millsboro still exist to date. Refer to Map 3.3: Mineral Resources for areas within the Project Area that have been previously undermined and coal reserves still exist.

In-active Clyde Mine (Mackin, 2007)

Oil/Gas Wells

According to the Pennsylvania Department of Conservation and Natural Resources (DCNR) the Project Area is located in the shallow gas fields of Pennsylvania. To drill a gas well in Pennsylvania the driller must obtain a permit from the Department of Environmental Protection, Bureau of Oil and Gas Management. To qualify for the permit, the well must be planned in an environmentally responsible manner, to protect environmentally sensitive areas such as streams and wetlands (Oil and Gas in Pennsylvania, DCNR). Oil/Gas Wells are identified on Map 3.3: Mineral Resources. There are nine Oil/Gas Wells identified in the Project Area as of December 2007.

Water Resources

Watersheds

Topography delineates drainage basins called watersheds. The US Environmental Protection Agency (EPA) defines a watershed as "the area of land that catches rain and snow and drains or seeps into a marsh, stream, river, lake or groundwater" (USEPA, 2004).

Every river, stream, and tributary has an individual watershed. East Bethlehem Township is located within the Ohio River watershed, which has a drainage area of 3,487 square miles in Pennsylvania (United States Department of Interior, Geologic Survey). The Ohio River watershed is divided into five major sub-basins. The eastern and southern portion of Washington County is located in the Monongahela River sub-basin, which drains 7,386 square miles. In addition, the Monongahela sub-basin is divided even further. East Bethlehem Township is located in the Monongahela, Ten Mile Creek, and Two Mile Creek watersheds. Map 3.4: Water Resources shows the boundaries of the sub-watersheds, rivers, streams, wetlands, and floodplains located in East Bethlehem Township.

Rivers, Streams & Tributaries

There are numerous streams and tributaries and one river within East Bethlehem Township, all of which are classified by the Pennsylvania Department of Environmental Protection (PA DEP) as Warm Water Fisheries.

Monongahela River

The Monongahela River has a drainage area of 7.3 square miles and originates at the confluence of the West Fork River and the Tygart Valley River in Fairmount, West Virginia. At Pittsburgh it meets the Allegheny River to form the Ohio River. The Pennsylvania Department of Environmental Protection (PA DEP) has classified this river as a Warm Water Fishery (WWF). It is also protected under the Navigation (N) use, meaning that this type of stream is used for the commercial transfer and transport of persons and goods.

Monongahela River (Mackin, 2007)

The Monongahela River Conservation Plan (RCP) was completed in 1998. This plan addresses the stretch of river from the Mason-Dixon Line to where the river confluences with the Allegheny River to form the Ohio River. Management objectives were provided in the plan to assist in the future planning of the watershed. The following were key recommendations included in the RCP and are incorporated into this comprehensive plan:

- Coordinate with PADEP's Bureau of Abandoned Mine Reclamation to identify "problem area" abandoned mine sites within the study corridor for reclamation and funding prioritization.
- Investigate the potential for utilizing abandoned tipples and other structures as public fishing piers.
- Coordinate with local officials and private industry to enforce stormwater management regulations and erosion control methods.

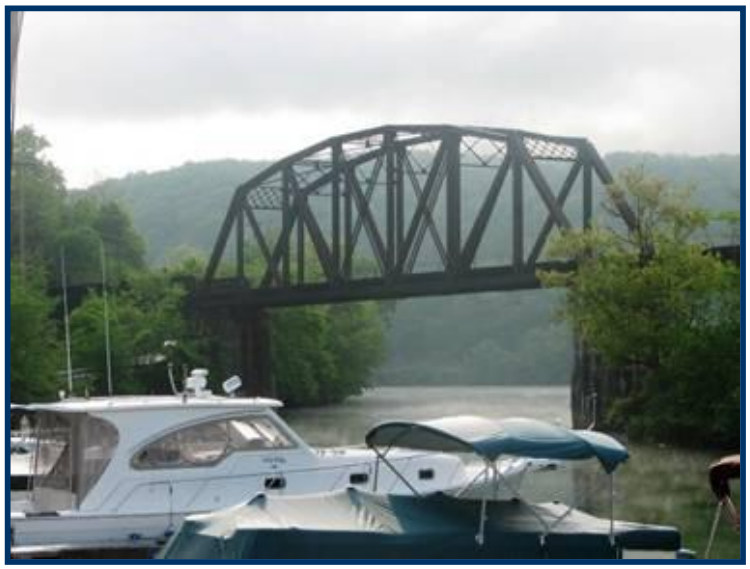
Ten Mile Creek

Ten Mile Creek flows through East Bethlehem Township and enters the Monongahela River. Ten Mile creek is classified by the PA DEP as a WWF. Ten Mile Creek serves as the border between Washington County and Greene County.

