

**FORM EQP 5111 ATTACHMENT TEMPLATE B4
ENVIRONMENTAL ASSESSMENT**

This document is an attachment to the Michigan Department of Environment, Great Lakes, and Energy's (EGLE) *Instructions for Completing Form EQP 5111, Operating License Application Form for Hazardous Waste Treatment, Storage, and Disposal Facilities*. See Form EQP 5111 for details on how to use this attachment.

The administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451) §324.11118(3) and R 299.9504(1)(e) and R 299.9504(1)(b) establish requirements for conducting environmental assessments at hazardous waste management facilities. Before receiving an operating license, owners and operators of hazardous waste treatment, storage, or disposal facilities must evaluate the (proposed) facility's impact on air, water, or other natural resources of the state. The evaluation must also include a failure mode assessment. All references to 40 CFR citations specified herein are adopted by reference in R 299.11003.

This license application template addresses requirements for an environmental assessment for hazardous waste management units at the Dow Michigan Operations Facility which consists of the Midland Plant facility and the Salzburg Landfill facility.

INTRODUCTION

B4.A CURRENT CONDITIONS

B4.A.1 Facility Description

B4.A.2 Description of Existing Environmental Conditions

B4.A.2(a) Climate

B4.A.2(b) Topography

B4.A.2(c) Geology

B4.A.2(d) Soils

B4.A.2(e) Hydrology

B4.A.2(f) Land Use and Zoning

B4.A.2(g) Historical or Archaeological Resources

B4.A.2(h) Social Environment

B4.A.2(h)(i) Demographics

B4.A.2(h)(ii) Infrastructure

B4.A.2(i) Transportation

B4.A.2(j) Air Quality

B4.A.2(k) Noise

B4.A.2(l) Appearance and Aesthetics

B4.A.2(m) Terrestrial Ecosystem

B4.A.2(m)(i) Flora

B4.A.2(m)(ii) Fauna

B4.A.2(m)(iii) Rare or Endangered Species

B4.A.2(m)(iv) Critical Habitat

B4.A.2(n) Aquatic Ecosystem

B4.A.2(n)(i) Flora

B4.A.2(n)(ii) Fauna

B4.A.2(n)(iii) Rare or Endangered Species

B4.A.2(n)(iv) Critical Habitat

- B4.B ENVIRONMENTAL IMPACTS OF (PROPOSED) FACILITY
- B4.C EXPOSURE INFORMATION REPORT FOR LANDFILLS AND SURFACE IMPOUNDMENTS
- B4.D EVALUATION OF ALTERNATIVE HAZARDOUS WASTE MANAGEMENT TECHNIQUES

Figures

- Figure B4-1 Wind Rose
- Figure B4-2 Land Use Areas
- Figure B4-3 City of Midland Zoning (Area Surrounding Dow Michigan Operations)
- Figure B4-4 Aerial Photograph
- Figure B4-5 Vegetation and Habitat for Surrounding Area

INTRODUCTION

This environmental assessment for *the Dow Michigan Operations Midland Plant & Salzburg Landfill facilities, which will be called the "Facilities" throughout the remainder of this document,* describes current conditions, environmental impacts, and applicable exposure information for landfills and surface impoundments. The goals of the environmental assessment are to describe and discuss (1) the probable impact of the facility on natural resources, human life, and all environmental elements that affect these values; (2) probable unavoidable adverse effects of the facility; (3) alternatives for accomplishing the same objective; and (4) possible modifications that would minimize adverse effects.

B4.A CURRENT CONDITIONS

B4.A.1 Facility Description

The Dow Michigan Operations Midland Plant Facility is located at 1790 Building, Washington Street, Midland County, Midland, Michigan (southern portion of the City of Midland in Section 26 of Midland Township: Township 14N, Range 2E) and the adjacent Salzburg Landfill Facility is located at 2314 Salzburg Road, City of Midland, Midland County, Michigan (southern portion of the City of Midland in Section 35 of Midland Township: Township 14N, Range 2E). The Salzburg Landfill Facility (SLF) is located at 2314 Salzburg Road, City of Midland, Midland County, Michigan (southern portion of the City of Midland in Section 35 of Midland Township: Township 14N, Range 2E). The SLF covers 152 acres and is designed for disposal of hazardous waste. Cells 1-19 and 38-43 have been constructed and filled with waste followed by subsequent closure. Three landfill cells, designated as Cells 20, 21, and 22, have been constructed and filled with waste and are scheduled to be closed in 2016. Four landfill cells, designated as Cells 23, 24, 25, and 26, are currently in use. The RCRA Part A Facility Map

(Drawing B2-010-927122 – RCRA PART A FACILITY MAP) shows the general location of the site and the area immediately surrounding the SLF. The location of the SLF in relation to the Midland Plant site waste management units are also provided on this map. Module A1 (General Facility Description) provides a detailed description of the facilities and the wastes managed are discussed in Module A2 (Chemical and Physical Analyses).

Virtually the entire site has been disturbed by human activities. The total area within the SLF fence is approximately 130 acres. Most of this area is given to capped or active disposal cells. A tall soil berm surrounds the landfill and provides a visual screen.

B4.A.2 Description of Existing Environmental Conditions

A description of existing environmental conditions at the facilities and any surrounding areas that may be affected by the facilities is included in this section. Detailed information that is provided in other attachment templates is not repeated here; however, references to appropriate attachment templates are provided. Maps, photographs, and other relevant information that are not included in other templates are included in this section. Important ecological relationships, functions, and interdependence of physical environmental elements and social and economic elements are discussed. Factual information from publications, reports, or personal communications is documented, with sources cited.

B4.A.2(a) Climate

The area is characterized by a continental climate regime, with winter temperatures cold enough to sustain stable snow cover and relatively warm summer temperatures. The minimum average temperature is 29.5°F (January), and the maximum average temperature is 82.2°F (July). Between 1991 - 2020, the Midland area average monthly precipitation ranged between 1.8 inches (February) and 3.9 inches (August), with an annual average of 31.7 inches (National Oceanic and Atmospheric Administration [NOAA], 2024).

According to annual measurements recorded in Midland from 1991 - 2020, the average seasonal snowfall between October and April was 40 inches. The average monthly snowfall in January is 13.9 inches, with similar average snowfall in December (11.8 inches) and February (11.4 inches) (NOAA, 2024).

Wind direction is predominantly from the west-southwest (that is, toward the east-northeast), regardless of season. Wind velocity peaks during February and March and is lowest during July. A wind rose depicting predominant wind direction and velocity for the area is included as Figure B4-1. The data used to develop the wind rose were obtained for the years 2019 through 2023 from a meteorological station located at Saginaw MBS International Airport.

B4.A.2(b) Topography

Drawings B2-001 thru 005-927122 illustrate the topography of the area. Due to the glacial history of Midland County, the resulting features left little topographic relief. Surface elevation varies in the county about 120 feet from the southeast to the northwest. Midland County's topographic profile indicates a shallow valley generally following the Tittabawassee River.

The plant site is generally flat. Localized highs and lows are present with the highest ground elevations at the northern end of the total site. The Tittabawassee River bisects the plant, and the majority of the site is northeast of the river. The topography of this plant site is not affected by current waste management operations but some capped historical waste disposal areas provide localized higher elevations. Engineered sewer systems, drainage and grading provide proper storm water management.

Salzburg Landfill generally slopes to the north and south with the east-west Center Road the drainage divide, averaging approximately 5 feet of elevation difference between the road and the fence line. The area north of this divide drains to Lingle Drain, and the area to the south drains southeast to two unnamed drains that flow directly to the Tittabawassee River.

Current and historical waste disposal areas provide localized highs and lows within the landfill. The highest elevation is approximately 650 feet (USGS Datum), located on capped Cells 20- 22. The lowest elevation is about 598 feet and occurs in active cells 23-26.

B4.A.2(c) Geology

There are four functional geologic units at the Facilities: Surface Soils and Fills; Regional Aquitard; Regional Aquifer and Bedrock. A summary of each of these units is provided below. For more detailed information, see Attachment XIV.B3, Hydrogeological Report.

Surface Soils and Fills

The upper five to twenty feet generally includes surface soils and fills. This unit is variable over the south Midland area and is commonly found as a veneer over the underlying clay aquitard. At the Facilities, portions of this unit can be natural, however typically fill is present above the natural soils. Fills are highly variable in thickness and composition. Former waste management units at the plant site were historically constructed within this geologic unit, extending to the aquitard that underlies it. Where natural soils are present underneath fills, they generally are stratified sands and silts with some thin layers of clay.

The Surface Sand is the strata primarily affected by human use of the site, with the greatest risk of potential contamination by historical activities. The shallow sand, along with any fill materials, is the target of the majority of engineered corrective actions at Michigan Operations.

Regional Aquitard

The Regional Aquitard Unit is composed of two sub-units: Lakebed Clay and Till with a hydraulic conductivity ranging roughly from 1×10^{-6} to 1×10^{-9} cm/sec. The Lakebed Clay is a lake bottom sedimentary deposit from a late pleistocene pro-glacial lake, lying directly over the Till. It consists of stratified, highly plastic clay layers mixed with varying fractions of silt and sand. Discrete layers of sand, sandy gravel, and silt, usually 0.5 feet or less in thickness, are interbedded within the clay and represent a small fraction of the total unit. These sandy and silty layers are often wet and are the source of most of the water in borings that penetrate this unit. The Lakebed Clay ranges in thickness from being absent under much of the Tittabawassee River and Bullock Creek to 24 feet in thickness along the north edge of the Facilities. The bottom elevations range from 580 to 605 feet USGS datum, and top elevations typically lie between 617 and 622 feet USGS datum. Where present, this unit is extremely effective in preventing vertical migration of groundwater, thereby providing an effective barrier to contamination of deeper strata.

The Till unit is an ice-deposited formation (lodgement till) with occasional interbedded fluvial sands and gravels, as well as interglacial intervals representing varved proglacial lake deposits. It is extremely stiff, highly compacted, grayish-blue, poorly sorted diamict, being a compacted mixture of sand, silt, and clay, with the clay fraction (defined as particles less than five microns in diameter, rather than by specific mineralogy) averaging about 30 percent. This is in direct contrast to the Lakebed Clay unit, where the clay fraction usually exceeds 50 percent. The Till is classified

as SM, SC, SC-SM, CL-ML, and CL in the Unified Soil Classification Standard. The Till can be identified during drilling by rock fragments, hard drilling, and a more uniform and coarse texture than the overlying Lakebed Clay unit. Soil borings which have completely penetrated the aquitard indicate an aquitard thickness of 120 to over 250 feet. Geophysical logs indicate considerable intervals of the Glacial Till have uniform characteristics. Stratified drift inclusions, sand tills, commonly referred to as "Deep Sands" or "Till Sands" within the massive (unstratified) Till have been postulated as being glacio-fluvial drainage ways or kettle-type deposits.

Visual and geophysical logs also show the presence of stratified sand subunits in the Glacial Till Sands, commonly referred to as "Deep Sands" or "Till Sands". The Till Sands typically occur randomly in several areas as pockets of more permeable material within the Till. Most Till Sands are small units, completely isolated by Till, but a few fluvial structures extend laterally for several thousand feet through the glacial sediments. A very few of these structures are shallow, (e.g. high in the glacial stratigraphic sequence), and post-glacial erosion has exposed them to shallow surface sediments, and in two cases, to the eroded Tittabawassee River channel.

The Till Sands are readily identifiable when drilling because of their extremely compact nature, generally resulting in standard penetration blow counts in excess of 100 per foot. The most common type of Till Sand is distinctive fine-grained gray silty sand, of relatively low permeability (laboratory permeability of roughly 4×10^{-5} to 3×10^{-6} cm/sec on Tertiary Pond Till Sand samples, 1992). Some fluvial structures contain small amounts of fine gravel and/or medium to coarse brown sand.

