

Moorhead East Growth Area Alternative Urban Areawide Review (AUAR) Update

Prepared for: City of Moorhead, MN
Prepared by: Stantec Consulting Services, Inc.

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Introduction

An Alternative Urban Areawide Review (AUAR) is authorized under Minnesota Rules Chapter 4410.3610 as an alternative form of environmental review for development projects. Generally, the AUAR consists of one or more development scenarios, an inventory of environmental and cultural resources, an assessment of the “cumulative” impacts that the development scenarios may have on these resources as well as public infrastructure services, and a set of mitigation measures that reduce or eliminate the potential impacts generated by the development. The AUAR is intended to address the “cumulative” impacts resulting from a sequence of related development projects as opposed to an Environmental Assessment Worksheet (EAW) or Environmental Impact Statement (EIS) which simply looks at a single project’s impacts and does not attempt to outline mitigation initiatives.

An AUAR is used as a tool to help parties interested in development within a defined area understand the existing environmental and cultural resources present on a site prior to initiating detailed planning and design. It is also used to identify key initiatives that must or should be undertaken to minimize negative impacts generated by proposed development.

AUAR Process Summary

The City first completed an AUAR for the AUAR area in conjunction with a study of the East Moorhead Township growth area in 2018. The City of Moorhead expected that property owners and developers in the growth area would begin to explore development projects. Rather than evaluating projects individually, the City desired a comprehensive review of the potential impacts of full growth east of the city.

In accordance with Minnesota Rules 4410.3610 Subp. 7, for the AUAR to remain valid as the environmental review document for the area, the document needs to be updated every five years until all development in the study area has received final approval. Since undeveloped areas still remain in the study area and the AUAR will expire in 2023, the purpose of this document is to update the AUAR pursuant to Minnesota Rules.

A relatively small amount of development has occurred since 2018, and much of the analysis in the 2018 AUAR remains valid. The City adopted an update to the Comprehensive Plan in 2022, which is used as one of the development scenarios for this AUAR update. The land uses in the Comprehensive Plan update are nearly identical to the land uses in the 2018 AUAR Scenario 2: Maximum Development. Differences include simplified land uses (heavy industrial and light industrial became one industrial land use category) and the addition of mixed use in some formerly commercial-only areas. The EQB adopted a new Climate EAW form in December 2022, adding several new questions meant to evaluate the impacts of climate change on any potential development. This AUAR update uses the new Climate EAW form to evaluate potential expansion into the East Growth Area.

Environmental Assessment Worksheet

This most recent Environmental Assessment Worksheet (EAW) form and guidance documents are available at the Environmental Quality Board's website at: <https://www.eqb.state.mn.us/> The EAW form provides information about a project that may have the potential for significant environmental effects. Guidance documents provide additional detail and links to resources for completing the EAW form.

Cumulative potential effects can either be addressed under each applicable EAW Item or can be addressed collectively under EAW Item 21.

Note to reviewers: Comments must be submitted to the RGU during the 30-day comment period following notice of the EAW in the *EQB Monitor*. Comments should address the accuracy and completeness of information, potential impacts that warrant further investigation and the need for an EIS.

1. **Project Title:** Moorhead East Growth Area AUAR Update

2. **Proposer**

Proposer: City of Moorhead
Contact person: Robin Huston
Title: City Planner/Zoning Administrator
Address: 500 Center Ave
City, State, ZIP: Moorhead, MN 56561
Phone: 218-299-5374
Email: robin.huston@moorheadmn.gov

3. **Responsible Governmental Unit (RGU)**

RGU Agency: City of Moorhead
Contact person: Robin Huston
Title: City Planner/Zoning Administrator
Address: 500 Center Ave
City, State, ZIP: Moorhead, MN 56561
Phone: 218-299-5374
Email: robin.huston@moorheadmn.gov

4. **Reason for EAW Preparation**

Required:

- ☐ EIS Scoping
- ☐ Mandatory EAW

Discretionary:

- ☐ Citizen petition
- ☒ RGU discretion
- ☐ Proposer initiated

If EAW or EIS is mandatory give EQB rule category subpart number(s) and name(s):

Over the past decade, the City of Moorhead has experienced an increase in development activity that has led to the need to plan for future growth. The City of Moorhead recognized the need for more detailed land use planning that would facilitate the development of multiple parcels in a cohesive manner and ensure that the public infrastructure needed to support development is planned appropriately. This AUAR Update is being prepared to evaluate the potential future growth and its associated impacts on a cumulative basis rather than on a piecemeal basis as individual projects require or conduct environmental reviews. This is a discretionary AUAR completed by the City of Moorhead.

5. Project Location

County: Clay County

City/Township: Moorhead, MN

PLS Location (¼, ¼, Section, Township, Range): Sections 11-15, Township 139N, Range 48W; Sections 18-19, Township 139N, Range 47W; Sections 23-24, Township 139N, Range 48W

Watershed (81 major watershed scale): County Ditch #47 Minor Watershed and Upper Red River of the North (57)

GPS Coordinates: 46°50'27.6"N 96° 41'56.2W

Tax Parcel Number: N/A

At a minimum attach each of the following to the EAW:

- County map showing the general location of the project;
- U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (photocopy acceptable); and
- Site plans showing all significant project and natural features. Pre-construction site plan and post-construction site plan.
- List of data sources, models, and other resources (from the Item-by-Item Guidance: *Climate Adaptation and Resilience* or other) used for information about current Minnesota climate trends and how climate change is anticipated to affect the general location of the project during the life of the project (as detailed below in item 7. Climate Adaptation and Resilience).

Figures 5-1 through 5-3 show project location

6. Project Description

- a. *Provide the brief project summary to be published in the EQB Monitor, (approximately 50 words).***

The City of Moorhead is updating the East Growth Area AUAR for the first time since its adoption in 2018. A relatively small amount of development has occurred in the growth area since 2018. The 2023 Update includes assumptions in the adopted 2022 Comprehensive Plan Update and the AUAR update incorporates questions regarding climate change adopted by the EQB in December 2022.

- b. *Give a complete description of the proposed project and related new construction, including infrastructure needs. If the project is an expansion include a description of the existing facility. Emphasize: 1) construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes, 2) modifications to existing equipment or industrial***

processes, 3) significant demolition, removal or remodeling of existing structures, and 4) timing and duration of construction activities

The AUAR area encompasses over 4,000 acres in east Moorhead Township and the southern portion of the City of Dilworth. Total build out of the AUAR area is not anticipated for over 20 years. This AUAR evaluates the potential full build-out scenario, as per the Growth Area Plan (GAP) adopted in 2016 and any updated policies from the 2022 Comprehensive Plan.

The full build-out development scenario is evaluated in this AUAR. This scenario reflects the land use pattern described in the Moorhead Growth Area Plan (GAP). The GAP was developed to address the increase in development activity that has led to the need to plan for future growth. General directions for the GAP were established based on the City Comprehensive Plan (updated in 2022), stormwater plans, utility infrastructure plans, and regional transportation plan as provided by Fargo-Moorhead Metropolitan Council of Governments (Metro COG). The general public, city staff, affected property owners and the development community were integrally involved throughout any past planning processes, providing input before alternatives were conceived and reviewing proposed alternatives to help converge on a preferred plan.

The future land uses for the Growth Areas were reinforced and formally adopted in the City's 2022 Comprehensive Plan Update, fulfilling a mitigation step in the 2018 AUAR. Minor changes were made to planned land uses to consolidate the City's land uses and create more areas that allow for mixed use development. Except these minor changes, the future land uses in the Growth Areas remain the same as in the 2018 AUAR full-buildout scenario (2).

1) Construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes.

Development in the AUAR area is not anticipated to involve the physical or hydrologic alteration of any existing surface waters; however, development could impact the Red River and its tributary streams if storm water runoff is not managed adequately.

2) Modifications to existing equipment or industrial processes

There will be no modifications to existing equipment or industrial processes. Any and all existing equipment will be removed from the site and disposed of according to all applicable city, state and federal regulations.

3) Significant demolition, removal or remodeling of existing structures

At this time, the city does not have plans for significant demolition, removal, or remodeling of any existing structures. However, should demolition occur, all construction wastes will be removed and disposed of off-site according to all applicable city, state and federal regulations.

4) Timing and duration of construction activities

The AUAR is not anticipated to reach full buildout within 20 years, depending upon market conditions.

c. Project magnitude

Total AUAR Acreage is approximately 4,313.50 acres.

This AUAR will evaluate two development scenarios with varying magnitudes. Table 1 summarizes the development magnitude data for each Scenario.

Scenario 1: No Further Build. This scenario assumes that development in the East AUAR area would halt at its current state. Therefore, acreage and development intensity figures used in this AUAR represent the current status (at time of writing) of development in the East AUAR area.

A relatively small amount of development or redevelopment has occurred in the growth area since the 2018 AUAR, which is reflected in the acreage assumptions for Scenario 1 – No Further Build in Table 1 below. Development or redevelopment since 2018 in the AUAR area includes about 10 acres of low density residential development, 3.4 acres of high density residential and mixed use development and about 2 acres of industrial development.

Scenario 2: Maximum Development. This scenario assumes that all land in the East AUAR area will develop to its maximum allowed intensity. The acreage figures for this scenario represent how the current AUAR area acreage is guided by the city. The development intensity figures for Scenario 2 represent the maximum development that could occur in the East AUAR area based on the City's current land use and zoning controls.

The acreages in Scenario 2 - Maximum Development have shifted slightly since the original 2018 AUAR based on the City's recently adopted 2022 Comprehensive Plan Update.

Table 1. Acreage Assumptions of East AUAR Area Scenarios

Land Uses	Scenario 1: No Further Build (acres)	Scenario 2: Maximum Development (acres)*
Residential	95.94 (+13.3)	1,284.25 (- 20.83)
Commercial	60.06	42.18 (- 62.15)
Mixed Use	--	258.17 (+ 72.15)
Industrial	1.85 (+1.85)	742.87
Public/Semi-Public, Institutional	179.20	335.84 (+ 40.21)
Parks & Open Space	20.57	44.82 (- 25)
Agricultural/Urban Reserve	3,663.56 (-15.15)	1,284.25
Right-of-Way	266.52	288.74 (- 4.39)
Open Water	25.80	32.38
Total	4,313.50	4,313.50

*Note: Maximum Development Acreage assumptions are based on the 2022 Comprehensive Plan Update. As development occurs, subdivision requirements will be applied including park dedication and right-of-way requirements which will increase the acreage in those two categories.

d. Explain the project purpose; if the project will be carried out by a governmental unit, explain the need for the project and identify its beneficiaries.

The City of Moorhead has experienced an increase in development activity that has led to the need to plan

for future growth. The City of Moorhead recognized the need for more detailed land use planning that would facilitate smart growth and the development of multiple parcels in a cohesive manner and ensure that the public infrastructure needed to support development is planned appropriately. This is a discretionary AUAR Update completed by the City of Moorhead.

