2.0 Project Background

This section of the project plan discusses the City's, its wastewater and landfill utilities, the economic and environmental context for the project, and areas for improvement in these utilities that are addressed by the proposed project.

2.1 Study Area Characteristics

2.1.1 Delineation of the Study Area

The study area includes the area served by the City's Waste Water Treatment Plant. This area includes the City of Midland within its city limits. This area is shown on the map in Appendix A. No changes to the area served by the Waste Water Treatment Plant are proposed in this project.

2.1.2 Land Use in the Study Area

Land use within the City of Midland city limits includes single- and multi-family residences, commercial developments, industrial facilities, parks, and agricultural land. The specific distribution of these uses is shown in the City's existing land use map and zoning map (Appendix A). No changes to the future land use or the potential for future development are proposed in this project. The future land use map for the City is attached in Appendix A.

2.1.3 Surface and Ground Waters

The Tittabawassee River flows through the City. It is a major tributary of the Saginaw River which flows into Lake Huron via Saginaw Bay. No points where water is withdrawn for public water supply are known. The City is supplied water by two intakes located in Saginaw Bay.

The Tittabawassee River receives discharge from several municipal, industrial, and agricultural sources. Effluent from the City's Waste Water Treatment Plant is discharged to the Tittabawassee River. Runnoff from nearby farms that utilize waste water treatment plant sludge as a soil amendment also enters the Tittabawassee River.

2.2 Economic Characteristics

The latest available census data (year 2000) on selected economic indicators are provided below for the City in Table 2-1. Figure 2-1 shows the projected population growth for the City.

Table 2-1. City of Midland Employment Data

Employed Civilian Population 16 Years and Over		
Industry	**Number**	**Percent**
Agriculture, forestry, fishing and hunting, and mining	56	0.2
Construction	1,272	5.4
Manufacturing	6,196	26.5
Wholesale trade	552	2.4
Retail trade	2,274	9.7
Transportation and warehousing, and utilities	564	2.4
Information	577	2.5
Finance, insurance, real estate, and rental and leasing	890	3.8
Professional, scientific, management, administrative, and waste management services	1,693	7.2
Educational, health and social services	5,605	24
Arts, entertainment, recreation, accommodation and food services	2,032	8.7
Other services (except public administration)	1,084	4.6
Public administration	582	2.5

Unemployment Rate	**Number**	**Percent**
Unemployed civilian labor force	1,062	4.3