Across the Facilities, the compact nature and low bulk permeability of the Regional Aquitard unit provides an effective barrier by limiting the potential for contaminant transport.

Regional Aquifer

The Regional Aquifer is a sand and gravel unit, confined by the overlying Regional Aquitard and underlying bedrock, is artesian, and provides highly mineralized water which is typical of deeper aquifers in the Michigan Basin. The unit has a thickness ranging from zero (in areas under Salzburg Landfill) to over 200 feet thick. Unlike other stratified drift deposits, this aquifer extends throughout the region, including both on-site and off-site areas, and has historically been used as a drinking water source. In accordance with R 299.9506(1)(b) of Part 111 of Act 451, the Regional

Aquifer is designated as the uppermost aquifer at the Facilities.

Bedrock

The Bedrock Unit underlying the Regional Aquifer contains gently folded sedimentary rocks, which form the Paleozoic Era, Pennsylvanian Age Saginaw Formation. The sediments, which formed these rocks, were deposited in the Michigan Basin 210 to 235 million years ago. In the area studied, the uppermost bedrock is primarily shale, often sandy or silty, and is interbedded with coal cyclothem or sand seams. In Midland County, deep wells and borings indicate the bedrock surface has a good deal of relief. The bedrock surface elevation ranges from less than 200 feet U.S. Geological Survey (USGS) datum to more than 500 feet USGS datum.

B4.A.2(d) Soils

The soils at the Facilities are classified as Urban Land (Ur) which is described as nearly level area covered by streets, parking lots, and buildings underlain typically by sandy or loamy sub-stratum material (USDA, 1976). Excess soils from excavations at the plant site have been re-located to designated areas as fill and covered in compliance with Part 201 of P.A. 451, as amended. Many former industrial areas at the plant site that are currently vacant have been converted for storm water detention. These areas typically are vegetated, with the upper foot of soils composed of significant areas of topsoil and grass. Some vacant gravel lots, gravel and asphalt parking areas, and gravel and asphalt roadways are also present.

Urban Land soils classification extends throughout the City of Midland. In less urbanized areas surrounding the Facilities, shoreline dune structures remain as ridges extending laterally for hundreds of feet or more and are sometimes mined for easily extracted construction sand. Two major facies can be distinguished from the deposition of the Surface Sand: a beach ridge and dune facies and a fluvial plain facies. Ancient beach ridges and dunes can be observed south of the cooling pond for the Midland Cogeneration Venture facility. These features can be observed by driving through the area or by examining the USDA soil survey of the area (Hutchison, 1979). Similar features can be identified in historical aerial photographs of the northeastern portion of the plant site. It is likely that much of the fills in the area are derived from dunes or beach ridges that were present at the plant site prior to development.

B4.A.2(e) Hydrology

A summary of the groundwater occurrence within each of the functional geologic units is provided below. For more detailed information, see Attachment XIV.B3, Hydrogeological Report.

B4.A.2(e)(i) Groundwater

This section provides a brief description of the groundwater quality, quantity, and flow directions at the Facilities. Groundwater occurs at the Facilities within the four functional geologic units: Surface Soils and Fills; Regional Aquitard; Regional Aquifer and Bedrock. A summary of each of these units is provided below. For more detailed information, see Attachment XIV.B3, Hydrogeological Report.

Surface Soils and Fills

The Surface Sands, along with the associated fill, comprise a highly variable unconfined saturated zone. Water elevations in this unit are found to have significant seasonal variation, but it is generally encountered roughly three to five feet below the existing ground surface, depending on location. East of the Tittabawassee River, groundwater is recharged by infiltration resulting from precipitation and from groundwater flowing onto the site from the northwest. Currently, plant site groundwater discharges into engineered groundwater intercept systems (e.g., the Revetment Groundwater Interception System or RGIS), into sewer systems, and in limited areas into surface waters and via evapotranspiration.

Groundwater migration in the plant site historic waste management units is controlled by a combination of engineering controls, such as clay dikes and slurry walls that act as barriers trapping groundwater behind them, to purge wells and drainage systems that actively remove groundwater from these units. Proximity to sewers also influences the degree of saturation.

In areas where groundwater is contaminated, discharge to surface water is prevented by engineered controls (RGIS and South Saginaw Road Tile (SSRT)). For additional information on engineered controls, see Attachment XIV.B2, Corrective Action. Within the plant site, groundwater seeps into the existing plant sewer system which discharges to Dow's Wastewater Treatment Plant (WWTP). Along the northeast plant perimeter, groundwater flows towards the northeast, discharging into the City of Midland storm sewers that eventually discharge to the

Tittabawassee River. Groundwater monitoring is performed along the northeast plant perimeter to verify on-going compliance with groundwater quality standards. For further information on groundwater monitoring programs, see Attachment XIV.B5, Environmental Monitoring Programs.

West of the Tittabawassee River, the southern portion of the area is dominated by large ponds. Seepage from these ponds into groundwater recharges groundwater, and groundwater migration is prevented by engineering controls (Tertiary Pond RGIS, Tertiary Pond Slurry Wall, No. 6 Brine Pond Collection Tile). For additional information on engineered controls, see Attachment XIV.B2, Corrective Action. North of the ponds, shallow groundwater is recharged by infiltration resulting from precipitation. Groundwater historically flowed and discharged to the west bank of the Tittabawassee River. Presently, discharge is prevented by engineered controls (West Side RGIS and 7th Street Purge Wells). Along the south and western portion of this area, groundwater seeps into storm sewers and eventually discharges into the Tittabawassee River. Groundwater discharges off-site in the area of the former Ash Pond to the north and along the west bank of the Tittabawassee River. In all areas where the potential for off-site flow is present, groundwater monitoring is performed to verify on-going compliance with groundwater quality standards. For further information on groundwater monitoring programs, see Attachment XIV.B5, Environmental Monitoring Programs.

Within Salzburg Landfill groundwater movement is the greatest near the surface. This is primarily due to permeable sandy soils and evapotranspiration. Seasonal fluctuation of the groundwater table within the surface sand unit is primarily due to recharge by infiltration and discharge by evapotranspiration. The mobility of water below this sand unit is much less and the residence time in the sediments is much greater.

Regional Aquitard

Groundwater is present throughout the Lakebed Clay and Glacial Till at saturation. Because of the compact nature and very low permeability, groundwater seepage within these units is extremely limited. Occasionally, small saturated sand and silt seams are encountered that yield limited quantities of groundwater. The quantity of water available in the Aquitard is dependent on slow recharge from one of the silt layers, or interception of one of the Glacial Till Sand bodies. The low permeability of the Aquitard has resulted in the development of a vertical gradient that are largely controlled by relative difference between the groundwater head in both the lower

Regional Aquifer and the shallow unconfined groundwater. Fractures are not unusual in the upper regions of the Till, possibly due to the post-glacial unloading of the Michigan Basin, with gradual rebound. These fractures do not appear continuous for any significant distance as confirmed by the lack of penetration for more than a few feet of dense components such as brine. The chemistry of the groundwater suggests that it is a transitional zone between the lower Regional Aquifer and the shallow unconfined groundwater.

Glacial Till Sand Units exist within the Glacial Till. Typically, these units are isolated sand pockets within the Glacial Till. In some cases, these units are more extensive, can have sufficient storage and recharge to provide adequate water for an individual home use and can be termed "localized aquifers." The primary controls on the availability of water are the permeability of the surrounding soils and the degree of connection with a source of recharge. In two areas (one upstream of the Dow Dam and one below the Dow Dam) where post-glacial erosion has exposed Glacial Till Sands to the Tittabawassee River channel, Glacial Till Sands are in direct connection with the surface sands and are recharged by the Tittabawassee River. Domestic well logs in the area indicate that several domestic wells in proximity to the Facilities utilize sand bodies or lenses present within the Glacial Till matrix. Detailed hydrogeologic analysis of each of the more extensive Till Sand subunits has been performed and is described in Attachment XIV.B3, Hydrogeological Report.

Regional Aquifer

The Regional Aquifer has static water levels that are generally higher than both the Glacial Till and shallow unconfined groundwater, typically indicated by an "upward" vertical hydraulic gradient. The horizontal gradient in the Regional Aquifer is typically from the southwest to northeast. The low-permeability Regional Aquitard causes the Regional Aquifer to behave as a confined aquifer, with an artesian head ranging from 628 feet USGS datum on the west side of the plant to 622 feet USGS on the northeast side. In the western part of the Dow Michigan Operations facility the groundwater in the Regional Aquifer is artesian (free flowing at the ground surface). Groundwater quality in the Regional Aquifer has not been impacted as a result of surface contamination at the plant site. The overlying Regional Aquitard has protected the aquifer from impact of surface activities, aided by the "upward" vertical gradient.

The source of recharge to the Regional Aquifer has not been designated, but the horizontal

hydraulic gradient indicates recharge is occurring from the west of Midland County. Sources of discharge for the Regional Aquifer include wells and seepage into overlying strata. Domestic use of the Regional Aquifer near Michigan Operations is limited to residences on the west side of Poseyville Road or south of Bullock Creek on the east side of Poseyville Road. These areas are all up-gradient of the Facilities. The highly variable groundwater present in the bedrock often has a high salt content that diffuses into the lower portions of the Regional Aquifer.

For further information on groundwater monitoring programs for the Regional Aquifer, see Attachment XIV.B5, Environmental Monitoring Programs.

Bedrock

The groundwater contained in the Bedrock Unit is found primarily in the sandstone layers. The water quality is highly variable but often of undesirable quality due to high mineralization. Groundwater is usually plentiful when a sandstone layer is intercepted. The USGS report of 1990 on Physical and Chemical Data for Ground Water in the Michigan Basin, 1986-89, lists a range of specific conductance for Saginaw Formation groundwater from 450 micromhos/cm (555 foot deep well) to 5,530 micromhos/cm (480 foot deep well). Sulfates can vary up to 750 mg/L, and iron to 2.3 mg/L. The potentiometric head in the Bedrock Unit is higher than the head in the Regional Aquifer, causing an increase in salinity in the Regional Aquifer as fresh water is removed for domestic and agricultural use, inducing recharge from the mineralized Bedrock waters. The sandstone layers are not significantly used as aquifers except in a few areas where other aquifers are not available for domestic water supplies. The salinity of the water and necessary depth of wells (over 400 feet) are barriers to widespread usage of the bedrock as a viable water supply.

The geology and hydrology indicate that with proper design, operation and monitoring, the site continues to be suitable for the development and operation of hazardous waste management facilities.

B4.A.2(e)(ii) Surface Water

The primary natural surface water in this area is the Tittabawassee River (USGS Hydrologic Unit Code (HUC) 04080201), which bisects the plant site and drains approximately 2,600 square miles of land within the Saginaw River watershed. The Tittabawassee River watershed is the fifth largest

watershed in Michigan (Department of Natural Resources and Environment, Tittabawassee River Assessment, 2009).

The headwaters of the Tittabawassee River begin in Roscommon and Ogemaw counties, which are approximately 26 miles north of the City of Midland. The Tittabawassee River flows south and southeast for approximately 80 miles to its confluence with the Shiawassee River to form the Saginaw River, near the city of Saginaw, located approximately 22 miles southeast of Midland (Tittabawassee and Saginaw River Team, 2024).

Most of the Tittabawassee River watershed upstream of Midland is forested or agricultural. The Pine and Chippewa Rivers are two tributaries of the Tittabawassee River, joining the river at Midland, and together contribute approximately 40 percent (%) of the Tittabawassee River flow at Midland (MDNR, 1988). Below the Dow Dam, the river flow is free flowing to its confluence with the Shiawassee and Saginaw Rivers. Flow in the Tittabawassee River is gauged by the USGS at the river mile 22.9, within the plant site.