The City is constrained by its flat ground and soils, which challenges the City's ability to extend sewer infrastructure to areas not currently served. Because of this, the growth areas are intended to be a long-term growth opportunity for the City. In the City's current 2022 Comprehensive Plan Update, most growth is focused in the City's mixed-use areas – downtown, along Highway 10 (EasTen) and around the I-94 intersection (Holiday).

The development within the AUAR area, while long-term, will increase housing options and availability and provide recreation opportunities, hospitality and commercial services to the area. The City and the region will be positively impacted by the increased revenue and property taxes generated by development within this area, as well as enhancements to services, jobs, and recreational opportunities in the region. The projects will mostly be completed by private developers.

- e. Are future stages of this development including development on any other property planned or likely to happen? ☐ Yes ☒ No***

If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review.

No. The AUAR evaluates the full build-out of proposed development within the AUAR area. The area is planned to be developed continuously for the next 20+ years in response to market demand.

- f. Is this project a subsequent stage of an earlier project? ☐ Yes ☒ No***

If yes, briefly describe the past development, timeline and any past environmental review.

N/A

7. Climate Adaptation and Resilience

- a. Describe the climate trends in the general location of the project (see guidance: Climate Adaptation and Resilience) and how climate change is anticipated to affect that location during the life of the project.***

In general, Minnesota is anticipated to experience an increase in temperature, precipitation, and more frequent extreme precipitation events resulting from climate change. In Minnesota, annual average temperatures have risen two degrees over the past century and up to three degrees in the northern part of the state. The highest average temperature increases have occurred during the winter. Since 1895, temperatures during the winter have increased at a rate two to three times higher than during the summer. In particular, winter warming rates have risen more sharply in recent decades¹. Current climate warming trends, most notably during the winter, are anticipated to continue².

Heavy rain events have become more frequent in Minnesota and more intense. From 1973 to 2020,

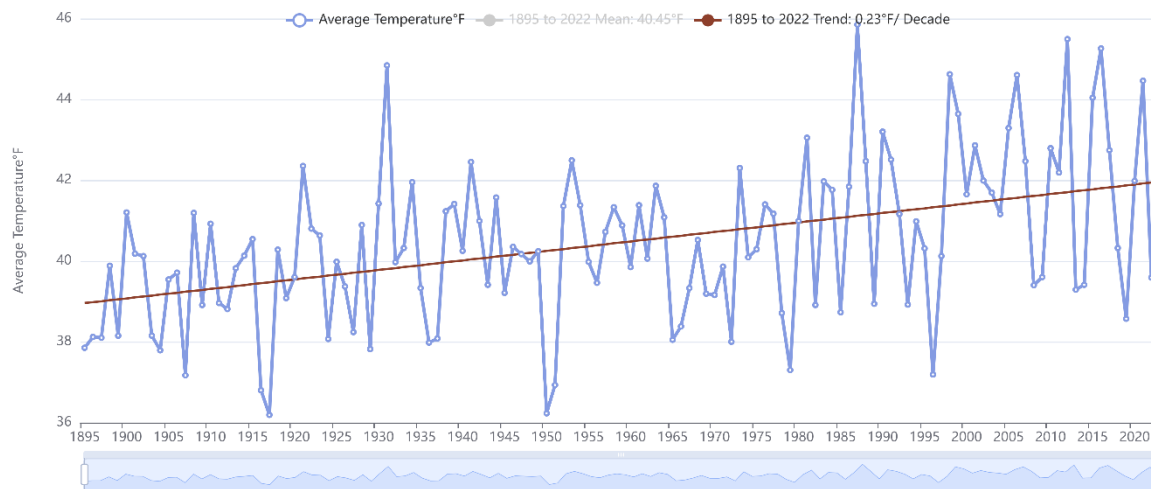
¹ DNR. 2021. Climate Trends. Available at: https://www.dnr.state.mn.us/climate/climate_change_info/climate-trends.html. Accessed May 2023.

² MnDOT. 2021. Minnesota Go Climate Change Report. Available at: <https://www.minnesotago.org/trends/climate-change>. Accessed May 2023.

Minnesota experienced 17 mega-rain events³ with a notable increase since 2000. Of these 17 events, three occurred in the 1970s, two in the 1980s, one in the 1990s, six mega-rain events occurred in the 2000s, four in the 2010s, and one in 2020. Thus, in the past 21 years (2000 to 2020), almost two times as many mega rain events occurred compared to the prior 27 years (1973 to 1999)⁴.

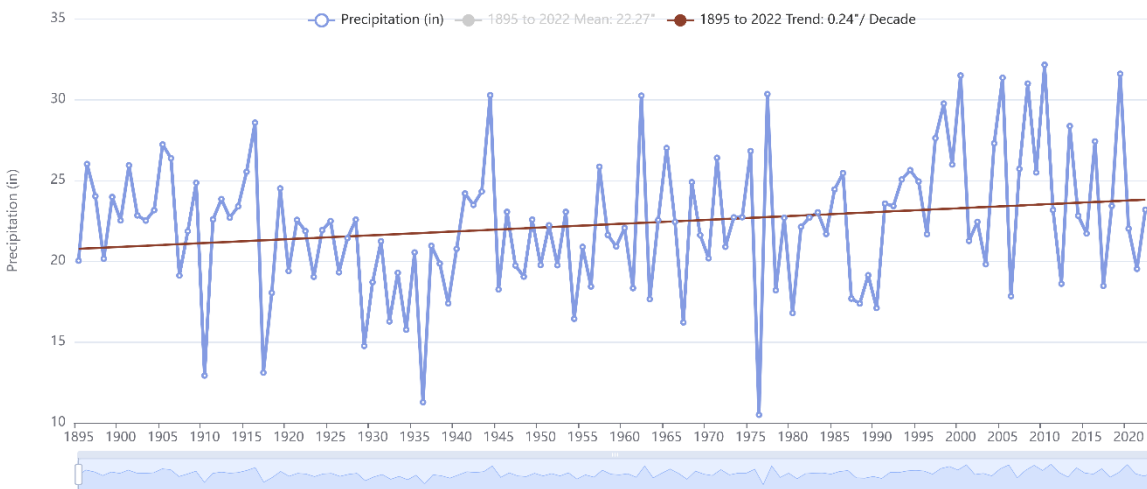
Climate trends for Clay County parallel the overall statewide trends, indicating Minnesota's climate is becoming warmer and wetter. Exhibits 1 and 2 illustrate historical average annual temperature and precipitation trends from 1895 to 2022. During this time period, the County experienced an average annual temperature increase of 0.23 degrees Fahrenheit (°F) per decade and annual precipitation increase of 0.24 inches per decade.

Exhibit 1. Historical Annual Average Temperature in Clay County (1895 – 2022)



Source: Minnesota Department of Natural Resources. <https://arcgis.dnr.state.mn.us/cwr/climateexplorer/main/historical>

Exhibit 2. Historical Annual Average Precipitation in Clay County (1895 – 2022)



³ Mega-rain events are defined as events in which six inches of rain covers more than 1,000 square miles and the core of the event tops eight inches.

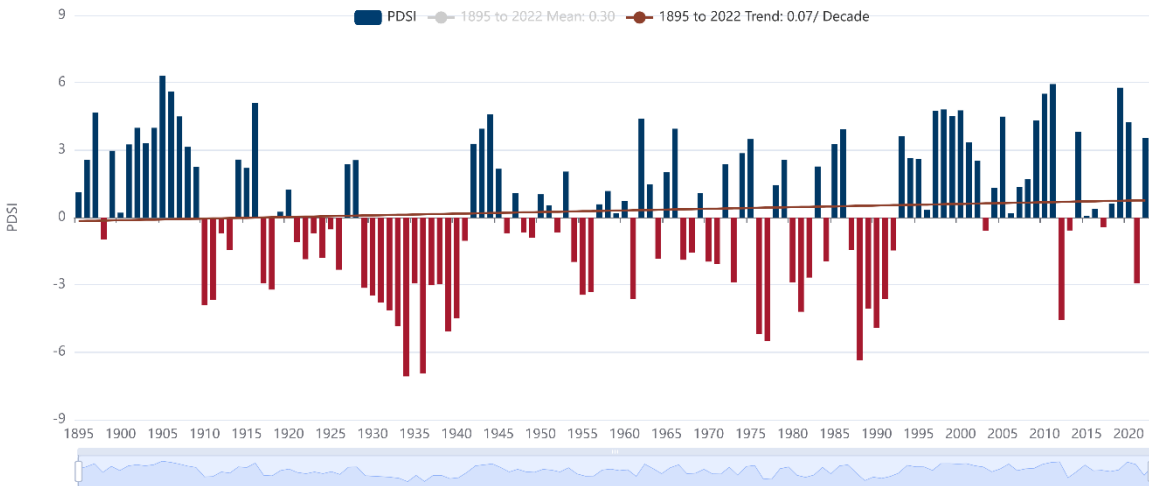
⁴ DNR. 2022. Historic Mega-Rain Events in Minnesota. Available at:

https://www.dnr.state.mn.us/climate/summaries_and_publications/mega_rain_events.html. Accessed May 2023.

Source: Minnesota Department of Natural Resources. <https://arcgis.dnr.state.mn.us/ewr/climateexplorer/main/historical>

The Palmer Drought Severity Index (PDSI) utilizes temperature and precipitation data to estimate relative soil moisture conditions and serve as an indicator of long-term drought conditions. The index ranges from -5 to +5 indicating dry and wet conditions, respectively. PDSI values are reported on a monthly basis. Exhibit 3 shows historic PDSI values for the month of August from 1895 to 2022 for Clay County, which indicates an increase of 0.07 per decade. Generally, the PSDI historical data indicates that the region is experiencing a wetter climate.

Exhibit 3. Historical PDSI Values for Clay County (1895-2022)



Source: Minnesota Department of Natural Resources. <https://arcgis.dnr.state.mn.us/ewr/climateexplorer/main/historical>

According to DNR climate trends data, the frequency of intense storms is increasing. The U.S. Environmental Protection Agency's (EPA) Climate Resilience Evaluation and Awareness Tool (CREAT) Climate Change Scenarios Projection Map⁵ details the expected percent change in 100-year storm intensity for a select area. Two different scenarios of "stormy" and "not as stormy" are considered for the years of 2035 and 2060. Table 2 quantifies these changes for the area containing the AUAR Area and shows that storm intensity in this area is expected to increase over time in either scenario.

Moorhead Public Service further clarified with their CREAT module from 2018/2019 that the increased frequency of intense storms is primarily in the form of snow during MN's dry season (winter). This increase in annual precipitation is lost during spring snowmelt and flood season, and statistically the summer months are receiving less frequent precipitation, but higher "mega rain events". This puts additional strain on water supply resources during the summer months, especially groundwater supplies.