The portion of Ten Mile Creek in East Bethlehem Township is navigable and several marinas are located along the creek. The Greene County Conservation District has applied for funding to complete a Rivers Conservation Plan for the Ten Mile Creek Watershed, which includes locations within

Washington County. A Rivers Conservation Plan identifies significant natural, recreational and cultural resources and issues, concerns, and threats to river resources within the designated Project Area. Recommendations are then made to conserve and restore the river or stream (PA DCNR, 2007).

The Ten Mile Creek Watershed Conservancy was established to be the voice for the natural continuum of Ten Mile Creek and neighboring watersheds in Greene and Washington Counties (Ten Mile Creek Watershed, 2007). The conservancy provides environmental and educational services and has a long term riparian buffer planting project in Ten Mile Park in East Bethlehem Township to enhance the beauty and biological diversity of the Park. The Conservancy has stated that they would like to see abandoned mine land be used as riverside parkland.



Ten Mile Creek (Mackin, 2007)

Tributaries

Other streams in East Bethlehem Township include Barney's Run, Blackdog Run, and Fishpot Run.

Wetlands

Wetlands can be defined as transitional layers between terrestrial and aquatic environments where the water table often exists at or near the surface, or the land is inundated by water (Cowardin, Cater, Golet, La Roe, 1979). As such, wetlands frequently exhibit a combination of physical and

biological characteristics of each system. Three factors are recognized as criteria for wetland classification: the presence of hydric soils; inundation or saturated conditions during part of the growing season; and a dominance of water-loving vegetation (Environmental Laboratory, 1987). Wetlands serve many functions, including the passive treatment of acid mine drainage, sediment trapping, nutrient filtering, providing wildlife and aquatic habitat, and controlling floodplains.

The US Fish and Wildlife Service (USFWS) has developed a National Wetland Inventory (NWI) as directed by the Emergency Wetlands Resources Act of 1986. According to the NWI mapping, there are approximately 12 wetlands in the Project Area, totaling approximately 200 acres. Most of the wetlands are along the Monongahela River and Black Dog Run. Map 3.2 Water Resources illustrates the NWI wetlands within the study area. The NWI is not a complete record of all existing wetlands as it only identifies the largest wetlands that can be documented by aerial photography.

Floodplains/Floodways

Rivers and streams often have to carry more water than their channels can contain. The excess water spills onto adjacent lowlands, the floodplain, until the water volume decreases enough to be contained within the channel again. Statistically, flooding is expected to occur on an average of 1.5 years. Large, damaging floods occur once every 100 years, and truly devastating floods occur once every 500 years. Under natural conditions flooding is controlled by the landscape and weather, however human activities have been increasing the frequency of flooding. Where there once were forests, meadows, and wetlands with soils that absorbed much of the rainfall, there are now concrete highways, parking lots, and roofs with impervious surfaces that do not allow filtration. Higher storm water runoff leads to higher peak flows and higher flood levels. If rainfall is intense enough and the storm sewer system is inadequate, the runoff builds dramatically and causes flash flooding that can wash out roads, destroy property, and cause loss of life (Pittsburgh Geological Society, 2006).

Floodplains hold back storm flows and reduce destructive flooding downstream. In addition, they have very fertile

soils, providing for good cropland for agriculture and important tree shading for stream habitat. The location of floodplains in the Project Area is illustrated on Map 3.2: Water Resources.

Flood management and insurance rates are coordinated through the National Flood Insurance Program. This program, which was established by the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973, was an effort to reduce the damage and hazards associated with flood events. To accomplish these goals, FEMA conducts routine flood insurance studies, which investigate the severity and existence of flood hazards throughout the country. The results of these studies are then used to develop risk data that can be applied during land use planning and floodplain development.

In addition to the flood hazard data provided by FEMA, the National Weather Service (NWS) operates river forecast points at several locations along the River. River stage information is available through recorded messages, the NWS Internet site (www.nws.noaa.gov\er\pitt), and the National Oceanic and Atmospheric Administration (NOAA) weather radio. Army Corps of Engineers (ACOE) also maintains copies of FEMA studies and related flood hazard investigations. This information as well as other flood hazard assistance is available through the ACOE, Pittsburgh District Office.

Information concerning floodplains, flood insurance rates, and river forecast points is very important to the Project Area because of the occasional flooding of the Monongahela River and Ten Mile Creek. While flooding is not always severe, there have been high-water events that caused damage and loss of property.