The maximum recorded historical crest of the Tittabawassee River occurred in 2020. On May 19, 2020, after three days of heavy rainfall, the Edenville and Sanford Dams along the Tittabawassee River failed. The river crested at 35 ft, over 10 feet above flood stage and surpassing the previous record of 33.9 feet during a major flood in 1986 (CNN, 2020). While the dams are being rebuilt, construction is ongoing and completion schedule is uncertain (ABC12, 2024).

The mean value for flow is 714 cubic feet per second (cfs) (USGS, 2024). Discharge is typically highest in March and April during spring snow melt and runoff. Flows greater than 20,000 cfs have occurred in 29 of the 114 years between 1910 and 20023, with flows greater than 30,000 cfs occurring in 1912, 1916, 1946, 1948, 1986, 2017, and 2020 (USGS, 2024).

Other secondary surface water features include small permanent and intermittent streams flowing into tributaries of the Tittabawassee River, small natural and constructed ponds, and constructed ditches used to store and convey storm water from developed properties. These ditches discharge water to the Tittabawassee River and associated tributaries. Tributaries near the Dow Michigan Operations Facility include Bullock Creek, Lingle and Ashby Drains. The regional topography indicates that surficial drainage patterns in the area are generally toward the Tittabawassee River. However, natural drainage patterns in developed portions of the area have

likely been altered and might direct surface water away from the Tittabawassee River, toward drainage basins and other storm water collection units. Drawings B2-001 thru-005-927122 depicts surface water bodies and the general topography in and around the area.

The major wastewater discharges to the Tittabawassee River in the area near the Facilities are from The Dow Chemical Company, the City of Midland Wastewater Treatment Plant, and the Midland Cogeneration Venture. The Dow Chemical Company has a National Pollutant Discharge Elimination System (NPDES) permit for treated wastewater from the Michigan Division Wastewater Treatment Plant (outfall 031). Minor discharges to the Tittabawassee River include backwash water from the City of Midland Wastewater Treatment Plant and a sewage treatment lagoon serving the town of Freeland.

Surface Water Quality

Surface water quality in the Tittabawassee River is monitored in the Surface Water Protection Monitoring Program described in Attachment XIV.B5, Environmental Monitoring. The results of the monitoring continue to support that the river is not impacted by current operations at the Facilities.

Surface water and sediment characterization, evaluation, and remedy adjacent to the Facilities are being performed in accordance with the Administrative Settlement Agreement and Order on Consent for Remedial Investigations, Feasibility Study and/or Engineering Evaluation and Cost Analysis and Response Design (US EPA Region 5, CERCLA Docket no. V-W-10-942).

Future releases to surface water and sediment are prevented by existing corrective actions (e.g. RGIS) and monitoring to demonstrate compliance with environmental standards on an on-going basis.

Further details of the hydrology of the area are included in Attachment XIV.B3, Hydrogeological Report.

B4.A.2(f) Land Use and Zoning

In the early 1900s, the area surrounding the Facilities and the City of Midland was primarily composed of land used for agricultural and recreational purposes. Beginning in 1916, a marked increase in land development for residential and industrial purposes occurred. By the 1960s,

residential properties were distributed throughout the Midland area and the rate of increase had stabilized; however, industrial and commercial land development continued to occur to the east, southeast, and southwest of Midland over the years. From the late 1800s to 2020, the population of the city increased from 1,160 to 42,547 as of the 2020 census U.S. Census Bureau, 2020)). The city currently encompasses approximately 36 square miles (City of Midland, 2024(a)).

Land Use

The majority of the property in the area is heavily industrialized with some active and idle farmland and woodlands near Salzburg Landfill. The industrial uses in the area are consistent with city and township development plans.

(http://www.midlandtownship.net/documents/PlanningCommission/Midland_Township_Master_Plan_2015-2035.pdf and <https://www.midlandcitymodern.com/theplan>). Immediately across the river to the south of the plant site is a gas-fired electric generating complex neither owned nor operated by Dow. The area to the north of the plant site boundary is primarily industrial and commercial land, some of which is owned by Dow. The area east of the plant site and north of the landfill is the Dow Silicones Corporation facility owned by Dow.

Figure B4-2 presents the local land use map.

Zoning

The following zoning districts, as defined by the City of Midland Zoning Ordinance, fall within the approximate 1-mile area surrounding the Facilities (City of Midland, 2024(b)). In each district some uses are permitted as of right, and, therefore, these uses are typically predominant in the district. Other uses are permitted only if permission is granted by the City Council after receiving a recommendation from the Planning Commission (i.e., “conditional land uses”).

Zoning District	Summary
RA-1 – Residential	This district allows single family and two family dwellings, day care centers, schools and similar residential or residential-like uses as of right. Additional conditional uses may include bed and breakfasts, libraries, places of worship, and golf courses.
RA-2 – Residential	
RA-3 – Residential	
RA-4 – Residential	
RB – Residential	Multiple family dwellings are permitted with conditions; fire stations, schools, parks and social service agencies are permitted as of right.
RC – Regional Commercial	The purpose of this district is to offer an area for a diversity of retail, service, entertainment, office, finance and related businesses. Traditional residential uses are not permitted in this district. Aside from traditional commercial uses, the district also allows child care

Dow Chemical Michigan Operations Operating License Reapplication
Environmental Assessment, Revision March 2025
Site ID No. MID 000 724 724 and MID 980 617 435

Zoning District	Summary
	centers, colleges, day shelters, residential treatment facilities, transitional housing, campgrounds, and outdoor recreational facilities.
RD – Mobile Home Park	The intent of this district is to allow for the location and regulation of mobile home parks. Permitted uses include mobile home parks, fire stations, schools and parks.
AG -- Agricultural	This district provides stable areas for agricultural use and preserves rural-like features. The Agricultural District allows for farm crops and nursery crops, commercial greenhouses, kennels, single-family detached dwellings, veterinary clinics, riding stables, schools, golf courses and the raising and keeping of farm animals and poultry. Permitted uses include outdoor storage of recreational equipment in an accessory building, public utility features, campgrounds and private recreation facilities.
OS – Office Services	The intent of this district is to accommodate administrative and professional offices, personal service businesses, and supporting retail. The only residential uses that are permitted as of right are dwelling units on the upper floors above business establishments. Other uses permitted as of right include schools, parks, child care centers and residential inpatient treatment facilities. Nursing homes are permitted with special conditions. Single and multiple family housing is permitted with the approval of the City Council as a conditional land use.
CC – Community Commercial	Convenient commercial development providing for a wide range of services for city residents is the purpose of this district.
NC – Neighborhood Commercial	This district provides for businesses that meet the everyday shopping and service needs of residents in neighborhoods nearby.
D —Downtown District	The Downtown and Downtown-Overlay districts are intended to be a vital area for city residents with a blend of uses including but not limited to commercial, office, civic, entertainment, recreational, residential uses.
DO – Downtown Overlay	
DNO – Downtown Northside Overlay	The Downtown Northside Overlay district is intended to manage and facilitate redevelopment for mixed-use properties. The intent is to provide a variety of residential types and a pedestrian-friendly environment.
HP – Historic Preservation District	The intent of this district is provide permits for additions or changes for resources to establish a Main Street Historic District
COM – Community	This district provides for public and private uses with community significance, such as civic centers, museums, stadiums and parks. Residential uses are not allowed, however, schools, transitional housing, and residential treatment centers are authorized. Juvenile service facilities and correctional facilities are permitted with the approval of the City Council as conditional land uses.
LCMR – Limited Commercial, Manufacturing and Research	This district provides for mixed use office and industrial uses in a campus like setting. Although office and industrial uses are the focus, child/day care centers are allowed as of right, and colleges, residential treatment centers, transitional housing and day shelters are permitted with conditions.
IA – Industrial	Industrial uses with limited off-site impacts. Residential uses are not allowed.
IB – Industrial	Intensive industrial activities, to be separated from residential and

Zoning District	Summary
	commercial areas. Residential uses are not allowed.

The zoning map for Midland can be accessed online at:

<https://cityofmidlandmi.gov/DocumentCenter/View/2564/City-Map-Zoning?bidId=>

Figure B4-3 is a zoning map for the area surrounding the Facilities. Figure B4-4 is an aerial photograph.

B4.A.2(g) Historical or Archaeological Resources

Past queries through the State Historic Preservation Office for projects at or near the plant site indicate one previously recorded archaeological site and 21 archaeological sites have been recorded within a mile of the project location and numerous sites just beyond the 1-mile search radius largely along the Tittabawassee River. Eight of the sites within a mile are currently eligible for listing on the National Register of Historic Places (NRHP).

Information obtained from the State Archaeologist and State Historian indicated there were two historic sites and one prehistoric site located in Section 35. An archaeological study was performed in 1980 by the Saginaw Archeological Commission, during which no diagnostic artifacts were recovered (see July 15, 1991 Salzburg Landfill Operating License Application). It was recommended that no further archaeological work be undertaken at the SLF.

B4.A.2(h) Social Environment

The social environment, in terms of demographics and infrastructure of the area, is discussed in the following two subsections.

B4.A.2(h)(i) Demographics

The population of Midland in 2020 was 42,547 (City of Midland, 2024(a)). Through the 1990’s, Midland’s population grew by about 10%. The population of Midland has stayed about the same since 2000. The major employers of Midland County are MidMichigan Health, Dow, Midland Public Schools, DuPont and Corteva Agrosience (Midland Business Alliance, 2021).

B4.A.2(h)(ii) Infrastructure

Support systems that may be affected by the Facilities are sewer and water service, police and fire protection, schools, roads, and solid waste disposal. The local fire department is 1.5 miles from the plant site and the local police department is located 2.2 miles away (City of Midland, 2024(a)). The plant has security and emergency services on site.

The schools within a mile radius of the Facilities are:

- Central Park Elementary School
- Midland High School
- Bullock Creek Elementary School
- Pre-Primary Center at Carpenter Street School
- St. John's Lutheran School
- St. Brigid Catholic School
- Kid's Creek Early Care and Education
- Longview Early Childhood Center
- Memorial Presbyterian Preschool

Electric and gas are provided by Consumers Energy. Drinking water for Midland residents is supplied from Lake Huron. City wastewater from the public sewer system is treated by a 10 million gallon per day (MGD) treatment plant, and the treated water is discharged to the Tittabawassee River. Water and sewer services are managed by the City of Midland. Sewage disposal occurs at the Midland Water Reclamation Facility, managed by the City. The City of Midland landfill is 4 miles from the facilities (City of Midland, 2024(a)).

B4.A.2(i) Transportation

The Midland plant site receives raw materials and waste from other locations by rail car, by truck, and Isotainers. Dow treats and disposes of the majority of its waste at the Midland plant site and at the Salzburg Landfill. The landfill receives waste from the Midland plant site by truck. Road access to the landfill is provided by two local county roads, Salzburg Road to the north and Waldo Road to the east. Both roads are two-lane, hard-surface highways with moderate traffic volumes. The limited waste that is not treated or managed on-site is shipped by truck to a disposal facility. On limited occasions, waste may be shipped by rail for off-site disposal.

Major highways near the Facilities include Highway M-20 (Isabella Road) approximately one mile to the north, US-10 approximately two miles to the northeast, and Highway M-47 (Midland Road) approximately three miles to the east. Poseyville Road borders the Dow Michigan Operations facility to the west. Saginaw Road borders the plant site to the east but has been vacated and incorporated into the plant site and is now the location of the Michigan Operations North Gate.