Table 2. Percent Change in 100-Year Storm Intensity for the AUAR Area

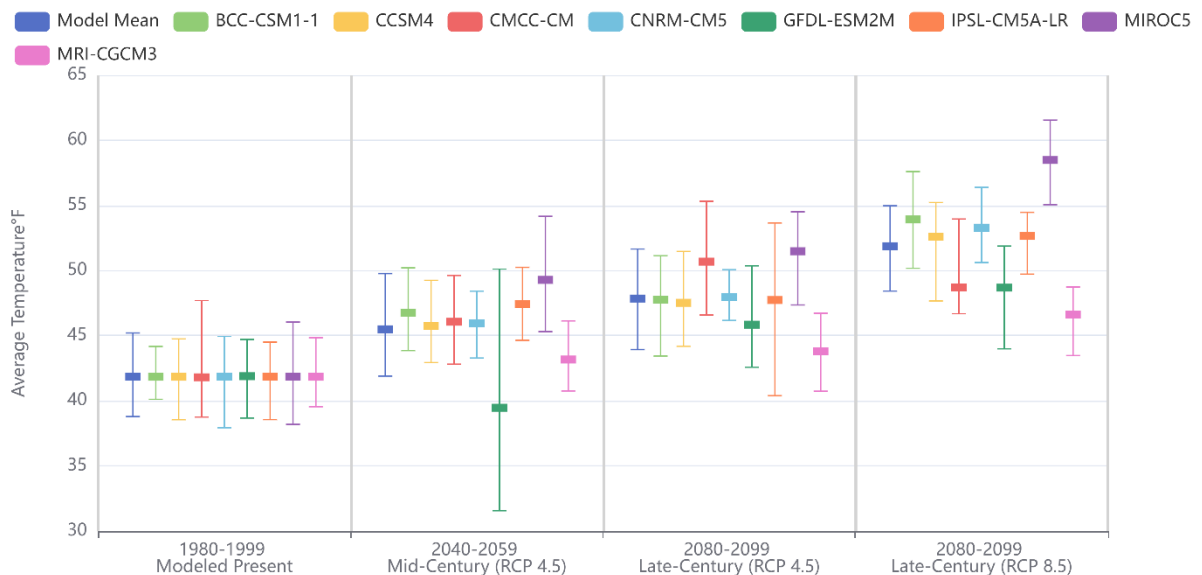
⁵ EPA. 2016. CREAT Climate Change Scenarios Projection Map. Available at: <https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=3805293158d54846a29f750d63c6890e>. Accessed May 2023.

Year	Scenario	
	Stormy	Not as Stormy
2035	13.2	2.2
2060	25.8	4.3

Projected climate trends indicate that temperatures within Clay County will continue to increase. Exhibit 4 illustrates projected temperatures for Clay County. Several climate models are shown in the projected temperature analysis. The model mean, shown in blue, illustrates the average of all models included in the analysis. Exhibit 4 shows the modeled present condition, mid-century (2040-2059) at Representative Concentration Pathway (RCP) 4.5, late-century (2080-2099) at RCP 4.5, and late-century (2080-2099) at RCP 8.5. RCP is a greenhouse gas concentration scenario used by the Intergovernmental Panel on Climate Change in the fifth assessment report. RCP 4.5 is an intermediate scenario in which emissions decline after peaking around 2040 and RCP 8.5 represents a worst-case scenario in which emissions continue rising through the 21st century.

Under the RCP 4.5 scenario, the annual temperature is anticipated to increase within the county from a modeled present mean of 41.9°F (1980-1999) to a mid-century (2040-2059) model mean of 45.5°F and a late-century (2080-2099) model mean of 47.9°F. Under the RCP 8.5 worst-case scenario, Clay County would experience a late-century (2080-2099) model mean temperature of 51.9°F.

Exhibit 4. Projected Temperatures in Clay County

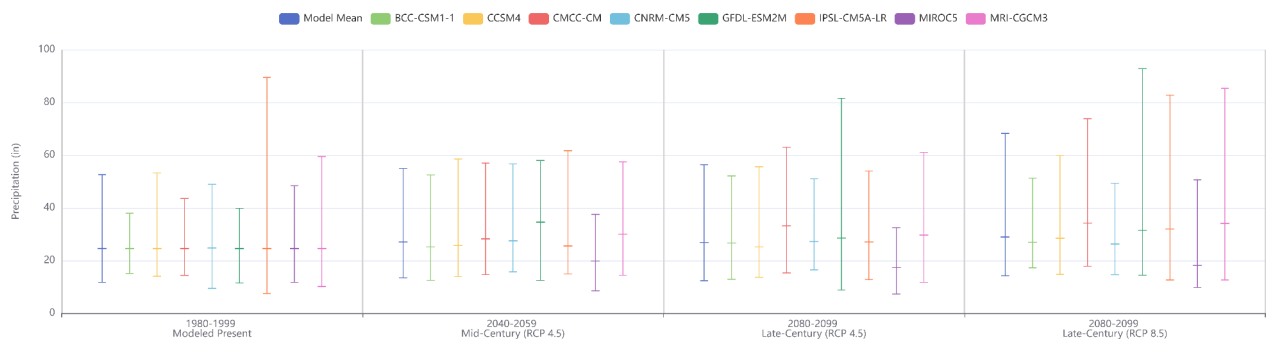


Source: Minnesota Department of Natural Resources. [Minnesota Climate Explorer \(state.mn.us\)](https://state.mn.us/minnesota-climate-explorer/). Definitions of the models included in this analysis can be found at [Climate Explorer Metadata | Minnesota DNR \(state.mn.us\)](https://state.mn.us/minnesota-climate-explorer/metadata/).

Exhibit 5 presents projected average annual precipitation for Clay County. Under the RCP 4.5 scenario, the annual precipitation is anticipated to increase within Clay County from a modeled present mean of 24.6 inches (1980-1999) to a mid-century (2040-2059) model mean of 27.0 inches and a late-century (2080-2099) model mean of 26.8 inches. Under the RCP 8.5 worst-case scenario, the county would experience a late-century (2080-2099) model mean precipitation of 28.9 inches. In comparison to the modeled present mean (1980-1999), the late-century (2080-2099) modeled mean annual precipitation

would increase by approximately 8.9 percent under the RCP 4.5 scenario and increase by approximately 17.5 percent under the RCP 8.5 scenario.

Exhibit 5. Projected Precipitation in Clay County



Source: Minnesota Department of Natural Resources. [Minnesota Climate Explorer \(state.mn.us\)](http://state.mn.us/minnesota-climate-explorer). Definitions of the models included in this analysis can be found at [Climate Explorer Metadata | Minnesota DNR \(state.mn.us\)](http://state.mn.us/minnesota-climate-explorer/metadata).

- b. **For each Resource Category in the table below: Describe how the project’s proposed activities and how the project’s design will interact with those climate trends. Describe proposed adaptations to address the project effects identified.**

Table 3 summarizes climate considerations related to the project and adaptation considerations.

Table 3. Climate Considerations and Adaptations

Resource Category	Climate Considerations	Project Information	Adaptations
Project Design	Increased heavy rainfall and flooding.	The Project would result in an increase in impervious surface under the maximum development scenario.	The Project would utilize infrastructure design standards appropriate for heavier rainfall and flooding and that are compliant with City of Moorhead requirements as well as the National Pollutant Discharge Elimination System (NPDES) stormwater management requirements.
Land Use	Heavier rainfall is expected to increase the risk of localized flooding.	The northwest portion of the AUAR area falls within a 500-year floodplain. The remaining sections of the AUAR Area are located within an area of minimal flood risk.	The Project would utilize infrastructure design standards appropriate for heavier rainfall and flooding that are compliant with City of Moorhead requirements as well as the National Pollutant Discharge Elimination System (NPDES) stormwater management requirements. The City will continue to require reduced impervious surface for new development.

			Currently this is done on a case-by case basis through an overlay for new developments and reduced parking requirements, but a more permanent solution may be explored in the future.
Water Resources	Addressed in item 12		
Contamination/ Hazardous Materials/ Wastes	Protection of water resources from soil and water contamination.	The presence or absence of hazardous materials will be determined as the Project develops. If present within the AUAR Area, hazardous materials would be stored properly using secondary containment and additional BMPs as necessary.	Stormwater management for impervious surfaces would be planned and consistent with NPDES requirements, including the use of permanent stormwater ponds.
Fish, wildlife, plant communities, and sensitive ecological resources (rare features)	Addressed in item 14.		

8. Cover Types

Table 4 provides a summary of land cover types currently in the AUAR area and estimated post-construction land cover as a result of planned development in Scenario 2 – Full Buildout. The current cover types have been updated to reflect development that has occurred since the 2018 AUAR. Existing cover types are shown in Figure 8-1. Estimated post-construction land cover types were calculated based on the Future Land Use data from the 2022 Comprehensive Plan.

Table 4. Cover Types

Cover Types	Current(acres)	After (acres)
Wetlands and shallow lakes (<2 meters deep)	61.8	43.78
Deep lakes (>2 meters deep)	--	--
Wooded/forest	16.91	12.55
Rivers/streams	--	--
Brush/grassland	--	--
Cropland	3,610.98 (-15.15)	1,284.25 ⁶
Livestock rangeland/pastureland	--	--

⁶ Data corrected in 2022 Comprehensive Plan

Lawn/landscaping	--	--
Green infrastructure TOTAL (from table below*)	--	--
Impervious surface (<11% to >90% impermeable ⁷	663.56 (+15.15)*	2,972.92**
Stormwater Pond (wet sedimentation basin)	35***	Not yet determined
Other (describe)	--	--
TOTAL	4,313.50	4,313.50

*Change in acreage of impervious surface is generalized based on permit data for development or redevelopment parcels. This does not account for required constructed stormwater infrastructure for these parcels, meaning actual impervious surface is less than the amount shown in the table.

**Note: After assumptions are based on the 2022 Comprehensive Plan Update. As development occurs, subdivision requirements will be applied including open space and park dedication, which will ultimately reduce the impervious surface category in this table.

***Note: The 35 acres of stormwater pond are included in the acreage for wetlands and shallow lakes and should not be counted towards total acreage.

While it is too early to identify specific green infrastructure elements to be included in new development, the City is committed to encouraging green infrastructure in new development, where feasible. The city recognizes that there may be limitations to green infrastructure given the flat topography and heavy clay soils that limit infiltration.

With its location along the Red River, the City of Moorhead regularly experiences heavy flooding. The City is committed to green infrastructure, where feasible, that reduces the frequency and impacts of flooding. The City has proactively acquired properties along the river and converted them to green space. The City has also been involved in the Fargo Moorhead Area Diversion Project, which has progressed significantly since the 2018 AUAR and will provide a permanent solution to protect the Fargo-Moorhead metro area by diverting excess water around the metro area during significant flood events. In its Comprehensive Plan, the City has committed to “develop policies that support individual and community projects such as native landscapes, rain gardens, local food production and pollinators,” and will remain flexible to allowing other green infrastructure elements in new development.