Median household income	**Dollars**
Median household income	47,377

Source: U.S. Census, 2000

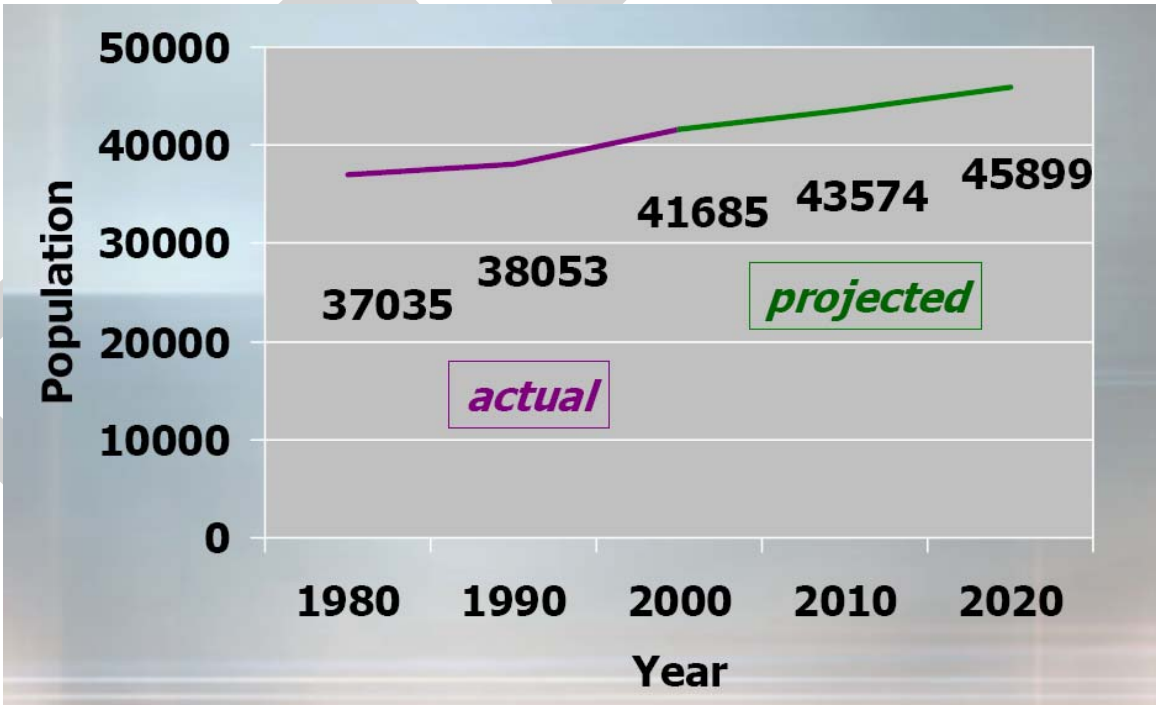

Figure 2-1. Projected City of Midland Population Growth (Source: Midland City Council Community Roundtable Discussions January 10 – 13, 2005)

Manufacturing is the dominant industry in the City. According to the City's Master Plan (2007), Midland has experienced overall growth in jobs from 1990 to 2000, but has seen a decline in the manufacturing sector. This decline is part of the regional trend that includes departure of jobs to overseas operations, increased efficiency, and other changes. In general, service sector employment has grown while manufacturing sector employment has decreased. The master plan projects continued growth in the next 20 years as a result of this trend and other development strategies.

The current Waste Water Treatment Plant is capable of treating up to 18 million gallons of wastewater per day. Current usage is between 5 and 7 million gallons per day. Therefore, due to the current operational capacity and the magnitude of the projected growth, this project plan does not envision any expansion of waste water treatment plant operation to meet the demands resulting from this growth.

2.3 Existing Facilities

2.3.1 Sanitary Sewer System

The City maintains nearly 195 miles of sanitary sewer, ranging in size from 6 to 48 inches in diameter, and 41 pump stations, with capacities ranging from 20 to 5,500 gallons per minute.

2.3.2 Stormwater Sewer System

The City's storm water collection system is separate from the sanitary sewer system and is constructed primarily under city streets, with some areas in the city utilizing ditches and streams for water runoff. There are approximately 170 miles of storm sewer pipe in the City's storm water collection system. The City's storm water system collects precipitation runoff from rooftops, streets, yards and parking lots and discharges it to local rivers, streams and drains. Footing drains servicing homes and other buildings constructed after 1987 are also connected to the City's storm sewer system.

Water that is collected through the City's system is conveyed to the Tittabawassee River. The City's storm water collection system is made up of three major drainage basins identified by the location of their respective outfall. These basins are the Sturgeon Creek Basin, the Snake Creek Basin and the George Street Basin.

2.3.3 Waste Water Treatment Plant (WWTP)

The City's Waste Water Treatment Plant (WWTP) is located at 2125 Austin Street, Midland, Michigan. The WWTP recycles wastewater that has been discharged into the City's sanitary sewer system. The recycling process involves physical and biological

processes that remove waste products from the water before it is discharged into the waters of the State of Michigan. Midland's Wastewater Treatment Plant is capable of treating up to 18 million gallons of wastewater a day, though on average, the plant treats 5 to 7 million gallons each day. The City has been issued a permit to discharge clean, recycled water to the Tittabawassee River.

The City's treatment plant has two separate biological treatment systems. Any bacteria that remain after these biological treatment phases are killed by chlorine gas that is injected into the water in the next phase of the treatment process. In the last treatment phase, water is dechlorinated using sodium bisulfite. The final product is then discharged to the Tittabawassee River.