The Election Day flood of 1985 was one of the most devastating floods to communities along the Monongahela River. The flood was caused by the development of Hurricane Juan in the Gulf of Mexico, which eventually brought heavy rainfall to Pennsylvania. The rainfall lasted over a six day period and totaled between five to ten inches in the Monongahela River valley. Not only were human possessions and structures destroyed but the navigation system along the Monongahela River was severely affected.

The Maxwell Locks and Dam, which is near East Bethlehem Township, had 18 barges trapped and the pool was lost for over a month. The loss of the pool affected four municipal water companies. However, there were able to operate by temporarily using floating pumps to obtain their raw water. This did affect riverside business as they were forced to close because of the short supply of water, flood damage, and loss of river navigation. Damages occurred to Fredericktown and the surrounding riverfront communities which lead to evacuations. Other floods that were significant was the 1964 flood caused by Hurricane Agnes and the 1994 flood caused by unusual wet weather. Damage to Fredericktown occurred during both of these floods.

Ecological Habitats/Environmental Sensitive Areas

The Western Pennsylvania Conservancy completed the Washington County National Heritage Inventory (NHI) in 2000, which is a database designed to catalogue various elements of the natural environment, such as plant, animal, and mineral resources. The NHI identifies and maps lands that support native species biodiversity; endangered species and their habitats; exceptional or unique plants and animals; areas important for wildlife habitat, open space, education, scientific study, and recreation; areas undisturbed by human activity; and, potential habitats for species of special concern. The data gathered in the NHI provides information that can be used to base decisions related to development and preservation. (WPC, 1994).

The classification of a Natural Heritage Area is based upon the ecological value of that particular site and the particular attributes of identified resources. The Washington County NHI categorizes five classifications of Natural Heritage Areas and suggests development restraints: Biological Diversity Area (BDA), Natural Areas (NA), Dedicated Area (DA), and Other Heritage Areas (OHA). There are two BDA's in the Project Area; Lower Ten Mile Creek BDA and Black Dog Hollow BDA. BDA's are shown on Map 3.4: Natural Areas.

Black Dog Hollow BDA

Black Dog Hollow BDA is a dry-mesic calcareous forest community containing numerous rock outcroppings and unusual species for Washington County. The cliffs and outcrops within the BDA are likely a conglomeration of sandstone, siltstone and limestone layers. Threats to this BDA include off road vehicle trails and several small

dumpsites. The NHI recommends that no futher development should occur within the BDA and that vegetation on the uplands not be cut or removed. The NHI also recommends that all areas now covered by young forest be permitted to mature without disturbance and all but passive activities should be excluded from the slopes.

Lower Ten Mike Creek Valley BDA

The Lower Ten Mile Creek BDA is a Community/Ecosystem Conservation Area, a High Diversity Area, and a Special Species Habitat. The BDA contains an extensive section of creek valley containing a number of natural communities and a large population of an endangered plant in Pennsylvania. The NHI recommends that the large upland buffers be created to protect the BDA, that no herbicides are used, and that the use of heavy equipment be avoided within the BDA.

Environmental Concerns

Water Quality

The quality of water in streams, rivers, lakes, ponds, and groundwater is important because it directly impacts the biological, physical, and chemical processes that take place in these waters directly. Any impacts in one watershed can impact waters in another watershed. Human impacts are in one of two forms of pollution– point source and non-point source.

Under Section 303(d) of the Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters (US EPA, 2004). This section requires that these jurisdictions establish priority rankings for waters on the lists and develop Total Maximum Daily Loads (TMDLs) for these waters. The total maximum daily load (TMDL) identifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and allocates pollutant loadings among point and non-point pollutant sources. TMDLs address sediments to meet water quality standards and control quality problems. High concentrations of sediment will negatively impact aquatic life and fisheries, cause taste and odor problems for human consumption, and reduce the effectiveness of water treatment systems. Best management practices on

agricultural lands and at development sites can reduce the TMDL and sediment concerns that affect areas of the project area. The Monongahela River has TMDLs for two pollutants-Chlordane and PCBs. Chlordane was used from 1948 until 1988 in the United States as a pesticide; it bioaccumulates and is a persistent chemical (>20 years). PCBs are manmade chemicals that were used in transformers, paints, adhesives, caulking compounds, some filters and carbonless copy paper.

The DEP protects three stream water uses: aquatic life; human health, and recreation. If a stream segment is not attaining any one of its three uses, it is considered impaired.

- Aquatic Life use attainment– The integrity reflected in any component of the biological community. (i.e. fish or fish food organisms)
- Human Health use attainment- The risk posed to people by the consumption of aquatic organisms (ex. Fish, shellfish, frogs, turtles, crayfish, etc.) or the ingestion of drinking water.