Table 5. Green Infrastructure

Green Infrastructure*	Before (acreage)	After (acreage)
Constructed infiltration systems (infiltration basins/ infiltration trenches/ rainwater gardens/ bioretention areas without underdrains/swales with impermeable check dams)	N/A (see text below)	N/A
Constructed tree trenches and tree boxes	N/A	N/A
Constructed wetlands	N/A	N/A
Constructed green roofs	N/A	N/A
Constructed permeable pavements	N/A	N/A
Other (describe) Landfill-based geothermal system	N/A	N/A
TOTAL*	N/A	N/A

⁷ Post-construction values reflect NLCD data and new impervious areas (e.g., buildings, parking lots, etc.) per the GAP.

The City of Moorhead has been designated as a Tree City USA for the past 30 years. The City also achieved Step 5 in the Green Step City program in 2022. New development will be required to plant trees per the landscaping and tree standards in the zoning code. Finally, the Comprehensive Plan has policies encouraging sustainability and tree planting. In recent years, the average number of trees planted by the city has increased from 400 to 700 annually.

Table 6. Tree Canopy

Trees	Percent	Number
Percent tree canopy removed or number of mature trees removed during development	0.1%	--
Number of new trees planted	0.1%	--

9. Permits and Approvals Required

List all known local, state and federal permits, approvals, certifications and financial assistance for the project. Include modifications of any existing permits, governmental review of plans and all direct and indirect forms of public financial assistance including bond guarantees, Tax Increment Financing and infrastructure. All of these final decisions are prohibited until all appropriate environmental review has been completed. See Minnesota Rules, Chapter 4410.3100.

Table 7 lists all permits that may be required for development in the AUAR area.

Table 7. Permits and Approvals

Unit of Government	Type of Application	Status
Federal		
US Army Corps of Engineers	Clean Water Act Section 401/10 Wetland Permits (Joint Application for Activities Affecting Water Resources in Minnesota)	Applicable to Future Development
Federal Aviation Administration	FAA 7460-1 Permit	
State		
Minnesota State Historic Preservation Office	Cultural Resource Coordination	Applicable to Future Development
Minnesota Department of Transportation	Utilities in Right-of-Way Permit	
	Right-of-way permit for work within or affecting MnDOT right-of-way	
	Limited Use Permit	
Minnesota Department of Health	Water Main Plan Review	
Minnesota Pollution Control Agency	NPDES General Permit for Construction	
	Sanitary Sewer Extension Permit	
	Clean Water Act Section 401 Water Quality Certification required if a US Army Corps of	

	Engineers Clean Water Action Section 404 Permit is required	
	Notification of Intent to Perform a Demolition	
	UST Notification of Installation or Change in Status Form	
Regional/Local		
City of Moorhead	Subdivision Approval	Applicable to Future Development
	Rezoning	
	Planned Unit Development Approval	
	Conditional Use Permit Approval	
	Grading/Erosion Control Permit	
	Site Plan Approval	
	Comprehensive Plan Amendment	
	Zoning Ordinance Amendments	
Variance		
Clay County	Roadway Access Permit	
	Utilities in Right-of-Way Permit	
Clay County Soil and Water Conservation District	Joint Application for Activities Affecting Water Resources in Minnesota	
Buffalo-Red River Watershed District	Watershed Permit	

10. Land use

a. Describe:

- i. *Existing land use of the site as well as areas adjacent to and near the site, including parks and open space, cemeteries, trails, prime or unique farmlands.*

Land within the East Growth Area is almost entirely agricultural or vacant in use. There are some single-family residences along main roadways in the area, especially along 50th Street South and 12th Avenue South. There are three commercial areas nearby the East Growth Area, two along Interstate 94, in the current far eastern City limits (Sanford Medical Campus) and one east of the airport along Highway 336 (Titan Machinery). There is one park and natural wetland just west of the Growth Area, associated with a single and multifamily housing development along 40th Street South, in the current far eastern part City limits. The Moorhead Municipal Airport is located southeast of the East Growth Area. Existing Land Use is shown in Figure 10-1.

Development or redevelopment since 2018 in the AUAR area includes about 10 acres of low density residential development, 3.4 acres of high density residential development and about 2 acres of industrial development.

The Horizon Shores park is located within the East Growth Area. Additionally, there are a variety of shared use paths within the growth area along roadways and surrounding Horizon Shores park. There are no cemeteries within the AUAR area. There is prime farmland within and surrounding the AUAR area.

- ii. *Plans. Describe planned land use as identified in comprehensive plan (if available) and any other applicable plan for land use, water, or resources management by a local, regional, state, or federal agency.***

Moorhead completed an update to the Comprehensive Plan in 2022, entitled Onward Moorhead. Included in the Comprehensive Plan is a future land use map which shows the East Growth Area as a combination of residential, commercial and public uses. Residential uses include a range of housing options from low-density homes (within the interior of the growth area) to medium and high-density homes along 12th Avenue South and adjacent to commercial uses. Commercial uses are guided to be located along Interstate 94. There will be six new park and open space elements within the growth area to serve nearby residential neighborhoods. Other park and open space development will occur around the Growth Area as residential development occurs.

Figure 10-2 illustrates the planned future land use in the East Growth Area from the 2022 Comprehensive Plan.

- iii. *Zoning, including special districts or overlays such as shoreland, floodplain, wild and scenic rivers, critical area, agricultural preserves, etc.***

Zoning within the East Growth Area is complicated because of the many jurisdictions located within the area. For property within the City of Moorhead, land is generally zoned LI Light Industrial and HI Heavy Industrial south of Interstate 94. The Moorhead Municipal Airport is also south of Interstate-94 and is zoned I Institutional. Additionally, there are airport safety zones established by the US FAA and MnDOT around the airport for future aviation activities. North of Interstate 94, there is a mix of low-density residential (RLD2 and RLD3), P Public Open Space, I Institutional, and RC Regional Commercial. The remainder of the land is zoned TZ Transitional.

Parts of the East Growth Area that are outside the City of Moorhead are under the jurisdictional authority of Clay County. Land within the East Growth Area is zoned AG General west of 60th Street S. Between 60th Street South and Highway 336, land is zoned Limited Highway Commercial or Wellhead Protection Overlay District, meant to protect the Buffalo Aquifer from contamination that would prevent its use as a water supply.

Much of the area north of Interstate-94 is within the Current 500-year (0.2 Annual Chance) flood zone. There is no shoreland, wild and scenic rivers, critical area or agricultural preserves.

- iv. *If any critical facilities (i.e. facilities necessary for public health and safety, those storing hazardous materials, or those with housing occupants who may be insufficiently mobile) are proposed in floodplain areas and other areas identified as at risk for localized flooding, describe the risk potential considering changing precipitation and event intensity.***

The AUAR area is not within the regulated 100-year floodplain and floodway. Generally, the flood risk within the AUAR area is low. As described in Item 7, future climate conditions may result in increased localized flooding associated with increased high intensity rainfall events. No critical facilities such as public health or specialty housing facilities would be included under the proposed Development Scenarios. Future industrial uses proposed within the AUAR area may include the

storage of hazardous materials. If proposed, safe storage measures would need to be implemented to minimize the risk of a potential spill or release, and opportunities to site storage tanks outside of potential flood risk areas under future climate conditions may be evaluated at the time that they are proposed.

- b. Discuss the project's compatibility with nearby land uses, zoning, and plans listed in Item 9a above, concentrating on implications for environmental effects.***

The 2022 Comprehensive Plan shows the adopted future land use for the area and should be relied upon for determining the future of the area. The growth shown in the AUAR Update is compatible with the future land uses shown in the Comprehensive Plan.

- c. Identify measures incorporated into the proposed project to mitigate any potential incompatibility as discussed in Item 10b above and any risk potential.***

Required Changes to Zoning:

Given that the proposed future land use in the East Growth Area is only generally consistent with existing zoning, the City must update their zoning map to accurately implement this revised future land use plan.

As new land within the East Growth Area is annexed into the City of Moorhead, the City must update its zoning map to reflect the residential and mixed-use nature of the proposed future land use.

11. Geology, Soils and Topography/Land Forms

- a. Geology - Describe the geology underlying the project area and identify and map any susceptible geologic features such as sinkholes, shallow limestone formations, unconfined/shallow aquifers, or karst conditions. Discuss any limitations of these features for the project and any effects the project could have on these features. Identify any project designs or mitigation measures to address effects to geologic features.***

Geologic conditions and risk factors remain unchanged from the 2018 AUAR.

- b. Soils and topography - Describe the soils on the site, giving NRCS (SCS) classifications and descriptions, including limitations of soils. Describe topography, any special site conditions relating to erosion potential, soil stability or other soils limitations, such as steep slopes, highly permeable soils. Provide estimated volume and acreage of soil excavation and/or grading. Discuss impacts from project activities (distinguish between construction and operational activities) related to soils and topography. Identify measures during and after project construction to address soil limitations including stabilization, soil corrections or other measures. Erosion/sedimentation control related to stormwater runoff should be addressed in response to Item 12.b.ii.***

Soil conditions, risk factors, and mitigation strategies are unchanged from the 2018 AUAR. The USDA-NRCS Web Soil Survey mapping remains unchanged from 2018⁸. Figure 11-1 shows the basic soil survey map for the AUAR area.

⁸ Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at <http://websoilsurvey.nrcs.usda.gov/> accessed [05/09/2023].

12. Water Resources

- a. Describe surface water and groundwater features on or near the site in a.i. and a.ii. below.*
- i. Surface water - lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, shoreland classification and floodway/floodplain, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include the presence of aquatic invasive species and the water quality impairments or special designations listed on the current MPCA 303d Impaired Waters List that are within 1 mile of the project. Include DNR Public Waters Inventory number(s), if any.*

Surface Waters

There are no lakes, streams, shorelands, trout streams/lakes, designated wildlife lakes, lakes of biological significance, or migratory waterfowl feeding/resting lakes within the AUAR area⁹. Clay County Ditch No. 41 bisects the AUAR area running north/south, and Clay County Ditch No. 47 briefly crosses the western boundary of the AUAR area. Approximately six existing stormwater ponds are present within the AUAR area¹⁰. Figure 12-1 shows existing water resources in the AUAR area.

DNR Public Waters

DNR Public Waters are not present within the AUAR area or within one mile of the AUAR area, which is unchanged from the 2018 review. The South Branch of the Buffalo River (kittle number: H-026-056-009) is a DNR Public Watercourse located approximately 1.3 miles east of the AUAR area, and the Red River (kittle number: H-026) is a DNR Public Watercourse located approximately 2.5 miles west of the AUAR area⁹.

Wetland Resources

According to a review of the National Wetlands Inventory (NWI) in 2023¹¹, there are approximately 61.8 acres of wetlands within the AUAR area, which is an increase from the 13 acres identified in the 2018 review. This discrepancy is because the 2023 AUAR update utilized updated NWI data. Of the 61.8 acres identified, approximately 35 acres consist of constructed stormwater features, approximately 15.4 acres consist of created ditch or roadside drainage features, and approximately 11.4 acres consist of naturally occurring basins.