Sludge that settles out during and after these treatment phases is pumped to a digester system, which stabilizes the sludge. The resulting product is called biosolids, which is currently hauled to local farm fields for spreading as a nutrient-rich soil amendment. During winter months, or when adverse weather prevents this practice, sludge is dewatered and disposed in the landfill, either through direct placement in the solid waste or as a nutrient addition to compost. The City recycles approximately 3.5 million gallons of biosolids each year.

The City WWTP also accepts residential septic waste and similar liquid wastes at its hauled waste disposal site. The hauled waste disposal site is a necessary appurtenance of the City's Wastewater Treatment Plant. The treatment plant was constructed and is operated and maintained as a service to City residents. The City has extended use of the hauled waste disposal site to the remainder of Midland County as a courtesy to its neighbors and to better ensure the environmentally sound disposal of residential septic tank waste generated within Midland County. The Midland WWTP facility only accepts domestic septage such as from home septic tanks, recreational vehicles, portable toilets and type III marine sanitation devices. All other types of septage are not allowed (such as food establishment septage, grease interceptor, etc.). Disposing of these types of septage is punishable by law.

2.3.4 Water Treatment Plant (WTP)

The Water Treatment Plant (WTP) is located at 2607 Bay City Road., Midland, Michigan. The City water system aims at continuous production of an adequate supply of safe, high-quality waters for public and industrial demands. The City water system operates under oversight from EPA and MDEQ under the U.S. Safe Drinking Water Act of 1974 and the Michigan Safe Drinking Water Act 1976 PA 399.

Raw water from Lake Huron is purchased from the Saginaw-Midland Municipal Water Supply Corporation pipeline. The pipeline corporation is jointly owned by the cities of Midland and Saginaw. The WTP is capable of producing 48 million gallons a day of high quality water from this supply. Chemicals are added to the raw water at the Water

Plant as part of the purification and disinfection processes. These processes include coagulation, clarification and filtration. Operators at the water plant monitor water quality in "real time" 24 hours a day, 365 days a year. Over 100,000 tests are performed each year by the laboratory, before, during and after treatment to assure that the water meets or exceeds all the requirements of Federal and State regulations for safe drinking water. The plant maintenance team is responsible for ensuring the reliability of all the electrical and mechanical systems for the treatment and delivery of the water. Water is stored in both elevated and underground facilities located throughout the water system to meet our customers' needs.

Finished water is distributed through separate transmission systems to both the City's general population (domestic flow) and industrial customers at Dow Michigan Division and Dow Corning. The water transmission and distribution system is comprised of over 312 miles of water main, providing water for fire protection, business, industry and individual customers in the City of Midland, Homer Township, Larkin Township, Midland Township, Mills Township, Water District #1 of Midland County and the City of Auburn. Water system distribution crews provide for the integrity of this delivery system with emergency water main repair, valve operation, elevated storage inspection and cleaning, hydrant inspections and meter reading and maintenance. The Distribution staff also administers the City's Cross Connection Control Program to protect the system from back flow potential.

2.3.5 City of Midland Sanitary Landfill

The City of Midland Sanitary Landfill (CML) is a MDEQ-licensed solid waste disposal facility located at 4311 East Ashman Street, Midland Michigan. The CML provides an environmentally responsible and regulatory-compliant waste disposal site for Midland County residents and businesses. Waste reduction efforts are promoted through educational tours and on-site recycling and composting. In addition, new technologies are encouraged in an effort to prolong site life through the efficient operation of the landfill.

The CML site consists of approximately 329 acres, and is separated into two "units." The South Unit is further separated into "Area A' and Cells 1-13. The CML began accepting waste in Area A of the South Unit in the 1960's. Area A was certified closed on January 15, 1993. Cells 1-13, which cover approximately 40.2 acres, accepted waste from 1975 to 1998, and are now also closed.