Drawing B2-010-927122 – RCRA PART A FACILITY MAP presents the main roads in the immediate vicinity of the Facilities.

B4.A.2(j) Air Quality

All operations at the Facilities are controlled such that there is an absence of dust, odors, and other inconveniences to the local residents. Most of the traffic areas are paved. In accordance with the site fugitive dust plan, dust suppression plans are in place to prevent visible dust. The truck parking areas are either paved or surfaced with gravel for dust minimization. The ambient air monitoring program is in place to monitor the fenceline and is described in *Attachment XIV.B5, Environmental Monitoring*.

The following is a summary of the 2022 Annual Air Quality Report for Michigan prepared by the Michigan Environment, Great Lakes and Energy (EGLE).

The criteria pollutants carbon monoxide, lead, nitrogen dioxide, and sulfur dioxide (with the exception of the Detroit area where sulfur dioxide is being further monitored) across the state of Michigan have continued to stay in attainment with levels well below their NAAQS established by the U.S. EPA. For ozone, Michigan was approved for attainment in a letter from the EPA on December 9, 2011. Michigan has had some designated non-attainment areas for particulate

matter but based on recent data, particulate trends have decreased and the state is in compliance for all NAAQS. For both ozone and particulate matter, levels continue to decline. Midland is not a non-attainment area.

B4.A.2(k) Noise

The Facilities generate relatively low levels of noise. Truck and rail traffic is the source of most noise generated, and noise is consistent with industrial operations.

B4.A.2(l) Appearance and Aesthetics

The Facilities are in an industrial area with no unique aesthetic value. There are no panoramic views and no special landscapes. The Facilities are surrounded by a greenbelt of consisting of grass, trees and shrubs. The landfill has a vegetated berm as an aesthetic buffer. In accordance with the site fugitive dust plan, dust suppression plans are in place to prevent visible dust. To the north and northeast of the plant site are other businesses and properties in commercial and industrial use and beyond this area are residential developments. To the west and southwest of the plant site is the Poseyville Landfill, undeveloped land and residences in the Midland Township area. To the south of the plant site is the Midland Cogeneration Venture (a gas-fired power plant). The Dow Silicones facility located east of the plant site and north of the landfill is owned by Dow. The Facilities are kept neat and well maintained.

B4.A.2(m) Terrestrial Ecosystem

The characteristics of the terrestrial ecosystem, in terms of flora, fauna, rare or endangered species, and critical habitat are described in the following subsections.

B4.A.2(m)(i) Flora

The flora of the entire site is typical of industrial locations. Trees and brush have been removed across the majority of the Facilities property. Nuisance weeds are located throughout the site. Closed landfill cells have grass vegetated caps. Small areas of grass and ornamental plantings are scattered through the site and are mainly concentrated around administrative and research buildings. Patches of wetland species are present and generally confined to ditches and other areas where surface water accumulates. Dow has significantly increased the amount of clean cover across the site including asphalt, gravel, and vegetation. At SLF there is in general two (2)

plant community types, open areas dominated by grasses and forbs (fields), and small patches of wetland species. Wetland species are generally confined to ditches, outfalls and other areas where surface water accumulates. The vegetation is mowed and maintained. The vegetation on the site does not include endangered or threatened species. Species present on the site are common species well represented in the fields either adjacent to the site or in the general area.

Vegetation on the site displays no remarkable components in the species mix which would indicate the possible existence of endangered or threatened species. Those common species present on the site are also well represented in the forest and fields in the general area. Therefore, the continued operations and/or development of the site would not result in destruction or elimination of any unique botanical resource.

Figure B4-5 presents a map of the vegetation and general habitat areas around the Facilities.

B4.A.2(m)(ii) Fauna

The Facilities are frequented by several common species of birds; however, bird numbers are low as a result of extensive human disruption on-site. Pigeons, sparrows, starlings and waterfowl represent the majority of the bird life. A few areas adjacent to the river may provide limited suitable habitat for blackbirds, upland songbirds, scavengers, and other marsh species. The Tertiary Pond associated with the site's Wastewater Treatment Plant and the No. 6 Brine Pond provide habitat for birds, such as ducks and geese. In the winter, bald eagles and ospreys have been sighted in the area. The contribution of reptiles and amphibians to the fauna of this site is marginal. Frogs, toads, and small water snakes are present in small numbers in areas adjacent to the river.

The mammalian population of the site consists primarily of rodents. Lands adjacent to the river could support rodents, such as muskrats, raccoons and rabbits. Due to the nature of SLF the presence of mammals, such as rabbits, skunks, groundhogs, deer, etc. are discouraged. White-tail deer are present and feed on the plant site and landfill grounds but are routinely removed from landfill.

Overall, the fauna of the site is not unique and does not contain endangered or threatened species. Those species present on the site are common species and well represented in the forests and fields in the general area.

B4.A.2(m)(iii) Rare or Endangered Species

Several Federally listed terrestrial endangered, threatened, and candidate species are potentially present in Midland County and immediately surrounding counties include: Indiana bat (endangered), northern long-eared bat (threatened), rufa red knot (threatened), Eastern massasauga rattlesnake (threatened), and Eastern prairie fringed orchid (threatened). While these species may be potentially present, they have not been identified in or near the facilities.

B4.A.2(m)(iv) Critical Habitat

There are no terrestrial habitat areas critical to the survival of local species on or near the Facilities.

B4.A.2(n) Aquatic Ecosystem

The Tittabawassee River bisects the plant site from the northwestern corner to the south-central edge. The river flows in a generally southerly direction until it joins the Shiawassee River to form the Saginaw River, which then flows north into the Saginaw Bay. The total length from headwaters to the Saginaw River junction is approximately 80 miles.

The Dow Dam is located on the Tittabawassee River where it flows through the Dow Michigan Operations facility. Dow is currently working on the Midland Fish Passage Restoration Project that will create a fish passage structure over the Dow Dam to improve fish mobility both up and downstream (Fish and Wildlife Service, 2024).

B4.A.2(n)(i) Flora

The flora of the Tittabawassee River is typical of waterways in this region. Industrial activity has resulted in tree and brush removal from riverbank areas. Flora consists of noxious weeds, quack grass, milkweed, cattails, willow, sumac, poison ivy, and other vegetation. The aquatic vegetation presents no remarkable components in the mix of species, which would indicate the possible existence of endangered or threatened species.

B4.A.2(n)(ii) Fauna

Areas adjacent to the river provide suitable habitat for migratory birds, upland songbirds,

scavengers, and other marsh species. Throughout the area, bird numbers are not high as a result of extensive human disruption. The large Tertiary Pond and No. 6 Brine Pond provide preferential habitat for migratory birds and waterfowl. Fauna adjacent to the river include gulls, redwing blackbirds, gold finch, killdeer, wood ducks, mallards, starlings, Baltimore orioles, white tail deer, and grackles. Reptiles and amphibians are represented by various frogs, toads, and small water snakes. Threatened and/or endangered (T/E) mussels may be present in the Tittabawassee River (MDNR, 2021).

An ecological risk assessment performed for the Tittabawassee River found that conditions do not pose ecologically significant risks to sustainability of local populations of aquatic and terrestrial birds, based on the species studied (Tittabawassee River and Saginaw River Team, 2024).

B4.A.2(n)(iii) Rare or Endangered Species

Two state threatened and/or endangered (T/E) mussel species, the Black Sandshell (*Ligumia recta*) and the Lilliput (*Toxolasma parvum*), are known or expected to occur in the Tittabawassee River, designated as a Group 2 watercourse in the 2021 Michigan Mussel Protocol (MDNR, 2021). While not seen recently, the federally T/E Snuffbox (*Epioblasma triquetra*) mussel species were found in the river a number of years ago (The Dow Chemical Company, 2023). The mussel survey performed on the Tittabawassee River near the Dow Dam in 2023 documented the presence of live mussels, including one Black Sandshell mussel. The mussels were relocated to an identified transplant site in 2024.

B4.A.2(n)(iv) Critical Habitat

There are no habitat areas critical to the survival of local species on or near the Facilities.

B4.B ENVIRONMENTAL IMPACTS OF THE FACILITY

The Facilities do not currently have significant impacts on physiography, climate, terrestrial systems, aquatic systems, regional hydrology, aesthetics, air quality, land use, and zoning. There are minor impacts on solid wastes, energy demand, and non-renewable resources. Truck traffic is routed to avoid adverse impacts on residential areas and nearby schools.

This section provides an analysis of the potential for safe handling of hazardous wastes to fail at this Facility during treatment, storage and disposal for the following units:

- Container Storage Area Units
- Tank Storage Units
- CAMU
- Incinerator
- Tertiary Pond and No. 6 Brine Pond
- Salzburg Landfill

Included is information on the potential for public exposure to hazardous wastes and hazardous constituents through releases related to the waste management units. To prevent such circumstances from happening, a contingency plan is in place for the Dow Michigan Operations Facility.

B4.B.1 Container Storage Units Failure Mode Assessment

The potential major failure modes which may occur in the container storage areas are described in this section. This section addresses the following container storage area units at the Dow Michigan Operations Facility:

- Waste Storage Area I (1143 Building)
- 32 Incinerator Pack Room Container Storage (Incinerator Complex)
- 32 Incinerator Unloading Spots
- 830 Building Container Storage (Incinerator Complex)

There are no Container Storage units located at the Salzburg Landfill facility.

B4.B.1(a) Spills from Containers

The most likely causes of spills from containers are:

- Puncture or rupture of a container in storage or during movement of containers into or out of the container storage;
- Over pressurization of a container due to overfilling or reaction of incompatible wastes;
- Spillage during transfer of waste from one container to another; and
- Deterioration of a container due to corrosion.

Structures, equipment and management practices are in place to minimize or eliminate the potential for such spills, or to minimize the impact of such spills. See Attachment XIV.A7,

Michigan Operations Contingency Plan for more information about structures, equipment, procedures, alarms and emergency response procedures.

In the event of failure or rupture of a container, it is possible that the entire contents of the container may be released suddenly. The largest containers handled at the container storage areas of the Facility are portable containers with typical capacities of up to 7,000 gallons. This quantity of material released would be readily contained within the storage area secondary containment. Potential impact to public health would therefore be negligible.

B4.B.1(b) Fire or Explosion

Fire or explosion may occur during the transfer or storage of hazardous wastes in containers. This is possible only if there is first a spill of the waste and it is exposed to air and ignition source.

Structures, equipment and management practices are in place to minimize or eliminate the potential for fire or explosion. See Attachment XIV.A7, Michigan Operations Contingency Plan for more information about structures, equipment, procedures, alarms and emergency response procedures.

B4.B.1(c) Failure of Container Storage Secondary Containment

The secondary containment systems in the container storage areas are constructed of reinforced concrete and any cracks that develop are sealed with an impervious coating. Some components of the secondary containment system are located outdoors, and are subjected to normal seasonal temperature variations and cycles of wetting and drying due to precipitation. The indoor portions of the secondary containment are also subjected to mechanical stress imparted by forklift travel. Although the concrete was designed to withstand these various stresses eventual deterioration is possible.

Dow inspects the integrity of the secondary containment at least weekly and promptly reports any cracks or gaps in the concrete and any deterioration of the impervious coating to the site maintenance group assigned to these types of repairs, in accordance with the established company procedures. All such instances are noted on the container storage area inspection log, as well as the date of the repair, see Attachment XIV.A5, Inspection Schedules.

The geologic setting of this Facility, on top of a layer of native clay at least 25 feet thick

and of very low permeability, also ensures that shallow groundwater will not percolate downward to the regional aquifer. Therefore, impacts to offsite groundwater and surface water are prevented.