MPCA 303d Impaired Waters List

There are no 303d impaired waters designated by the Minnesota Pollution Control Agency (MPCA) within the AUAR area or within one mile of the AUAR area, which is unchanged from the 2018 review. As of this AUAR Update, the MPCA has published its list of 2024 impaired waters. According to this updated list, the South Branch of the Buffalo River (assessment unit identifier [AUID]: 09020106-503) is located approximately 1.3 miles east of the AUAR area and is impaired for aquatic life and aquatic recreation as a result of *E. coli*, turbidity, and dissolved

⁹ DNR. 2011-2020. Minnesota Geospatial Commons. Available at: <https://gisdata.mn.gov/>. Accessed May 2023.

¹⁰ DNR. undated(a). Minnesota Conservation Explorer. Available at: <https://mce.dnr.state.mn.us/content/explore>. Accessed May 2023.

¹¹ 2009-2014 National Wetland Inventory Update. Data analyzed in ArcGIS using spatial and tabular geodatabase data from Minnesota Geospatial Commons, downloaded in 2022.

oxygen. Additionally, the Red River (AUID: 09020104-544) is located approximately 2.5 miles west of the AUAR area and is impaired for aquatic consumption, aquatic life, and aquatic recreation as a result of *E. coli*, mercury in fish tissue, and turbidity. In 2018, the Red River was delisted for polychlorinated biphenyls (PCBs) in fish tissues without the use of corrective actions¹².

The MPCA approved a Watershed Restoration and Protection Strategy (WRAPS) reports for the Upper Red River of the North watershed on December 22nd, 2017, and for the Buffalo River on August 9, 2016. The WRAPS process was developed by the MPCA to identify and address water quality threats in Minnesota's eighty major watersheds. The reports have two parts. The first is that impaired waters have restoration strategies, and the second is that non-impaired waters have protection strategies.

A full report for the Upper Red River of the North watershed can be found here: <https://www.pca.state.mn.us/sites/default/files/wq-ws4-36a.pdf>, and a summary of the report is also provided by the MPCA: <https://www.pca.state.mn.us/sites/default/files/wq-ws4-36b.pdf>. The Buffalo River WRAPS report can be found here: <https://www.pca.state.mn.us/sites/default/files/wq-ws4-11a.pdf>. The WRAPS summary includes information on the WRAPS program, watershed characteristics, and strategies for protection, as well as other components of this process. Best management practices (BMPs) based on sediment, phosphorus and nitrogen delivery, as well as bacteria risks, in this area, are identified. Developers should reference this report and incorporate BMPs where possible. The Buffalo River is not within the AUAR area and may not be impacted by development within the AUAR area.

Floodway/Floodplain

According to the Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL) viewer, the majority of the AUAR area is within an area of minimal flood hazard. However, the northwest portion of the AUAR area is within a 500-year floodplain. (FEMA 2012)¹³. This has not changed since the 2018 review.

As discussed in Item 8, the proposed Fargo Moorhead Area Diversion Project has developed since 2018 and will provide permanent improvements to mitigate flood risk by diverting excess water around the metro area during significant flood events.

- ii. ***Groundwater – aquifers, springs, seeps. Include: 1) depth to groundwater; 2) if project is within a MDH wellhead protection area; 3) identification of any onsite and/or nearby wells, including unique numbers and well logs if available. If there are no wells known on site or nearby, explain the methodology used to determine this.***

Depth to Groundwater

The available Minnesota Well Index data on wells within the AUAR area are unchanged from the 2018 AUAR update¹⁴. Depth to groundwater within the AUAR area ranges from 12 feet to 180 feet in the wells observed within the area. Average groundwater depth is 70 feet. However, since low permeability soils and clay deposits exist in the area, there is a potential for perched groundwater to be present at or near the land surface over portions of the AUAR area. Figure 12-2 shows well

¹² MPCA. 2022. Minnesota's impaired waters list. Available at: <https://www.pca.state.mn.us/air-water-land-climate/minnesotas-impaired-waters-list>. Accessed May 2023.

¹³ FEMA. 2012. National Flood Hazard Layer (NFHL) Viewer. Available at: <https://www.fema.gov/flood-maps/national-flood-hazard-layer>. Accessed May 2023.

¹⁴ Minnesota Geological Survey County Well Index data. February 2023. Provided by MGS annually to subscribers.

locations.

MDH Wellhead Protection Area

As of the 2018 review, it was determined that the eastern edge of the AUAR area near Highway 336 overlaps with a portion of the Drinking Water Supply Management Area (DWSMA) for the Buffalo aquifer. This remains true for the 2023 review. This DWSMA has been classified as “highly vulnerable” to contamination from spills or leaks that occur at or near the land surface¹⁵. This is either due to the clay layers not being laterally extensive across the DWSMA to afford protection, or the presence of human-sourced contamination has been detected in the aquifer. In the area, best management practices should be undertaken to avoid spills or leaks infiltrating into soils. The Moorhead Public Service Wellhead Protection Plan and Clay County Development Code language for Wellhead Protection Overlay District areas should be used to reference protective measures to be undertaken in this area.

Onsite Wells

A total of 30 groundwater wells have been identified within the project area using the County Well Index database. This number is unchanged from the 2018 AUAR and onsite wells are shown in Figure 12-2. The actual number of wells within the AUAR area is likely to be greater, since not all wells have been accounted for in the State’s database, especially any wells drilled prior to 1975 before the State started collecting well records. Improperly constructed wells, or unused wells which haven’t been sealed, can act as a pathway for contaminants to reach the aquifer. Therefore, Well Code requires that unused wells be sealed by a licensed well contractor. If any unused wells are encountered during construction activities, or if any wells are taken out of service during the course of construction, these wells must be sealed to meet the Well Code.

b. Describe effects from project activities on water resources and measures to minimize or mitigate the effects in Item b.i. through Item b.iv. below.

i. Wastewater - For each of the following, describe the sources, quantities and composition of all sanitary, municipal/domestic and industrial wastewater produced or treated at the site.

1) If the wastewater discharge is to a publicly owned treatment facility, identify any pretreatment measures and the ability of the facility to handle the added water and waste loadings, including any effects on, or required expansion of, municipal wastewater infrastructure.

The City of Moorhead completed a Sanitary/Storm Water Master Plan for this area in 2006. This plan was updated in 2007, and investigated the future sanitary sewer needs in some of the area covered in this AUAR. In 2015, an additional Study was implemented to evaluate some of the area that is covered under this AUAR.

The majority of this AUAR is undeveloped, so construction of trunk sewer facilities in this AUAR area is readily achievable. The western portion of this AUAR is currently under development and sanitary sewer is either installed or planned. Future growth in this East AUAR area requires that sanitary sewer flows be conveyed to the City’s Wastewater Treatment Facility (WWTF), which is located on 28th Street North, just north of 15th Ave. North.

¹⁵ MDH. 2012. Source Water Protection Web Map Viewer. Available at: <https://www.health.state.mn.us/communities/environment/water/swp/mapviewer.html>. Accessed May 2023.

Since this AUAR is located in the eastern portion of the City, the conveyance facilities must go through either the existing 34th St Trunk Sewer Facilities, or find a new route to the WWTF.

A conceptual layout for the portion of the AUAR that can be served through the 34th St Trunk Sewer Facilities is shown on Figure 12-3. This Figure also shows trunk facilities coming from a portion of the South AUAR. For the East AUAR, two lift stations, associated forcemains, and trunk gravity sewer from the development area to existing Lift Station No. 38. Lift Station No. 38 would need to be expanded to accommodate this increased flow. Lift Station No. 38 pumps to Lift Station No. 39, which would also need to be expanded to accommodate this additional flow. The analysis behind the system layout was conducted using two phases. These two phases were established by considering anticipated construction based on an expected logical progression of growth.

With the strategies employed on Figure 12-3, the proposed sanitary sewer system is projected to be able to serve approximately 45% of the flow that is anticipated to be generated by this AUAR area. A new trunk sewer system will need to be designed to serve the balance of the area covered in this AUAR.. These improvements are anticipated to be more than ten years into the future.

All wastewater in the City of Moorhead is transported to the WWTF. The WWTF is currently operating under its wet weather design capacity of 9 million gallons per day (MGD). However, in order for this area to be completely developed, a major expansion to the WWTF will be needed. Based on the City's anticipated growth rate, expansion will not be needed for the next 10 years.

MITIGATION STRATEGIES

The City of Moorhead will monitor the wastewater system to determine when additional improvements are needed and will continue to update its capital budget to plan accordingly for these investments. Through the site development plan review process, the City of Moorhead will monitor and verify estimated wastewater flows for general conformance to current draft Sanitary/Storm South and East Area Master Plan. Each development will be responsible for 1) Sanitary sewer connection fees related to their proposed development; 2) Proportional share of the costs of the Trunk Sanitary Sewer Components; 3) Construction of local sewer components to serve the development; and, 4) MPCA/NPDES sanitary sewer extension permits.

- 2) *If the wastewater discharge is to a subsurface sewage treatment systems (SSTS), describe the system used, the design flow, and suitability of site conditions for such a system. If septic systems are part of the project, describe the availability of septage disposal options within the region to handle the ongoing amounts generated as a result of the project. Consider the effects of current Minnesota climate trends and anticipated changes in rainfall frequency, intensity and amount with this discussion.*

N/A

- 3) *If the wastewater discharge is to surface water, identify the wastewater treatment methods and identify discharge points and proposed effluent limitations to mitigate impacts. Discuss any effects to surface or groundwater from wastewater discharges, taking into consideration how current Minnesota climate trends and anticipated climate change in the general*

location of the project may influence the effects.

N/A

- ii. ***Stormwater - Describe changes in surface hydrology resulting from change of land cover. Describe the routes and receiving water bodies for runoff from the project site (major downstream water bodies as well as the immediate receiving waters). Discuss environmental effects from stormwater discharges on receiving waters post construction including how the project will affect runoff volume, discharge rate and change in pollutants. Consider the effects of current Minnesota climate trends and anticipated changes in rainfall frequency, intensity and amount with this discussion. For projects requiring NPDES/SDS Construction Stormwater permit coverage, state the total number of acres that will be disturbed by the project and describe the stormwater pollution prevention plan (SWPPP), including specific best management practices to address soil erosion and sedimentation during and after project construction. Discuss permanent stormwater management plans, including methods of achieving volume reduction to restore or maintain the natural hydrology of the site using green infrastructure practices or other stormwater management practices. Identify any receiving waters that have construction-related water impairments or are classified as special as defined in the Construction Stormwater permit. Describe additional requirements for special and/or impaired waters.***

Surface waters in the AUAR area are shown on Figure 12-1. Surface water generally flows north and west to the Red River via county ditches. The AUAR area contains County Ditch No. 41 and a small portion of County Ditch No. 47.