The North Unit encompasses approximately 66.5 acres, and consists of Cells 14-19; of which Cells 14, 15 and 16 have been constructed. Waste filling began in Cell 14 in 1998, and is currently occurring in Cells 14 through 16. Cells 14-19 were designed with a composite base liner and leachate collection system.

Cells 1-8 have approximately 569,668 tons of waste in place, Cells 9-13 have approximately 570,442 tons of waste in place, and Cells 14-16 have approximately

1,500,000 tons of waste in place. Cells 14-19 have a design capacity of approximately 11,850,000 tons of waste. At the current average waste-filling rate, Cells 14-19 will be full by about 2077. However, the exact closure date will depend largely on actual refuse acceptance rates.

As part of the natural decomposition process, the solid waste within the landfill generates landfill gas, a combination of methane, carbon dioxide, and a small concentration of other chemical compounds. The rate of landfill gas generation depends on the rate of waste decomposition, which is controlled by several biological factors, including available water and nutrients, temperature, and pH. Currently the landfill follows modern landfilling practices and does not control these biological factors directly. Landfill gas, when emitted to the atmosphere, is considered a nuisance. However, it can be captured and destroyed by burning. As an alternative disposal method, the methane content of the gas can be harnessed as an alternative energy resource.

Another key element of the environmental protections implemented by the landfill is the collection of leachate – liquid that percolates from the waste due to infiltrating rainwater and waste decomposition. Until the waste is completely stabilized through biological decomposition, the compounds present in leachate have the potential to contaminate the groundwater if they escape the landfill. The City prevents this escape through the landfill's composite baseliner system – a barrier to liquid infiltration. This leachate is safely disposed through treatment in the City's WWTP. Thus, the landfill and the WWTP rely on each other for the environmentally-safe treatment and disposal of wastewater.

2.4 Need for the Project

2.4.1 Compliance Status

The Landfill will be required by the Michigan DEQ to install and operate an active gas collection system to collect landfill gas generated by the decomposition of waste and waste water treatment plant sludge.

The City of Midland is a "Class A" sewage treatment plant and has been issued a National Pollution Discharge Elimination System (NPDES) Permit by the EPA and MDEQ. This permit can be found in Appendix B. The treatment plant has a design capacity of 10.0 million gallons a day (MGD) and a hydraulic capacity of 18.0 MGD. Samples are collected each shift and analyzed daily by the operational staff in the wastewater laboratory. Process adjustments for each phase of treatment are made based on the analytical results in comparison to permit limitation of each pollutant. Daily reports are generated and compiled into a monthly operating report which is submitted to the State of Michigan.

Sludge is a waste product that is generated from solids removed during the cleaning of the wastewater. It is stabilized through a biological process referred to as anaerobic digestion. In this process microorganisms destroy pathogens and viruses while reducing the volatile content, creating a safe recyclable product called biosolids.

The City is authorized to land apply bulk biosolids or prepare bulk biosolids for land application in accordance with the requirements established in R323.2401 through R323.2418 of the Michigan Administrative Code (Part 24 Rules). The City has developed and implemented a Residuals Management Program (RMP) which complies with the requirements of the Part 24 Rules. The WWTP conducts its residual disposal activities in accordance with Part II.D.7. of its permit.

2.4.2 Orders

There are no outstanding orders concerning the City of Midland Waste Water Treatment Plant of the CML.

2.4.3 Water Quality Problems

Wastewater treatment operations at the WWTP as well as pump station operation throughout the city depend on the continuous supply of electricity. During normal operation of the electric distribution grid, this electricity is supplied by an outside utility. In the event of power outage, WWTP and pump station operation is interrupted, creating the potential for sewage overflows into local surface waters.

According to the U.S. Department of Energy, more than 60% of the electricity generated in Michigan is produced by burning coal, a non-renewable resource. Coal-burning powerplants contribute to water pollution through the release of Nitrogen Oxides (NOx), Sulfur Oxides (SOx), mercury, and other pollutants.

Development of a green, alternative energy source for the WWTP will address both of these water quality problems.