Black Dog Run, Fishpot Run, and Ten Mile Creek all support aquatic life according to PA DEP's eMap online service. Barney's Run is impaired for aquatic life use due to agriculture and road runoff.

Point Source Pollutants

Point source pollutants are easily identified and can be traced directly to their source. Point source pollutants are usually:

- Industrial discharges
- Municipal discharges
- Stormwater discharges
- Combined sewer overflow discharges
- Concentrated animal feeding operations

All point source pollutants require a National Pollutant Discharge Elimination System (NPDES) permit, established by Section 402 of the 1972 Clean Water Act. According to the EPA's Envirofacts website (EPA, 2004), two facilities have been issued NPDES permits in the Project Area; Engles Holiday Harbor and East Bethlehem Township Municipal

Authority.

The NPDES permit limits what a facility can discharge, monitoring and reporting requirements and contains other provisions to ensure that the discharge does not hurt water quality or people's health (EPA, 2007).

Non-Point Source Pollutants

Non-point source pollution comes from many different sources and is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human made pollutants, depositing them into lakes, rivers, wetlands and underground sources of drinking water (EPA, 2007). The following are a list of some non-point source pollutants:

- Excessive fertilizer and pesticide use
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems
- Sediment from improperly managed construction sites
- Oil, grease, and toxic chemicals from urban runoff

Hazardous Waste Sites

An inventory of hazardous and toxic waste sites was conduced using the US Environmental Protection Agency's (US EPA) Right-to-Know Network database (US EPA, 2007). The query system identifies waste management facilities listed within the following regulatory databases:

CERCLIS Sites

The CERCLIS database provides listings of regulated hazardous waste sites only with the federal environmental legislation related to these sites. Using a CERCLIS query, no Pennsylvania Superfund Site's were found currently existing in the Township. However, the Clyde Mine was listed on the Superfund List on June 1, 1981 due to contamination of lead. The site clean-up was completed on October 1, 1984.

Illegal Dumping/Littering

Littering and unregulated dumping of refuse at non-permitted sites has been identified as a county-wide issue for Washington County. (Washington County Comprehensive Plan 2005) Illegal dumping often occurs in

remote areas, it may not be readily recognized as an environmental hazard.

Littering has significant environmental, economical, and aesthetic impacts to an area. Both the aquatic and terrestrial environments are affected by both physical and chemical littering. Water pollution results from the improper or illegal disposal of chemicals. Littering impacts a community economically by increasing the cost to the taxpayer. Cleaning up litter is approximately nine times more expensive than collecting trash from trash receptacles (PA DEP, 2004). Trash could also potentially reduce property value in a community. The presence of litter has a negative impact on the aesthetic value of a community and can reduce the quality of life for some individuals.

Illegal Dump Site (Mackin, 2007)

Littering has been identified as a problem in Fishpot Run Area, portions of Black Dog Hollow, Fredericktown Hill, and Vestaburg Hill. DEP has held clean-ups of certain sites with the help of local sponsor.

Pennsylvania CleanWays is a non-profit organization that assists communities with identifying and cleaning illegal dumpsites along with maintaining sites that have been part of past clean-up efforts. PA CleanWays is similar to the Adopt-A-Highway program, but focuses on debris sites along non-state roads and adjacent areas. Around 20 local chapters (most county-wide) exist within the Commonwealth; however, Washington County does not have its own chapter. The closest local chapters would be the Fayette County Chapter and the Greene County Affiliate Chapter.

Natural Resources Action Items

Goal: Reclaim existing gob pile in Milfred Terrace

Objective: Establish a liaison to the Washington County Redevelopment Authority, County Planning Commission and other organizations who would coordinate remediation efforts on behalf of the Township.

Objective: Contact the Nemacolin Power Plant regarding their interest to remove the spoils for their use.

Objective: Prepare a feasibility for the site, which would outline specific next steps, responsible parties, and funding for ongoing remediation of the site. Pending the completion of a sound strategic strategy and planned remediation, a Master Site plan should be completed to determine the best use of the land and ensure the compatibility of future development with that of the surrounding neighborhood.

Goal: Maintain the project area free of litter and dumping

Objective: Continue volunteer efforts for trash removal or land stewardship program to clean and preserve the creeks and other natural areas.

Objective: Work with PennDOT to remove litter from roadways by developing a "Keep PA Beautiful" program for the Project Area.

Objective: Implement a volunteer effort for trash pick-up and designate community clean up days.

Objective: Enact and enforce an ordinance that imposes fines for illegal dumping and littering.

Objective: Identify areas in the community to place trash receptacles. Specific locations should include areas with a more dense population.