Existing conditions largely consist of agricultural land use, with little structural stormwater management. Development in the AUAR area is anticipated to increase stormwater runoff due to the increase in impervious surfaces associated with urban land uses. Under proposed conditions, a stormwater system will be implemented to address local, state, and federal requirements, as discussed below. This system will generally consist of stormwater ponds for rate control and water quality treatment; infiltration, filtration, or bioretention for volume control and water quality treatment where feasible in accordance with City code and MPCA permit requirements; and temporary erosion and sediment control features such as vegetative restoration, storm drain inlet protection, construction entrance protection, and silt fence.

Where possible, the City's Growth Area Plan (GAP) encourages stormwater to be kept on the surface and treated on-site to reduce expensive stormwater system costs, subject to site limitations. In some cases, regional stormwater treatment may be more effective. The GAP also encourages the stormwater system to be integrated with the open space system to create a valuable amenity for neighborhoods. The GAP illustrates how landscape corridors and parkways can meander through neighborhoods and contain stormwater systems.

There are several planned stormwater ponds identified in the City's Storm Water Master Plan for the AUAR area, generally discharging to County Ditches No. 41 or No. 47.

Development within the AUAR area is subject to the regulations of Chapter 8 – Storm Water Management of Title 3 – Public Health and Sanitation of the City Code. The City Code incorporates the design standards in the Minnesota Stormwater Manual and NPDES Construction Site Permit by reference. The Code calls for treatment of the required water quality volume (subject to site-specific limitations and/or prohibitions), as well as no net increase from pre-development peak flows for the 2-

, 10-, and 100-year storm events.

Additionally, stormwater will need to be managed in accordance with the City's NPDES MS4 Stormwater Permit and SWPPP, Construction Site Stormwater Permit, and (for industrial sites) Industrial Stormwater Permit, as well as the requirements of the Buffalo-Red River Watershed Management District. These plans, codes, and permits provide requirements for rate control, water quality treatment, and volume control – where feasible. They address both temporary and permanent stormwater management.

As discussed in Item 7, Minnesota is anticipated to see an increase in precipitation and an increase in the frequency of extreme precipitation events. As a result, stormwater BMPs proposed as part of future development should be designed to be able to handle this increase in volume, and the erosion control and sediment control devices used on site will need to be maintained regularly.

MITIGATION STRATEGIES

- Development within the AUAR will comply with relevant requirements for TPP and TS. Developments should seek to incorporate Low Impact Design (LID) practices; LID is a stormwater management approach that helps produce conditions similar to the site's natural hydrology. Examples of LID practices include vegetated filter strips at the edges of paved surfaces, trees or swales between rows of cars in a parking lot, rain gardens, porous pavers, and green roofs. Developers will refer to the online Minnesota Stormwater Manual for guidance.
- Development within the AUAR area is subject to the regulations of Chapter 8 – Storm Water Management of Title 3 – Public Health and Sanitation of the City Code. The City Code incorporates the design standards in the Minnesota Stormwater Manual and NPDES Construction Site Permit by reference. The Code calls for treatment of the required water quality volume (subject to site-specific limitations and/or prohibitions), as well as no net increase from pre-development peak flows for the 2-, 10-, and 100-year storm events.
- Better Site Design concepts found in the Minnesota Stormwater Manual will be utilized to maintain pre-development hydrology for the AUAR area by minimizing the amount of new impervious surfaces that will result in increased flows to the Red River.
- Infiltration areas will be utilized to the extent practicable to keep water onsite.
- A minimum 50-foot natural buffer will be maintained near surface waters during and after construction. When this buffer cannot be maintained, redundant downgradient sediment controls will be utilized, and the natural buffer restored with native vegetation upon completion of construction.
- Due to the impairment of the Red River, any soil that is disturbed as a result of development must be stabilized within seven days for any portion of the development where soil disturbance will temporarily or permanently cease for seven days or more.
- Stormwater runoff for proposed developments will be regulated by MPCA-issued NPDES permitting and local inspection. Stormwater management is discussed in detail in Section 12.b.ii below.

iii. *Water appropriation - Describe if the project proposes to appropriate surface or groundwater (including dewatering). Describe the source, quantity, duration, use and purpose of the water use and if a DNR water appropriation permit is required. Describe any well abandonment. If*

connecting to an existing municipal water supply, identify the wells to be used as a water source and any effects on, or required expansion of, municipal water infrastructure. Discuss environmental effects from water appropriation, including an assessment of the water resources available for appropriation. Discuss how the proposed water use is resilient in the event of changes in total precipitation, large precipitation events, drought, increased temperatures, variable surface water flows and elevations, and longer growing seasons. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation. Describe contingency plans should the appropriation volume increase beyond infrastructure capacity or water supply for the project diminish in quantity or quality, such as reuse of water, connections with another water source, or emergency connections.

Moorhead Public Service (MPS), a municipally owned entity, will be the source of water for the AUAR area. The current firm capacity of the MPS system is 10.0 MGD (million gallons per day), using three different water sources. These sources are the Red River, the Moorhead Aquifer, and the Buffalo Aquifer. The new Water Treatment Plant (WTP) is designed to treat up to one hundred percent of its 10 MGD capacity using surface water from the Red River. Maximizing the surface water use depends on surface water quality, with groundwater held as drought backup supply. Groundwater pumping capacity can supply up to 5.6 MGD during emergencies. Current water usage is approximately 4.5 MGD, with a peak demand of 9.0 MGD during summer months.

Development of the AUAR area is anticipated to increase water demand by 6.9 MGD for average daily demand, with an estimated additional peak demand of 17 MGD. Therefore, the system will ultimately need to provide for an ultimate demand of 26 MGD to satisfy peak demands, approximately 2.5 times the existing capacity of the current MPS water treatment plant. Development of other portions of the city may additionally increase daily demands on the system, requiring further appropriations of surface water and groundwater to meet these demands. Substantial infrastructure additions will be required to handle additional volume projections including other water supply sources.

The Moorhead Aquifer has historically provided groundwater to the community but is limited in its yield due to a low recharge rate. Water levels in the Moorhead Aquifer have dropped over the past century due to continued pumping, but have rebounded recently since the new surface water treatment plant was placed into service in 1994. Additional water supply needs will therefore be more dependent on the expansion of pumping from the Buffalo Aquifer and the Red River.

The Buffalo Aquifer receives a higher amount of recharge than the Moorhead Aquifer and is therefore a more sustainable source of groundwater for the coming decades, however there are still concerns related to limited yield capacities. MPS, with cooperation from the DNR, has developed the Buffalo Aquifer Management Plan to help guide usage of this aquifer for future needs, especially during drought periods where the aquifer will be heavily relied upon to meet most of Moorhead's water supply needs. The plan outlines a monitoring approach to identify drought stages and provides appropriate responses to address each stage of drought that include potential water demand reductions and demand reduction actions.

MPS is planning to secure appropriations permits for an additional well field in the Buffalo Aquifer capable of producing an additional 2.0 MGD. Expansion of the Red River appropriations permit and associated infrastructure buildout of the surface water treatment plant would be required for increasing water supply and treatment capacity.

Expanding the water supply system to further utilize the Buffalo Aquifer and the Red River will require an amended Water Appropriations Permit from the Minnesota DNR. As part of this permitting

process, an investigation into any possible environmental impacts of the groundwater or surface water withdrawals will need to be undertaken. At present, there are no known negative impacts identified other than the reduction in water levels of the Moorhead and Buffalo Aquifers. However, supply projections above would likely push Buffalo and Moorhead Aquifer past their individual safe yield thresholds if full 1:1 redundancy is anticipated. Further study will be required to demonstrate that proposed future water withdrawals will be sustainable without negatively impacting natural resources or other well owners in the vicinity.

Expansion of the water supply system will also require an expansion of the water distribution system in order to pipe water to the AUAR area. Additional water storage may also be required in order meet peak demands.

If temporary dewatering of shallow groundwater is required as part of the Project activities and is expected to exceed 10,000 gallons per day or one million gallons per year, then a separate Minnesota DNR Water Appropriations permit will be required before undertaking dewatering. Any temporary dewatering activities are not expected to have an impact on nearby groundwater wells (either private or municipal).

No specific wells have been identified for abandonment as part of the Project activities. As existing properties are redeveloped, however, there is a likelihood that wells on these properties may be sealed as part of those redevelopment activities. Potential wells that could be impacted are identified in Figure 12-2. Other wells that are not identified in Figure 12-2 may also exist within the AUAR area if they are not accounted for in the State's database.

Climate change trends may affect surface water and groundwater interactions that may lead to long-term uncertainty regarding surface and groundwater levels, aquifer recharge, and groundwater flow, resulting in impacts to groundwater supply availability, quality, and quantity. Surface and groundwater quantity is driven by the balance of atmospheric input from precipitation (recharge) and losses due to evapotranspiration¹⁶. The DNR Water Appropriation Plan requires that all permittees adhere to the Statewide Drought Plan in accordance with M.S. 103G.293 and that all practical and feasible water conservation methods and practices are employed, including reuse and recycling of water.

MITIGATION STRATEGIES

Expansion of the MPS water supply system will be required to meet anticipated water demands for the built-out AUAR area. Expansion of the system will require appropriations of water from the Buffalo Aquifer and/or the Red River. The Buffalo Aquifer Management Plan will be used to guide future development of wells in the Buffalo Aquifer, along with management of pumping rates. A Minnesota DNR Water Appropriations permit will be required to utilize new (or expanded) sources of water. Depending on the actual number of wells that are required, and the future water demands, the permitting process will identify any additional mitigation measures needed to protect natural resources or other water supply users. Additional mitigation strategies may include additional monitoring of aquifer levels, instituting more preventative water conservation measures, and working with the DNR to predict aquifer sustainability.

If current water resources are unable to meet anticipated water demands, more aggressive water conservation and reuse will need to be implemented, including, but not limited to, temporary water

¹⁶ DNR. 2021. Climate's Impact on Water Availability. Available at: https://www.dnr.state.mn.us/climate/water_availability.html. Accessed May 2023.

sprinkling bans during peak demand periods and the use of stormwater for irrigation to reduce demands on the aquifers.

If temporary dewatering of shallow groundwater is required as part of the project activities, and is expected to exceed 10,000 gallons per day or 1 million gallons per year, then a separate Minnesota DNR Water Appropriations permit will be required before undertaking dewatering. Any temporary dewatering activities are not expected to have an impact on nearby groundwater wells (either private or municipal).