During the winter months, the City of Midland must dry and store its sludge. The dewatering equipment at the WWTP poses a risk of fugitive sludge release due to the operation of the current equipment. Furthermore, the process of drying, storing, transporting, and spreading the sludge creates multiple opportunities for sludge to create polluted runoff that increases the nutrient loadings of local surface waters. The City would like to reduce this potential by implementing alternative beneficial end uses that decrease these risks.

Since 1998, the North Unit of the CML has been operating according to the latest solid waste regulations, including the construction of composite-lined waste containment cells,

installation of leachate collection system, use of daily cover, and diversion of stormwater using intermediate cover and diversions channels. The combined effect of these modern waste management practices is the creation of a "dry tomb" landfill, where the interaction of water and nutrients with the waste is minimized and, hence, the biological decomposition of the waste is similarly reduced. The arresting of biological decomposition leads to a longer time for the solid waste contained in the landfill to stabilize, meaning that it will continue to degrade and release leachate that could threaten surface and ground water quality. This process can take longer than 50 years to resolve. By reintroducing liquids and solid nutrients to the landfill, the biological decomposition process can be accelerated, stabilizing waste faster, and decreasing future water quality problems.

2.4.4 Projected Needs for the Next 20 Years

The size of the landfill will continue to grow during the next 20 years as part of the on-going placement of solid waste. As a result, the volume of leachate generated by the landfill will also continue to grow. The current excess treatment capacity of the WWTP is sufficient to meet this demand. However, the energy consumption of the WWTP will continue to increase with this growth. Therefore, the demand for green, renewable energy will also continue to grow.

2.4.5 Future Environment without the Proposed Project

Without improvement of the WWTP sludge disposal system, the potential for pollution of local surface waters will continue to increase.

Without implementation of backup electricity generation capabilities at the WWTP and WTP, the residents of the City are at risk of exposure to releases of untreated sewage and loss of water supply.

Finally, by not tapping this available green energy resource, the City will continue to rely on non-renewable resources and waste this opportunity to reduce the nation's emission, water pollution, and resource depletion associated with traditional energy sources.

2.5 Population Data

2.5.1 Existing Population

According to the 2000 U.S. Census, the population of the City is 49,387.

2.5.2 Population served by existing facilities

The City WWTP serves the residents of the City of Midland. The landfill and the septage receiving facility at the WWTP serve the residents of Midland County. According to the 2000 U.S. Census, the total population of Midland County is 82,874.

2.5.3 Current and Future Population to be Served by the Proposed Project

The proposed Integrated Utility Improvements target existing wastewater facilities. Therefore, no changes to the population served by existing facilities is proposed in this project plan.

2.5.4 Population Projections for the Study Area for the Next 5, 10, and 20 Years

The trend of the expected population growth rate is illustrated in Figure 2-1. Current wastewater facilities have sufficient capacity to service this growth rate. However, future growth will increase the economic and environmental benefits from implementing the proposed utility improvements.

2.6 Environmental Setting

2.6.1 Cultural Resources

The proposed project minimizes the potential impact on local cultural resources by limiting construction activities to existing property, rights-of-way, and easements in use for infrastructure and utility purposes within the City. Furthermore, the City has completed a visual survey of the proposed project site to confirm that no cultural resources are present near the project site. This effort is documented in the Historical Review and Application for Section 106 Review, included in Appendix C. This document was forwarded to the State Historic Preservation Office (SHPO) for review.

2.6.2 The Natural Environment

Climate

The climate of the City is primarily a construction concern. Therefore, the City plans to implement several construction measures to ensure the successful construction of the proposed project within the constraints of the climate. For example, pipe burial depths, footing elevations, and other infrastructure will be located according to local building code requirements addressing frost. Seasonal rainfall and runoff will be addressed through construction stormwater management. The proposed building will be structurally and environmentally sized to conform to the demands of central Michigan weather.