The container storage units range in distance from 180 to 890 feet to the nearest fence line along the Tittabawassee River. The units range from 4200 to 4900 feet from the nearest fence line along Saginaw Rd., the nearest point at which the public could be exposed to any vapors from a release of this nature. Due to the distances to these fence lines and the general topography of the Facility in this area, leak detection and secondary containment inspection requirements, it is unlikely that a surface spill coupled with a secondary containment breach would lead to human exposure.

B4.B.2 Tank Storage Units Failure Mode Assessment

The potential major failure modes which may occur in the tank storage units are described in this section. This section addresses the following tank storage units at the Dow Michigan Operations Facility:

- 1163 Building
- 33 Building
- Incinerator Tank Farm (Incinerator Complex)

For information on the tank systems designated as 1163 Building and 33 Building, see Attachment XIV.C2, Tanks.

There is no Tank Storage located at the Salzburg Landfill facility.

B4.B.2(a) Spills from Tanks

Potential causes of spills from tank storage units and ancillary equipment are overfilling of a tank, failure of ancillary equipment such as a valve, pump, flange, or pipe, and uncontrolled reaction due to mixing of incompatible materials, which could cause an emergency venting of a tank.

Structures, equipment, and management practices are in-place to minimize or eliminate the potential for spills from tanks. See attachment XIV. A7, Michigan Operations Contingency Plan for more information about structures, equipment, procedures, alarms, and emergency response procedures.

Overfilling is prevented by the use of a high level sensor and over-fill alarm with automatic actuation of the tank fill line shutoff valve. Tank transfers are always attended by facility

personnel. In case of failure of the high level alarm and shut off system, the tank farm operator is present during transfers and can manually shutoff the transfer pump to prevent or minimize spillage due to overflow. The high level sensor, alarm, and automatic shutoff are tested monthly to ensure they are functioning.

It is possible for a spill to occur other than during transfer operations by failure of the bottom drain fitting or valve on a tank. In this case failure could occur during a time when no facility personnel are present in the tank farm area to respond immediately. Although less likely than the possibility of a spill during waste transfer, this scenario could result in the release of the entire contents of the tank into the tank farm secondary containment system.

Assuming the worst case, a full tank of 18,000 gallons could be released into the secondary containment for the unit, resulting in an exposed surface area of spilled material of approximately 6,800 square feet. The secondary containment system for these units are sized to contain 100% of the volume of the tanks plus the precipitation from a 24-hour, 25-year storm event.

B4.B.2(b) Fire or Explosion

Wastes stored in the tank storage units can be ignitable. The worst case scenario of a fire or explosion would involve loss of the entire contents of a tank, which then are entirely volatilized to form a vapor cloud, which ignites in a vapor explosion. This is a highly unlikely scenario because of the precautions taken at the facility to prevent hazards and minimize consequences by prompt response. However, in the event that this scenario was to occur, impacts outside of the facility boundary are unlikely.

B4.B.2(c) Failure of Tank Storage Unit Secondary Containment

The secondary containment systems in the tank storage units are constructed of reinforced concrete and sealed with an impervious coating. Some components of the secondary containment system are located outdoors and are subjected to normal seasonal temperature variations and cycles of wetting and drying due to precipitation. The indoor portions of the secondary containment are also subjected to mechanical stress imparted by forklift travel. Although the concrete was designed to withstand these various stresses, eventual deterioration is possible.

Dow inspects the integrity of the secondary containment daily and promptly reports any cracks or gaps in the concrete and any deterioration of the impervious coating to the site maintenance group assigned to these types of repairs, in accordance with the established company procedures. All such instances are noted on the container storage area inspection log, as well as the date of the repair, see Attachment XIV.A5, Inspection Schedules.

The geologic setting of this Facility, on top of a layer of native clay at least 25 feet thick and of very low permeability, also ensures that shallow groundwater will not percolate downward to the regional aquifer. Therefore, impacts to offsite groundwater and surface water are prevented.

The tank storage units range in distance from 180 to 450 feet to the nearest fence line along the Tittabawassee River. The units range from 4500 to 4600 feet from the nearest fence line along Saginaw Road, the nearest point at which the public could be exposed to vapors from a release of this nature. Due to the distances to these fence lines and the general topography of the Facility in this area, leak detection and secondary containment inspection requirements, it is unlikely that a surface spill coupled with a secondary containment breach would lead to exposure to the community.

B4.B.3 CAMU/Staging Pile Failure Mode Assessment

The potential major failure mode which may occur in the CAMU (Corrective Action Management Unit)/Staging Pile is described below.

B4.B.3(a) Flooding

The worst case failure scenario for the CAMU/Staging Pile is a 100 year flood event. Run-off/run-on is prevented by the earthen dikes and other storm water management practices that are routine at the facility. The storm water management practices include the facility sewer system that routes leachates and run-on/run-off to the on-site waste water treatment plant for management. However, in the event of a 100-year flood, there may be an influx of a volume of water that the storm water management practices in place at the facility may be temporarily overwhelmed. The elevation of the ground along the fence line and perimeter dike is higher than the 100-year flood elevation. Therefore, flood waters during and after the flood event would not run off-site and would eventually be captured and treated. Additionally, the secondary containment system for this unit is sized to contain 100% of the volume of the waste plus the precipitation from a 24-hour, 25-year storm event.

B4.B.4 Incinerator Failure Mode Assessment

The potential major failure modes which may occur in the 32 Building Incinerator are described in this section.

B4.B.4(a) Fire or Explosion at 32 Building Incinerator

Fire or explosion may occur during the incineration treatment of hazardous wastes in the incinerator complex. Structures, equipment and management practices are in-place to minimize or eliminate the potential for fire or explosion, including an emergency vent built as part of the incinerator that will trigger in the event that pressure is building up, in order to prevent an explosion. See Attachment XIV. A7, Michigan Operations Contingency Plan for more information about structures, equipment, procedures, alarms, and emergency response procedures.

The Contingency Plan does not apply to a fire or explosion that occurs as part of the incineration treatment process within the rotary kiln or secondary combustion chamber (SCC) of the incinerator, provided it causes no damage to the Facility and results in no unlicensed/unpermitted releases to the environment.

B4.B.5 Tertiary Pond and No. 6 Brine Pond

The Tertiary Pond is a RCRA regulated hazardous waste surface impoundment and the No. 6 Brine Pond is a waste management unit. The Tertiary Pond has approximately 200 acres of water surface area and the No. 6 Brine Pond has approximately 135 acres of water surface area. The Tertiary Pond has 14,000 lineal feet and the No. 6 Brine Pond has 16,000 lineal feet of dikes that could impact the environment and local property. The ponds are located on the west side of the Tittabawasee River to the east of Poseyville Road and north of Bullock Creek.

The worst case scenario associated with the Tertiary Pond and No. 6 Brine Pond would be a dam failure. The following section discusses the possible scenarios. A breach in the dam could impact the Tittabawasee River by releasing wastes directly into the river and causing a flood event. A flood event would potentially impact the downstream community (residences, businesses) and could cause road closures and evacuations. In addition, there would likely be an impact to the aquatic ecosystem. The following section discusses the possible scenarios.

B4.B.5(a) Dam Failure

The potential major failure modes which may occur in the permitted dam associated with the Tertiary Pond and No. 6 Brine Pond are described in this section. The Part 315 Dam Safety

Emergency Action Plan for the Tertiary Pond and No. 6 Brine Pond dams provides detailed emergency response actions for three different classification levels of dam emergencies, which is summarized below. This plan can be found in Module A.7 of this license application.

The Tertiary Pond and No. 6 Brine Pond are inspected every three years as part of Dow’s Dam Inspection Program and periodically by Dow employees or contractors. Upon identification of a seep, an under seepage (boil) or a potential imminent breach, provisions of the Dam Safety Emergency Action Plan may be implemented.

Category	Description	Action
Category Level 1	Not an emergency. Minor seeps that are confined within plant boundaries - closely monitored and are not normal but have not yet threatened the operation or structural integrity of the dam or offsite areas, but possibly could if it continues to develop.	<p>Facility Emergency Coordinator (FEC) and/or their designee will inspect the dam, the reservoir area, upland abutments, and drainage channels and Bullock Creek.</p> <p>The inspection will be recorded and documented with photographs and video, as possible. Based on the findings of the inspection, the event will be categorized and addressed in accordance with the Dam Safety Emergency Action Plan.</p> <p>FEC will contact appropriate technical staff to investigate and recommend appropriate actions.</p>
Category Level 2	<p>Potential dam failure situation, rapidly developing: Under seepage (boils) at or near the toe of the dike embankments that have the potential to affect the community outside of the Facility fence line. This situation, if not addressed, may eventually lead to dam failure and flash flooding downstream, but there is not an immediate threat of dam failure.</p> <p>A failure of the west dike of the No. 6 Brine Pond is the only failure scenario that would involve evacuations. There are no immediate buildings, residences, etc. downstream of the Tertiary Pond that would be impacted by a failure of the Tertiary Pond dikes.</p>	<p>FEC will initiate the procedures of the Emergency Action Plan (EAP), contact appropriate technical staff to investigate and recommend appropriate actions and if time permits, will conduct a dam inspection and document all observations and findings.</p> <p>The FEC will initiate activities to notify the Director of Emergency Services, Midland County Department of Emergency to inform him/her that the EAP has been activated and if current conditions get worse, an emergency situation may require evacuation. Preparations should be made for possible road closures and evacuations.</p> <p>If time permits, the FEC will initiate Level 2 Emergency remedial actions in accordance with the EAP.</p> <p>Notify EGLE Dam Safety Program.</p>
Category Level 3	Imminent Dike Breach - Urgent; dam failure appears imminent or is in progress: Immediate potential to affect the community outside of the Michigan	FEC will contact Dow ES&S and the Director of Emergency Services, Midland County Department of Emergency to inform them of a potential failure. All provisions of the EAP shall

	Operations fence line. Examples are overtopping of the dikes and boils breaking out in other areas near an original boil or a slope failure associated with a major seepage or boil. This is an urgent situation when a dam failure is occurring or is about to occur and unlikely to be prevented. Flash flooding will occur downstream of the dam.	be immediately implemented. FEC will maintain ongoing communication with the Director of Emergency Services and provide updates of the situation and assist him/her in making timely decisions concerning warning and evacuations. Notify EGLE Dam Safety Program. Monitor and record all information, observations, calls and actions taken.
--	--	--

B4.B.6 Salzburg Landfill Failure Mode Assessment

The potential major failure mode associated with the Salzburg landfill facility are described in this section:

Failure of the Liner:

The Salzburg Landfill facility is equipped with a bilayer liner system, which consists of a primary liner over a clay liner then a leak detection, collection, and removal system, and then a secondary liner. Both the primary and the secondary liner are made of a high density polyethylene (HDPE) geomembrane (GMB) material. A failure is when leachate has, by some means, penetrated the primary liner and entered the liner failure detection system or penetrated the secondary liner and entered the natural soils and/or groundwater underlying the landfill.

A liner failure can occur due to: improper installation of the liner resulting in poor quality seams or poor compaction of the clay liner and/or areas with improper clay depth, use of “surface sand unit” or other permeable soils for liner material, or disposal of wastes in the landfill which adversely affect the structure of the clay o GMB liner thereby significantly affecting its permeability.

Failure of Leachate Collection and Removal system

The leachate collection and removal system, hereinafter referred to as the leachate collection system, is located on top of the primary liner and consists of a 12 inch (minimum) thick coarse drainage sand with a perforated HDPE pipe collection system at the bottom of each cell. The cell bottom slopes towards the collection pipes. The collection pipes then flow into a lift-station which utilize a submersible pump to transfer the leachate to the Dow Wastewater treatment plant

(WWTP) through a dual contained HDPE forcemain. A failure of the leachate collection system has occurred if leachate builds up in the cell due to plugging of the sand drainage layer around the collection pipes, collection pipe collapse or plugging, an inoperative lift-station, or a failure of the forcemain.