The City of Moorhead Wellhead Protection Plan should be used to reference protective measures to be undertaken in this area. Any wells abandoned during Project development or redevelopment will need to be sealed according to Minnesota Well Code by a licensed well contractor.

iv. Surface Waters

- a) Wetlands - Describe any anticipated physical effects or alterations to wetland features such as draining, filling, permanent inundation, dredging and vegetative removal. Discuss direct and indirect environmental effects from physical modification of wetlands, including the anticipated effects that any proposed wetland alterations may have to the host watershed, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Identify measures to avoid (e.g., available alternatives that were considered), minimize, or mitigate environmental effects to wetlands. Discuss whether any required compensatory wetland mitigation for unavoidable wetland impacts will occur in the same minor or major watershed and identify those probable locations.**

According to the most recent National Wetlands Inventory (NWI) data, there are approximately 61.8 acres of wetlands within the AUAR area¹⁷. However, approximately 50.4 acres of these NWI basins are artificial or heavily manipulated features such as stormwater ponds, road right-of-way drainages, or excavated agricultural ditches. The remaining NWI features are primarily farmed depressional basins.

Wetlands within the AUAR may be regulated under the jurisdiction of Section 404 of the federal Clean Water Act (CWA) and the Minnesota Wetland Conservation Act (WCA). Additionally, the City of Moorhead may regulate any excavation, grading, or filling in a wetland, designated flood plain, or shoreland district. Further consultation with the city, county, and appropriate Watershed Management District should be conducted during the planning phase of any future development within the AUAR area with the potential to impact wetlands.

MITIGATION STRATEGIES

Mitigation strategy for potential wetland impacts is to follow the state and federal wetland permitting processes, and this is unchanged from the 2018 AUAR update.

Currently, no specific development in the AUAR area is planned; however, it is anticipated that the city will avoid impacts (e.g., dredging, filling) to wetlands to the greatest practicable extent during project-specific planning for future development.

Additional mitigation strategies that may be implemented to preserve and protect surface waters

¹⁷ 2009-2014 National Wetland Inventory Update. Data analyzed in ArcGIS using downloaded spatial and tabular geodatabase data from Minnesota Geospatial Commons, downloaded in 2022.

include vegetative buffers, construction erosion control, and coordination with watershed district staff on watershed quality issues. Wetlands will not be utilized for stormwater treatment unless they have been mitigated for.

- b) Other surface waters- Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicialditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal and riparian alteration. Discuss direct and indirect environmental effects from physical modification of water features, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Identify measures to avoid, minimize, or mitigate environmental effects to surface water features, including in-water Best Management Practices that are proposed to avoid or minimize turbidity/ sedimentation while physically altering the water features. Discuss how the project will change the number or type of watercraft on any water body, including current and projected watercraft usage.***

Development in the AUAR area is not anticipated to involve the physical or hydrologic alteration of any existing surface waters. However, development could impact the Red River and its tributary streams, the South Branch of the Buffalo River and its tributary streams, County Ditch No. 41, and/or County Ditch No. 47 if stormwater runoff is not managed adequately. The MPCA has identified portions of the Red River in the Moorhead area, as well as the South Branch of the Buffalo River, as impaired. Additional drainage from urban development could increase sediment and pollutant loads into these waterways. Recognizing this issue, the City of Moorhead has developed a Stormwater Ordinance which addresses the treatment of stormwater runoff, including construction techniques to minimize erosion and stabilize soils.

The potential for erosion of soils exposed during development of the AUAR area will be minimized using BMPs during and after construction. Specific erosion control practices will be identified in final grading and construction plans for each proposed development project. Developments will be required to meet, as necessary, the standards of the National Pollutant Discharge Elimination System (NPDES), the City of Moorhead, and the Buffalo-Red River Watershed Management District.

13. Contamination/Hazardous Materials/Wastes

- a. Pre-project site conditions - Describe existing contamination or potential environmental hazardson or in close proximity to the project site such as soil or ground water contamination, abandoned dumps, closed landfills, existing or abandoned storage tanks, and hazardous liquid or gas pipelines. Discuss any potential environmental effects from pre-project site conditions that would be caused or exacerbated by project construction and operation. Identify measures to avoid, minimize or mitigate adverse effects from existing contamination or potential environmental hazards. Include development of a Contingency Plan or Response Action Plan.***

The following databases were reviewed to evaluate on-site or nearby potential sources of contamination or environmental hazards: the MPCA “What’s in My Neighborhood” (WIMN) online maps, the Minnesota Department of Agriculture (MDA) “County Spill Records,” the MPCA Institutional Controls Interactive (IC) online maps, and the MPCA Petroleum Remediation Program (PRP) online maps. Table

8 summarized sites documented in MPCA's WIMN database within and in close proximity to the AUAR area. Figure 13-1 identifies MPCA WIMN sites within or in close proximity to the AUAR area.

Table 8. MPCA WIMN Database Inquiry Results

Site ID	Site Name	MPCA Program	Status
Within AUAR Area			
253473	MCCARA 5 th (17-A6-02)	• Stormwater	Active
247632	Moorhead Municipal Airport Taxiway A Rehabilitation	• Stormwater	Active
140782	Opportunity Substation	• Stormwater	Active
129944	Jeremy Somers	• Solid Waste	Active
253682	Moorhead City of Plot 2	• Investigation and Cleanup	Active
214148	Horizon Shores 10th	• Stormwater	Active
98285	Pactiv Corp	• Multiple Programs	Inactive
185501	Commercial East Acres Truck Plaza	• Investigation and Cleanup	Active
145884	Horizon Shores 6 th (13-A6-2)	• Stormwater	Active
253680	Moorhead City of Plot 1	• Investigation and Cleanup	Active
212289	24 th Ave S (16-A6-2)	• Stormwater	Active
101404	Titan Machinery - Moorhead	• Multiple Programs	Active
136104	Horizon Shores 7 th Add'n - Moorhead	• Stormwater	Inactive
157214	King Aviation LLC	• Stormwater	Active
234754	Moorhead Municipal Airport Runway 12-30 Rehabilitation	• Stormwater	Active
214526	12 th Ave & 45 th St S Improvements (16-A2-06)	• Stormwater	Active
139850	Sanford Health Moorhead Clinic	• Multiple Programs	Active
152293	Horizon Shores 9 th (15-A2-6)	• Stormwater	Active

253683	Moorhead city of Plot 3	• Investigation and Cleanup	Active
135146	Section 24 W Side Drainage Improvements	• Stormwater	Inactive
143070	Horizon Shores Ph 2 Detention pond 12-A5-1	• Stormwater	Active
140335	Circle K Store 2746415	• Tanks	Active
157218	Moorhead Aviation	• Stormwater	Active
228672	Moorhead Truck Center	• Hazardous Waste	Active
85250	King Aviation LLC	• Multiple Programs	Active
10307	Commercial Truck Stop	• Hazardous Waste	Inactive
Within 500 ft. of AUAR Area			
229157	2019 Horizon Shores Utility Improvements	• Stormwater	Active
221092	Horizon Shores Commercial	• Stormwater	Active
251248	Moorhead Mega Storage	• Stormwater	Active
130411	28 th Ave S (11-A2-5)	• Stormwater	Active
143011	Unishippers Addition	• Stormwater	Active
131738	Holiday Station store #415 - Moorhead	• Stormwater	Inactive
216536	Mjolsness Properties	• Stormwater	Active
7137	40 th Ave S Drainage System	• Stormwater	Inactive
150925	South Shore Landing	• Stormwater	Active

- b. Project related generation/storage of solid wastes - Describe solid wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from solid waste handling, storage and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of solidwaste including source reduction and recycling.***

Construction

Future proposed developments may require demolition of certain existing structures in the AUAR area. Therefore, the proposed development will require pre-demolition regulated building materials surveys prior to demolition of any existing structures.

The historical land use of much of the AUAR area appears to have included agricultural use. It is common practice in rural areas to dispose of old structures by burning and/or burying demolition debris onsite. Therefore, shallow-buried farmstead debris may be encountered and require management for proper off-site disposal during development. In addition, old cisterns, septic tanks, and water wells are often associated with former farmsteads and will need to be managed in accordance with local and state regulations if these features are identified or encountered prior to or during construction.

The disposal of solid wastes generated by clearing the construction area is a common occurrence associated with construction projects. Additional items that may require removal and offsite recycling/disposal include existing vegetation (e.g., trees and crops), components associated with the irrigation system, fencing, and other agricultural items that may be present on the property.

Post-Construction

Future development within the AUAR area would generate solid waste during operation. Future proposed development will be required to undertake acceptable methods to minimize excess waste materials. When and where feasible, items will be evaluated for recycling or reuse prior to disposal at an offsite landfill. All solid waste minimization, avoidance, and disposal measures will be handled by the contractor under provisions outlined in their contract. Solid wastes generated during future operations would be subject to compliance with local, state, and federal regulations as well as the industrial developer's corporate policies on waste reduction and recycling.

- c. ***Project related use/storage of hazardous materials - Describe chemicals/hazardous materials used/stored during construction and/or operation of the project including method of storage. Indicate the number, location and size of any new above or below ground tanks to store petroleum or other materials. Indicate the number, location, size and age of existing tanks on the property that the project will use. Discuss potential environmental effects from accidental spill or release of hazardous materials. Identify measures to avoid, minimize or mitigate adverse effects from the use/storage of chemicals/hazardous materials including source reduction and recycling. Include development of a spill prevention plan.***

Not applicable to an AUAR

- d. ***Project related generation/storage of hazardous wastes - Describe hazardous wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from hazardous waste handling, storage, and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of hazardous waste including source reduction and recycling***

Small quantities of hazardous wastes in the form of used oils/lubricants, waste paints, or other materials may be generated during construction. Hazardous wastes may be generated post construction at future industrial facilities and operations developed in the AUAR area. Through the land development planning, assessment, and approval process, the City will require that MPCA and other regulatory requirements be met for the generation/storage of hazardous wastes.

MITIGATION STRATEGIES

Proposed development will be required to conduct pre-demolition regulated building materials surveys prior to demolition of any existing structures.

Any shallow-buried farmstead debris encountered during construction will be managed for proper off-site disposal during development. In addition, old cisterns, septic tanks, and water wells will be managed in accordance with local and state regulations if these features are identified or encountered prior to or during construction.

Post Construction, when and where feasible, items will be evaluated for recycling or reuse prior to disposal at an offsite landfill. Additionally, the City will require that MPCA and other regulatory requirements be met for the generation/storage of hazardous wastes post construction.

14. Fish, Wildlife, Plant Communities, and Sensitive Ecological Resources (Rare Features)

a. Describe fish and wildlife resources as well as habitats and vegetation on or in near the site.

The AUAR area is located within an ecological area classified as the Prairie Parkland Province (251), Red River Valley Section (251A), and Red River Prairie Subsection (251Aa). The land is presently used primarily for agriculture within this Subsection and the Glacial Lake Agassiz lake plain has been ditched for this purpose. Native vegetation is present in fragments east of the beach ridges and in the interbeach zone. This native vegetation, which was more widespread pre-settlement, consisted of tallgrass prairie and wet prairie communities with bluestems (i.e., *Andropogon gerardii* and *Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), bluejoint grass (*Calamagrostis canadensis*), cordgrass (*Spartina* spp.), cattails (*Typha* spp.), rushes (*Juncus* spp.), and sedges (*Carex* spp.). Forested floodplains, woodlands, and brushlands were also prevalent^{18,19}.