Air Quality

The air quality of the City of Midland will be improved through the implementation of the proposed landfill gas collection and control system discussed in the following report sections. The potential noise generated by the proposed alternative energy facility will be mitigated through noise control measures integral to the proposed system.

Wetlands

A map of the wetlands within the study area is included in Figure 5. However, the area of the proposed improvements does not include any wetlands.

Coastal Zones

No coastal zones (Great Lakes shorelands) occur within the study area.

Floodplains

A map of the floodplains within the study area is included in Figure 6. However, the area of the proposed improvements does not include any floodplains.

Natural or Wild and Scenic Rivers

No rivers designated for protection are impacted by the proposed utility improvements.

Major Surface Waters

The Tittabawassee River flows through the City of Midland as shown in Figure 1. It is a major tributary of the Saginaw River which flows into Lake Huron via Saginaw Bay. Effluent from the City Waste Water Treatment Plant is discharged to the Tittabawassee River. Runnoff from nearby farms that utilize waste water treatment plant sludge as a soil amendment also enters the Tittabawassee River. The project plan will potentially improve the quality of this surface water by reducing potential runoff from agricultural lands treated with these biosolids.

Recreational Facilities

The City maintains several recreational facilities. These facilities are included in the lands denoted "COM – Community" in the zoning map in Figure 3. No changes to these facilities are proposed in this project plan.

Topography

The topography of the study area is illustrated by the USGS topo map shown in Figure 1.

Geology and Soils

The regional geology is characterized by approximately 400-600 feet of glacial deposits overlying approximately 14,000 feet of sedimentary bedrock known as the Michigan Basin. Previous studies completed for the City have classified the regional geology and the unconsolidated sediments, above the bedrock, as characteristic of repeated glacial advance and retreat across the area. Over geologic time, deep channels were eroded into the bedrock and subsequently filled with coarse-grained, inter-bedded fluvial sediments. Planar to gently sloping glacial till deposits on the bedrock/fluvial sediment surface resulted from deposition by retreating glaciers followed by compaction and erosion by the next advancing glacial episode. The glacial till of the area is characterized by clay, silt, sand and gravel, and boulder-sized materials, which is typically unsorted (1995 Hydrogeologic Report, City of Midland Landfill).

The 1982 Quaternary Geology of Michigan, prepared by W.R. Farrand at the University of Michigan and the Department of Environmental Quality, Geological Survey Division, classified the unconsolidated material in the area as gray, grayish brown or reddish brown, non-sorted glacial debris. The matrix is comprised dominantly of clay, clay loam, or silty clay loam textured material, with variable amounts of cobbles and boulders. End moraines of fine-texture glacial till occur in narrow linear belts of hummocky relief marking the former till-stands of the ice-sheet margins. These areas include small ground

moraines, as well as outwash deposits. The thickness of the end moraines tend to be somewhat greater than the adjacent ground moraine areas.

In general, this geology is conducive to the construction proposed in this project plan. The proposed construction takes place completely on or within the glacial deposits discussed, which are consistently located throughout the entire project site. Furthermore, the proposed construction is similar to previous construction on the site and utilizes previously developed infrastructure, ensuring that construction is feasible in this setting. As part of the construction quality assurance to be implemented during construction, construction inspectors will monitor foundation conditions for new buildings and pipelines to avoid potential problems interfacing with the local geology.

Agricultural Resources

All lands to be included in the proposed construction activity are currently used for industrial, utility, landfill, or other infrastructure. Therefore, no disturbance to farmlands is proposed.

Fauna and Flora

The City has completed a review of the habitat and the potential presence of threatened or endangered species in the proposed project site. As noted in the inspection of the project site documented in Appendix C for the SHPO review, no environmentally-sensitive habitat was located on the project site. A review to determine if any threatened or endangered species are present was also completed and is documented in Appendix C in a letter to the MDNR Wildlife Division. This review found no threatened or endangered species on the project site.

Unique Features

All lands to be included in the proposed construction activity are currently used for industrial, utility, landfill, or other infrastructure. Therefore, no disturbance to unique features is proposed.