A failure of the leachate collection and removal system can occur due to the use of low permeability clayey sand in the drainage layer, poor construction methods, and poor maintenance.

Failure of the Landfill Cap

The final landfill cap will consist of an uniform sand sub-base, a geosynthetic clay liner (GCL), a GMB, geocomposite drainage material, and 24 inches of cover soil seeded with grass. Please see the Closure section of this license for more details. A failure of the landfill cap has occurred or is suspected if the presence of a significant volume of leachate is generated from a previously closed landfill area, gas pressure generation within the landfill causing distortion or cracking, or hazardous waste constituents seeping through the closed landfill areas.

A failure of the cap can be caused by: poor construction practices in the placement, material control, or seaming of both the GCL or GMB; Erosion rills or subsided areas develop and not promptly repaired; or deep rooted plants or trees growing on the completed cap.

Failure of the Stormwater Drainage system

A stormwater drainage system surrounds the entire landfill facility, and captures all surface runoff from the undeveloped and closed areas of the landfill. This drainage system discharges to multiple surface water drains including: Lingle drain to the north, and an unnamed surface drain that flows directly to the Tittabawassee river on the southeast. Runoff from the active landfill areas that are not yet fully closed is collected by the leachate collection system. Diversion/retention structures have been built around the active portion of the landfill to ensure that these areas are not inundated by a 24-hour, 100-year storm.

B4.C.1 Tertiary Treatment Pond (T-Pond)

B4.C.1(a) General Information

There is no available health or risk assessment information for the Tertiary Pond.

Figure B4-2 shows the general land use for the surrounding area. Figure B4-3 presents the local zoning map and Figure B4-4 is an aerial photograph of the Michigan Operations Facility. The available waste analysis information is provided in Attachment XIV.A2, Chemical and Physical Analyses and Attachment XIV.A3, Waste Analysis Plans.

The Tertiary Pond receives approximately 20 million (MM) gallons of liquid waste per day via pipelines. The Facility is inspected by EGLE. The Facility structures and equipment are inspected routinely by plant personnel, to identify malfunctions, deterioration, operator errors, discharges and any other situations which may lead to the release of hazardous waste constituents into the environment or a threat to human health. See Attachment XIV.A5, Inspection Schedules for details on inspection procedures.

The inspection compliance reports are maintained at the Facility central filing system for the current and three previous years and are then archived in long term storage for the life of the Facility.

The primary failure mode likely in the Tertiary Pond is the leakage of hazardous wastes or hazardous constituents from the impoundment into the surrounding groundwater, surface waters or soil. These media are addressed individually below.

B4.C.1(b) Groundwater

The Tertiary Pond is constructed over native soils. Lateral contaminant transport to groundwater is prevented by engineering controls (Tertiary Pond RGIS and the Tertiary Pond Slurry Wall). For further information on Corrective Actions, see Attachment XIV.B2, Corrective Action. Vertical contaminant transport is minimized by the underlying Regional Aquitard. Refer to Attachments XIV.B3 and XIV.B4, Hydrogeologic Report and Environmental Assessment, respectively. Groundwater detection monitoring is performed to demonstrate no releases are occurring from the unit on an ongoing basis. Further details on groundwater monitoring are provided in Attachment XIV.B5, Environmental Monitoring Programs.

B4.C.1(c) Surface Water

The Tertiary Pond is located within 275 feet of the Tittabawassee River, which bisects the Facility, and within 110 feet of Bullock Creek. The impoundment includes engineering controls (Tertiary Pond RGIS and the Tertiary Pond Slurry Wall) to prevent migration of contaminants to these surface water bodies. Annual inspections of the Tertiary Pond occur and include the area between the Tertiary Pond and both the Tittabawassee River and Bullock Creek.

Environmental monitoring has continued to demonstrate that the engineering controls in place are effectively preventing impacts resulting from activities at the Facility. See Attachment XIV.B5, Environmental Monitoring for details on surface water protection monitoring.

B4.C.1(d) Air

Ambient air monitoring is conducted on a Facility-wide basis. The Tertiary Pond is managed so that there are no exposed solids and there are no impacts to air. See Attachment XIV.B5, Environmental Monitoring Programs for details on the ambient air monitoring activities.

B4.C.1(e) Subsurface Gas

This subsection is not applicable for the Tertiary Pond. The Tertiary Pond was constructed in a manner that it does not impact native soils below. The management of liquid waste in the Tertiary Pond does not generate subsurface gas.

B4.C.1(f) Soil

The current normal operations and the construction of the Tertiary Pond do not impact native soils. There is no evidence of a release from the Tertiary Pond that has impacted soil. The Tertiary Pond is monitored and maintained in accordance with the Tertiary Pond Maintenance Plan dated September 27, 2007.

After the active life of the Surface Impoundment, it will be closed in accordance with Condition II.M of the Operating License. See Attachment XIV.A11, Closure and Post-closure Plans for information about the final cover system.

B4.C.1(g) Transportation Information

The liquid waste managed by the Tertiary Pond is delivered to the pond via pipelines. There is no transport of the waste via vehicle. Attachment XIV.A8 presents a discussion of the general transportation information for the Facility.

B4.C.1(h) Management Practices

The Dow Chemical Company participates in the global Responsible Care® initiative in conjunction with the American Chemistry Council's Responsible Care initiative which requires that companies implement a Responsible Care Management System® (RCMS®), which is certified by third-party auditors. The RCMS assures continuous improvement in environment, health, safety, and security performance and its basic framework includes:

- Policy & Leadership
 - Leadership Responsibility - Commitment
- Planning (PLAN)
 - Define Risks/Hazards - Objectives & Targets
 - Process/Program Development - Communications
- Implementation, Operation & Accountability (DO)
 - Training - Documentation
 - Procedures - Management of Change and Employee Empowerment
- Performance Measurement & Corrective Action (CHECK)
 - Self-Assessment - Incident Investigations
 - Internal Audits - Records Management
 - Corrective/Preventative Action - Measurements
- Management Systems Review (ACT)
 - Management Systems Review

Dow maintains a database of all injuries and accidents at the Facility. To date no injuries or accidents have occurred due to the operation of the Tertiary Pond. Internal health and safety protocols and procedures are in place to ensure workers safety in case of injury, illness, accident. Work is covered by either a safe work permit or a written procedure. The material safety data sheets (MSDS) are located in Environmental Operations and are accessible. The Facility Central Files contain information regarding safety meeting topics and videos, injury data history, MSDS updates, site safety statistics, site standards, site safety plan, Attachment XIV.A7, The Michigan Operations Contingency Plan is available for reference, as well.

B4.C.1(i) Known Release Information

There are no known releases from the Tertiary Pond. The West RGIS monitoring program is in place, as described in Attachment XIV.B5, Environmental Monitoring Program.

B4.C.1(j) Tertiary Pond Location and Potential to Cause Human Exposure

There is a very low potential for human exposure related to the wastes in the Tertiary Pond due to the construction and operation of the impoundment.

B4.C.2 Salzburg Landfill

B4.C.2(a) General and Pathway-Specific Information

A general description of the SLF, including land use and zoning in the surrounding areas, was provided in Section B4.A.1 of this Environmental Assessment. A formal Risk Assessment has not been performed for the site, and analytical data from the site are not available at this time. Section B4.B.6 of this Environmental Assessment contains the Failure Mode Assessment to evaluate the adverse affects of hypothetical landfill failures.

The wastes disposed at the SLF include a wide variety of hazardous materials, (for example, incinerator ash, contaminated soil, dewatered sludges, asbestos, and demolition rubble) Appendix A, List of Acceptable Waste Types, of Attachment XIV.A2, Chemical and Physical Analyses, of this application describes the acceptable waste types for disposal at the SLF.

Under normal circumstances, the environmental impact of the SLF should be minimal and can be mitigated or moderated, as described in Section B4.A. Under failure mode (e.g., accidental release, liner failure, fire, or flooding), media that could potentially be impacted by hazardous waste landfill operations include groundwater, surface water, soil, and air. The potential for human exposure via these pathways is discussed in this Section. To date, there have been no known releases of hazardous waste to the environment from normal operations, leachate collection or a liner failure, or other accidental release from the SLF.

B4.C.2(b) Transportation

The transportation route from the Facility to the Salzburg Landfill site is over one all-weather

public road (Salzburg Road). Saginaw Road has been incorporated into the facility. Under normal operation, waste (the majority of which is incinerator ash) is transported to the landfill every Wednesday, and on an as needed basis the rest of the week. A vehicle wash-down (decontamination) facility is provided at the SLF. In the event that the Salzburg Road entrance is not available, a secondary entrance (mainly used for non-waste hauling vehicles) exists off of Waldo Road.

In the event of a spill, cleanup is handled by trained personnel wearing appropriate personal protective equipment in accordance with Dow Chemical's policies and procedures.

B4.C.2(c) Human Exposure Potential

Likely receptors within the SLF are site workers, including operations personnel (transporting, placing, and covering wastes) and construction workers (excavating and constructing new cells or capping closed cells). Exposure to hazardous chemicals via groundwater is unlikely. Groundwater is not a potable water source and is deeper than planned excavation at the site. The only surface water on-site is in drainage ditches after a rain event. Stormwater in the ditches does not come in contact with the waste and is not impacted. Exposure to contaminated soil, either by dermal contact, ingestion, or inhalation of dust, is possible, as is inhalation of volatile emissions from hauling or landfilling waste. However, these exposures are minimized, if not avoided completely, by the required use of protective clothing and safety equipment by all SLF personnel. Training programs are also in place to educate personnel regarding the hazard potential and safe handling of the materials managed at the SLF.

Trespassers on the property are not anticipated due to the perimeter fence, the locked gates at the entrances, posted warning signs, and other site security measures. These measures eliminate the potential for non-employees to unknowingly expose themselves to hazardous materials within the SLF.

The potential for hazardous chemical exposure to the general public due to normal operations at the site is considered to be negligible. In the unlikely event of accident or failure, exposure to the public via groundwater would not be expected, since the groundwater in the area is not a potable water source. Exposure via contact with contaminated surface water, in the unlikely

event of an accident, could be possible, since runoff from the SLF eventually drains to the Tittabawassee River. Significant site-specific exposures are unlikely, however, due to the location of the river within an industrial area. Direct contact with contaminated soil would also not be likely for the general public, since such contamination would be limited to areas within the fenced perimeter of the SLF. The only other potential exposure pathways for the public would be the inhalation of particulate matter or volatile emissions from a release either within the SLF or from a vehicle transporting waste to the SLF. The potential for exposure to the general public under these conditions is low. Routine air monitoring has shown that air quality is well within applicable air standards.

B4.D EVALUATION OF ALTERNATE HAZARDOUS WASTE MANAGEMENT TECHNOLOGIES

Construction costs have already been incurred since this is an existing licensed Facility. This section evaluates several operational alternatives:

- Alternative 1. Continue centralized operations at the existing Facility
- Alternative 2. Management of wastes at sites of generation
- Alternative 3. Waste reduction

Alternative 1, continuation of centralized operations at the existing Facility, is the selected alternative.

Alternative 1. Continue centralized operations at the existing Facility

The advantages of the existing Facility are that facilities and procedures are in place, fewer workers are needed, and documentation is centralized and established. Releases and non-compliance with regulations are less likely due to the existence of suitable facilities, trained staff and established operating procedures, including zoning (industrial). Construction, operation, and management of the SLF are subject to licensing and oversight by the Michigan Department of Environmental Quality, Office of Waste Management and Radiological Protection.

The disadvantage of centralized operation is the costs and risks associated with additional transportation of wastes.

Alternative 2. Management of wastes at sites of generation

The advantages of managing wastes at each site of generation are reduced costs and risks associated with transportation. Dow's practice is such that only hazardous wastes which cannot be treated or effectively incinerated are landfilled. Landfilling wastes in a facility other than site landfills would only change the disposal destination.

The disadvantages of managing wastes at each site of generation are the need for additional staff, additional training, new operating procedures for each site, and additional costs for licensing and construction of physical facilities.

Alternative 3. Waste reduction

Waste reduction applies to either alternative and these efforts are on-going. Dow also participates in the Responsible Care[®] program of the chemical industry that promotes continuous improvement in the environment. This program includes:

- Train other businesses and our customers on process safety
- Help customers use, transport, and dispose of our products safely
- Provide technical support and information for our customers
- Help train community emergency responders
- Teach communities about recycling
- Work with community advisory panels
- Improve manufacturing processes to reduce waste and energy consumption
- Recycle manufacturing by-products
- Strive to work safely and develop improved safety procedures
- Create better ways to transport products
- Find processes and products that reduce environmental impact

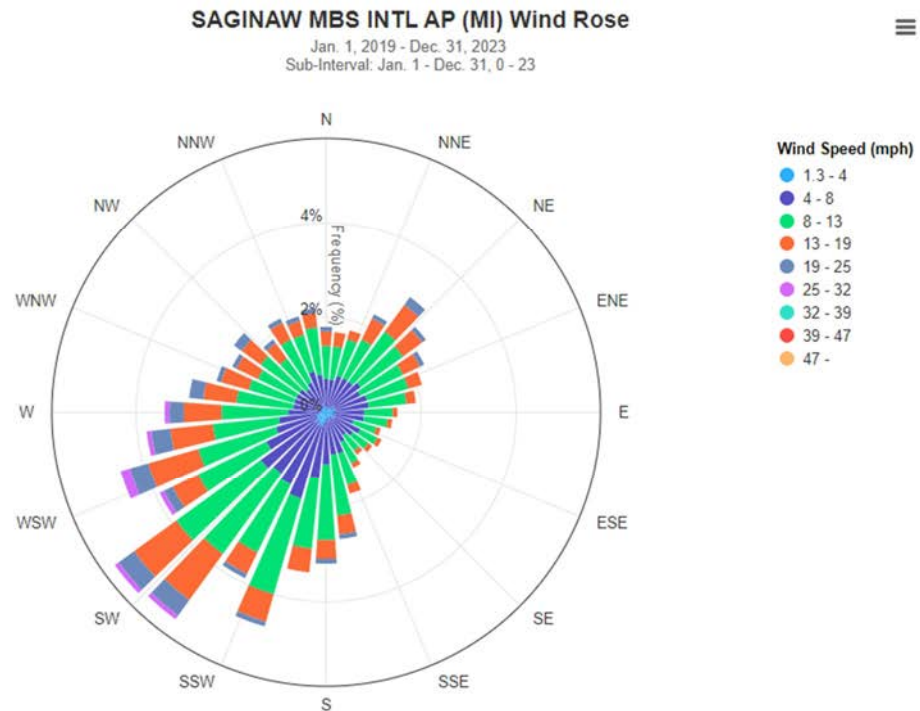
References

- ABC12, 2024. Dam Recovery. Four Lakes Task Force Revises Dam Rebuilding Schedule. https://www.abc12.com/news/dam-recovery/four-lakes-task-force-revises-dam-rebuilding-schedule/article_c986be6e-f80d-11ee-9c31-3bfd6b238082.html
- City of Midland, 2024(a). City Services; Patrol Division; and Planning and Development Department. <https://cityofmidlandmi.gov/>. June 2024.
- City of Midland, 2024(b). Zoning Ordinance. <https://cityofmidlandmi.gov/492/Zoning-Ordinance>. June 2024.
- CNN, 2020. Michigan Dam Breaches. <https://www.cnn.com/2020/05/20/weather/michigan-dam-breaches/index.html>
- The Detroit News (2020). Tittabawassee River Midland Flooding. <https://www.detroitnews.com/story/news/local/michigan/2020/05/20/tittabawassee-river-midland-flooding/5226734002/>
- The Dow Chemical Company (2023). Midland Fish Passage Mussel Survey Report and Relocation Plan. August 15, 2023.
- EGLE (2022). Air Quality Annual Report. <https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Reports/AQD/monitoring/annual-reports/2022-air-quality-annual-report.pdf?rev=ce6b1249df6d49b7b0bc2ac57db509a9&hash=30247DBCF9BA43E56DC91E604291D89F> . May 2024.
- Fish and Wildlife Service (FWS) (2024). Tittabawassee River Midland Fish Passage Restoration Project. <https://www.fws.gov/story/tittabawassee-river-midland-fish-passage-restoration-project#:~:text=The%20Dow%20Dam%20on%20the%20Tittabawassee%20River%20in,currently%20impedes%20fish%20passage%20during%20most%20flow%20conditions>. May 2024.
- MDNR. (1988). Remedial Action Plan for Saginaw River and Bay Areas of Concern.
- Midland Business Alliance (2021). 2021 Leading Employers in Midland County. <https://mbami.org/leading-employers/> . June 2024.
- Tittabawassee and Saginaw River Team, 2024. Ecological Risk Assessment: Segments 1-7. Tittabawassee River/Saginaw River and Bay Site. May 2024.
- U.S. Census Bureau (2020). 2020 Census Results. <https://www.census.gov/programs-surveys/decennial-census/decade/2020/2020-census-results.html> . June 2024.
- USGS (2024). Tittabawassee River at Midland, MI, Gauging Station #04156000 Data. <https://waterdata.usgs.gov/monitoring->

Dow Chemical Michigan Operations Operating License Reapplication
Environmental Assessment, Revision March 2025
Site ID No. MID 000 724 724 and MID 980 617 435

[location/04156000/#parameterCode=00065&period=P7D&showMedian=false . June 2024.](#)

Figure B4-1. Wind Rose for MBS International Airport



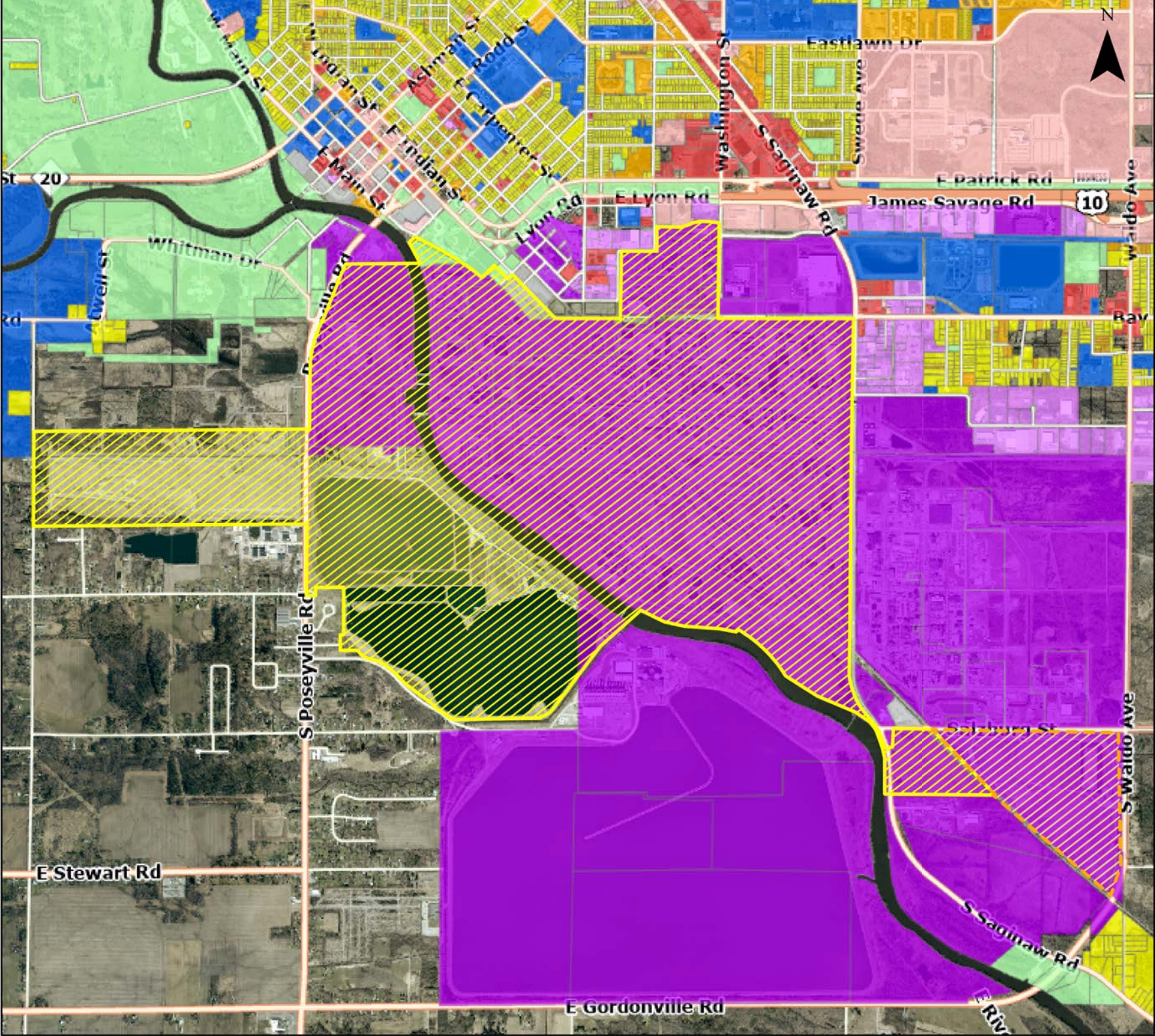
SAGINAW MBS INTL AP (MI) - Wind Frequency Table (percentage)


Latitude : 43.5331 Start Date : Jan. 1, 2019 Sub Interval Windows
 Longitude : -84.0797 End Date : Dec. 31, 2023 Start End
 Elevation : 660 ft. # of Days : 1826 of 1826 Date Jan. 1 Dec. 31
 Element : Mean Wind Speed # obs : poss : 43102 of 43824 Hour 0 23

(Greater than or equal to initial interval value and Less than ending interval value.)

Range (mph)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	Total			
1.3 - 4	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	5.8
4 - 8	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.5	0.6	0.5	0.5	0.6	0.7	0.8	0.9	1.2	1.6	1.4	1.4	1.4	1.2	0.9	0.8	0.7	0.6	0.6	0.6	0.6	0.5	0.6	0.7	0.7	0.8	0.7	0.7	28.1	
8 - 13	0.7	0.7	0.8	0.9	1.3	1.1	1.0	0.9	0.8	0.6	0.5	0.5	0.4	0.4	0.4	0.5	0.7	1.3	1.6	1.5	2.1	1.6	2.1	2.2	1.6	1.7	1.4	1.4	1.2	1.0	0.9	1.0	0.8	1.0	0.8	1.0	0.8	38.4		
13 - 19	0.3	0.3	0.2	0.5	0.7	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.4	0.4	0.5	0.6	0.5	1.2	1.1	0.6	1.1	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	16.4			
19 - 25	0.1	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.4	0.4	0.2	0.4	0.4	0.3	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	4.3			
25 - 32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8		
32 - 39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1		
39 - 47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
47 -	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total(%)	1.8	1.7	1.9	2.4	3.2	2.6	2.3	2.1	1.9	1.6	1.5	1.3	1.2	1.2	1.1	1.3	1.7	2.7	3.2	3.5	4.7	3.9	5.4	5.5	4.0	4.5	3.8	3.3	3.0	2.5	2.2	2.4	2.0	2.2	2.1	2.2	94.0			
Calm (<1.3)																																						5.9		
Ave Speed	9.4	9.0	9.0	10.4	11.4	10.1	9.7	9.2	8.6	8.1	8.0	7.8	7.7	7.6	7.8	8.0	8.2	9.4	9.5	8.9	9.2	9.1	11.0	10.9	10.3	12.2	12.2	11.6	11.5	10.7	10.8	11.0	10.7	10.2	9.5	9.6	9.5			

- Existing Land Use**
- 2-FAMILY RESIDENTIAL
 - AGRICULTURAL
 - HEAVY INDUSTRIAL
 - LIGHT INDUSTRIAL
 - MOBILE HOME PARK
 - MULTIPLE FAMILY RESIDENTIAL
 - NO ACTIVITY
 - OFFICE SERVICE
 - PARKING/AIRPORT
 - PARKS AND RECREATION
 - PUBLIC/ SEMI-PUBLIC
 - RETAIL COMMERCIAL
 - SINGLE FAMILY RESIDENTIAL
 - WASTE RELATED ACTIVITY
- Roads**
- Freeway
 - Major Road
 - Major Road
 - Local Road
 - Local Road (Private)
 - Other
- Other**
- Dow Facility Boundary
 - Salzburg Landfill



-  City Boundary
- Zoning Overlay Districts**
 -  CENTER CITY OVERLAY DISTRICT
 -  DOWNTOWN NORTHSIDE OVERLAY DISTRICT
 -  DOWNTOWN OVERLAY DISTRICT
- Zoning Districts**
 -  AGRICULTURAL (AG)
 -  CIRCLE DISTRICT (C)
 -  COMMUNITY COMMERCIAL (CC)
 -  COMMUNITY (COM)
 -  DOWNTOWN DISTRICT (D)
 -  INDUSTRIAL (IA)
 -  INDUSTRIAL (IB)
 -  LIMITED COMMERCIAL, MANUFACTURING (LDMR)
 -  NEIGHBORHOOD COMMERCIAL
 -  OFFICE SERVICE (OS)
 -  RESIDENTIAL (RA-1)
 -  RESIDENTIAL (RA-2)
 -  RESIDENTIAL (RA-3)
 -  RESIDENTIAL (RA-4)
 -  RESIDENTIAL (RB)
 -  RESIDENTIAL (RB-2)
 -  REGIONAL COMMERCIAL (RC)
 -  MOBILE HOME PARK (RD)
 -  FACILITY BOUNDARY
 -  SALZBURG LANDFILL
 -  FACILITY 1 MILE BUFFER

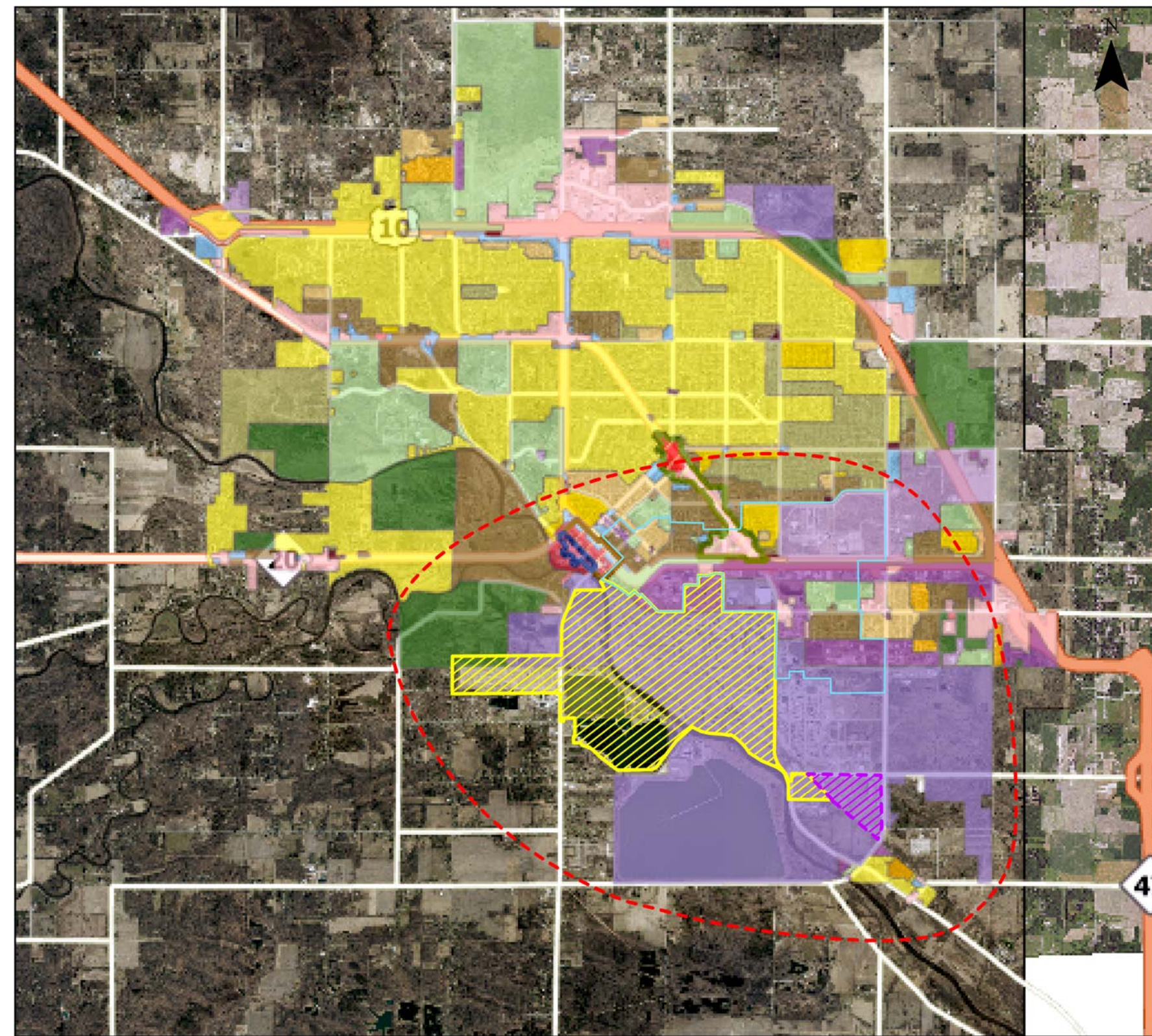


Figure B4-4
Aerial of MiOPs

CLIENT

THE DOW CHEMICAL
COMPANY -
MICHIGAN DIVISION
MIDLAND, MI

CONSULTANT



AECOM
MICHIGAN - DOW PROGRAM
25 BUILDING
MIDLAND, MICHIGAN 48667
989-636-0151 TEL 989-636-2700 FAX
www.aecom.com

CONSULTANTS

Project Manager
Helen Artz Patton
Regulatory Specialist, Remediation, Austin,
Texas
1.512.296.5803
www.aecom.com

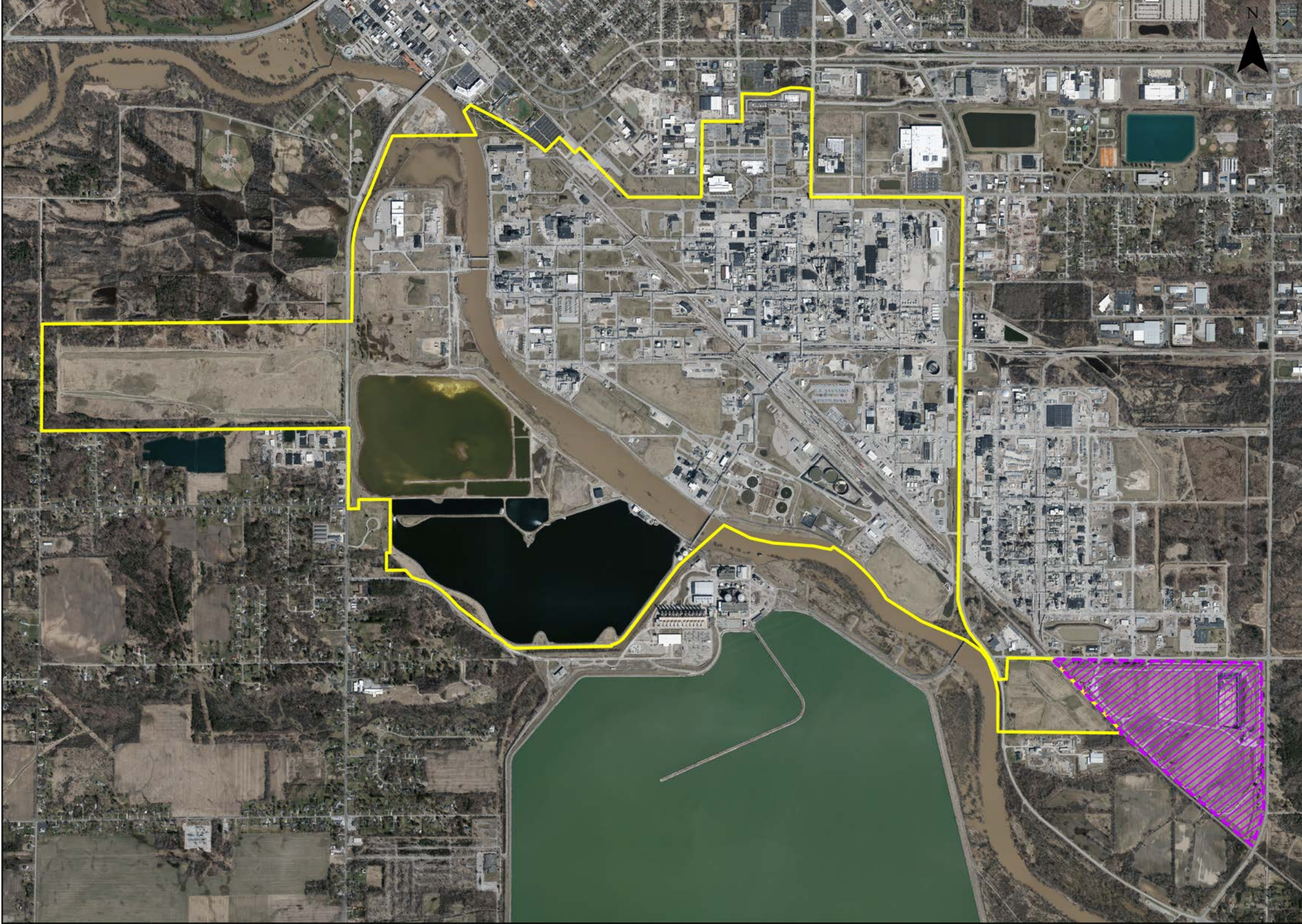
Geologist II
Noah Tibbitts
25 Building
Midland, MI 48667
616.293.9887 tel 989.636.2700 fax
www.aecom.com

LEGEND

-  Dow Facility Boundary
-  Salzburg Landfill

PROJECT NUMBER

Z:\GIS\Projects\License Renewal\NEW maps\Land use



-  Facility Boundary Polygon
-  Dow Property
- NLCD Land Cover Class**
-  Open Water
-  Perennial Snow/Ice
-  Developed, Open Space
-  Developed, Low Intensity
-  Developed, Medium Intensity
-  Developed, High Intensity
-  Barren Land
-  Deciduous Forest
-  Evergreen Forest
-  Mixed Forest
-  Shrub/Scrub
-  Herbaceous
-  Hay/Pasture
-  Cultivated Crops
-  Woody Wetlands
-  Emergent Herbaceous Wetlands