A detailed description of the land cover types within the AUAR area is available in Item 8 and Table 4. The AUAR area overlaps the eastern boundary of the City of Moorhead and extends further east primarily over cropland. Additional land cover, according to Google Earth aerial imagery, includes developed areas consisting of rural residences as well as paved and gravel roadways, lawn/landscaping, fragmented woodlands, open water features, and wetlands. Moorhead Municipal Airport is also within the AUAR area. As the AUAR is primarily cropland and developed land (Table 4), limited habitat is available for wildlife; however, these areas may provide habitat for urban wildlife species, such as mice, rabbits, raccoons, squirrels, deer, coyotes, and foxes. Additionally, while limited, the woodlands may provide suitable nesting and migratory stopover sites for avian species, and the open water and wetland areas may provide suitable habitat for aquatic species, such as fish, frogs, and toads. The woodlands, open water, and wetlands located within and near the AUAR area may also contain suitable summer habitat and foraging habitat for bat species.

b. Describe rare features state-listed (endangered, threatened or special concern) species, native plant communities, Minnesota Biological Survey Sites of Biodiversity Significance, and other sensitive ecological resources on or within close proximity to the site. Provide the license agreement number (LA-) and/or correspondence number (MCE) from which the data were obtained and attach the Natural Heritage Review letter from the DNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe the results.

¹⁸ DNR. 2000. Ecological Classification System. Available at: <https://www.dnr.state.mn.us/ecs/index.html>. Accessed May 2023.

¹⁹ DNR. 1999. Minnesota Geospatial Commons – Ecological Sections of Minnesota. Available at: <https://gisdata.mn.gov/dataset/geos-ecological-class-system>. Accessed May 2023.

Federally – Listed Species

The United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IpaC) tool²⁰ was reviewed to identify an updated list of federally listed species that have the potential to occur within the AUAR area. Two species were identified from this review: the northern long-eared bat (*Myotis septentrionalis*; endangered) and the monarch butterfly (*Danaus plexippus*; candidate). The northern long-eared bat (NLEB) was identified in the 2018 review but has since been up-listed from threatened to endangered as of March 31, 2023²¹. Additionally, the monarch butterfly was not identified in the 2018 review, and the Dakota skipper (*Hesperia dacotae*; threatened) was identified in the 2018 review, but not identified in the 2023 review. The IPaC results are included in Appendix B.

Northern long-eared bat

Suitable summer roosting, forage, and travel habitat for northern long-eared bat (NLEB) consists of a wide variety of contiguous forested and wooded habitats with varying tree density and amounts of canopy closure. While roosting, the NLEB is generally found in deep crevices in areas such as forests and woodlots (i.e., live trees and/or snags greater than or equal to three inches in diameter at breast height that have exfoliating bark, cracks, crevices, and/or cavities) as well as linear features such as fence rows, riparian forests, and other wooded corridors. NLEB roosts in both live trees and snags^{22,23,24}. Additional summer habitat for the NLEB consists of areas adjacent to wooded areas, namely emergent wetlands and edges of agricultural fields, old fields, and pastures. The NLEB has also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses²⁵. During winter months, NLEB hibernates in caves or abandoned mines²¹.

Clay County is not listed as a county with documented white-nose syndrome (WNS)^{26,27}. Since the 2018 review; however, the 4(d) Rule of the Endangered Species Act (ESA) no longer applies to the NLEB as a result of the up-listing from threatened to endangered. According to the Minnesota Department of Natural Resources (DNR) Natural Heritage Information System (NHIS) database under license agreement LA-2022-023, no known roost trees or hibernacula are in the AUAR area or within a one-mile radius of the AUAR area.

The AUAR area, as detailed in Item 8 and Table 4, is primarily cropland (approximately 3,610.98 acres; 84 percent) and impervious surface (approximately 659.81 acres; 15 percent). Approximately 16.91 acres of wooded habitat is present within the AUAR area. These trees may provide suitable roosting habitat for the NLEB, but this is unlikely due to their lack of connectivity to large, contiguous tracts of forest and their proximity to developed areas. The open water features and wetlands located within and near the

²⁰ USFWS. 2023a. Information for Planning and Consultation. Available at: <https://ipac.ecosphere.fws.gov/>. Accessed May 2023.

²¹ USFWS. 2023b. Northern Long-eared Bat. Available at: <https://www.fws.gov/species/northern-long-eared-bat-myotis-septentrionalis>. Accessed May 2023.

²² Sasse, D.B., and P.J. Pekins. 1996. Summer roosting ecology of northern long-eared bats (*Myotis septentrionalis*) in the White Mountain National Forest. Bats and forests symposium. British Columbia Ministry of Forests Working Paper 23:91-101.

²³ Foster, R.W. and A. Kurta. 1999. Roosting ecology of the northern bat. (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). *Journal of Mammalogy* 80:659-672.

²⁴ Owen, S.F.; Menzel, M.A.; Ford, M.W.; Chapman, B.R.; Miller, K.V.; Edwards, J.W.; and Wood, P.B. 2003. Home range size and habitat use by the northern *Myotis* (*Myotis septentrionalis*). *American Midland Naturalist* 150: 352-359.

²⁵ USFWS. 2022a. Rangewide-Wide Indiana Bat & Northern Long-Eared Bat Survey Guidelines. Available at: <https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines>. Accessed March 2023.

²⁶ WNS Response Team. 2023. Where is WNS Now? Available at: <https://www.whitenosesyndrome.org/where-is-wns>. Accessed May 2023.

²⁷ DNR. 2020. White-nose Syndrome and Minnesota's Bats. Available at: <https://www.dnr.state.mn.us/wns/index.html>. Accessed May 2023.

AUAR area may also provide drinking and foraging sources for NLEB utilizing habitat outside of the AUAR area.

Direct mortality from collision with construction equipment is unlikely given that construction activities would occur during daylight hours when bats would not be active. Up to five acres of tree clearing is anticipated to occur within the AUAR area as part of construction. This action may impact potentially suitable, undocumented NLEB roosting habitat within the AUAR area. Tree clearing is recommended to occur during the bat inactive period from November 15 to March 31.

Given the lack of documented NLEB roost trees and hibernacula as well as the lack of contiguous forest within the AUAR area, adverse impacts to the NLEB as a result of the Project are not anticipated.

Monarch butterfly

The monarch butterfly is a migratory butterfly that exists in two main populations within the United States divided by the Rocky Mountains: the eastern population that overwinters in the mountains of Mexico, and the western population that overwinters along the southern pacific coast of California²⁸. This species generally occurs in areas with high densities of nectar sources, preferably native prairies with nectar species such as black-eyed Susan (*Rudbeckia hirta*), narrow-leaved coneflower (*Echinacea angustifolia*), and rough blazing star (*Liatris aspera*) utilized for feeding by adults²⁹; however, the presence of milkweed (*Asclepias* spp.) is required for breeding habitat as it is the only genus on which the larvae can feed³⁰. The monarch butterfly is a candidate for federal listing due to habitat loss, relating mainly to the loss of milkweeds and native prairies.

The monarch butterfly is a candidate for federal listing and is not regulated by the USFWS at this time. Neither suitable foraging habitat (native prairie) nor suitable breeding habitat (milkweeds) are present within the AUAR area in large enough densities to support this species given the large areas of cropland present. Additionally, no grasslands were identified within the AUAR area as shown in Table 4. As such, impacts to this species are not anticipated as a result of the Project. It is also recommended that impacts to this species be reassessed when a listing status is finalized.

Migratory birds

Construction activities and development within the AUAR area have the potential to impact birds protected under the Migratory Bird Treaty Act (MBTA). The MBTA makes it illegal for anyone to take (i.e., to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in such conduct) any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations.

Under the MBTA, construction activities in grasslands, roadsides, wetlands, riparian (streams), shrublands, or wooded habitats that would otherwise result in the taking of migratory birds, eggs, young, and/or active nests should be avoided. Although the provisions of the MBTA are applicable throughout the entire year, most migratory bird nesting activity in Minnesota occurs approximately from mid-March to August 15³¹. According to the USFWS IPaC results, there are 12 migratory bird species listed as Birds of Conservation

²⁸ USDA Forest Service. undated(a). Migration and Overwintering. Available at:

https://www.fs.fed.us/wildflowers/pollinators/Monarch_Butterfly/migration/. Accessed November 2021.

²⁹ DNR. 2022. Butterfly Gardens. Available at: <https://www.dnr.state.mn.us/gardens/butterfly/index.html>. Accessed March 2022.

³⁰ National Wildlife Federation. undated. Monarch Butterfly. Available at: <https://www.nwf.org/Educational-Resources/Wildlife-Guide/Invertebrates/Monarch-Butterfly>. Accessed December 2021.

³¹ DNR. 2014. Best Practices for Meeting DNR GP 2004-0001 (version 4, October 2014). Available at: http://files.dnr.state.mn.us/waters/watermgmt_section/pwpermits/gp_2004_0001_chapter1.pdf. Accessed May 2023.

Concern (BCC). These species are detailed in Table 9.

Table 9. Birds of Conservation Concern with Potential to Occur Within the AUAR Area

Common Name	Scientific Name	Habitat
American golden-plover	<i>Pluvialis dominica</i>	Forages in lagoons and estuaries, breeds in lowlands and mountains of the tundra, and uses grasslands and farmlands as stopover sites during migration
Black tern	<i>Chlidonias niger</i>	Variety of wetland habitats and tropical ocean waters
Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>	Forests, woodlands, scrub, and thickets
Bobolink	<i>Dolichonyx oryzivorus</i>	Grasslands, tallgrass and mixed prairie, hayfields, marshes, and rice and sorghum fields
Chimney swift	<i>Chaetura pelagica</i>	Urban or suburban settings with chimneys, or rural areas with hollow trees, tree cavities, and caves
Franklin's gull	<i>Leucophaeus pipixcan</i>	Breed in freshwater marshes with emergent vegetation; forages in agricultural fields, pastures, and wetlands; and uses a wide variety of habitats during migration (opportunistic)
Golden-winged warbler	<i>Vermivora chrysoptera</i>	Open woodlands, wet thickets, tamarack bogs, aspen or willow stands, and wetlands
Hudsonian godwit	<i>Limosa haemastica</i>	Breeds in arctic bog habitats known as muskegs; forages along coastlines, mudflats, and marsh edges; and uses stopover sites at various wetland types during migration
Lesser yellowlegs	<i>Tringa flavipes</i>	Breeds in open or semi-open woodlands, wet meadows, marshes, bogs, and ponds; utilizes fresh and brackish wetland types during migration and overwintering
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	Deciduous woodlands with oak, oak-hickory, maple, ash, and/or beech with dead or partially dead trees present
Short-billed dowitcher	<i>Limnodromus griseus</i>	Breeds in taiga habitat in wetlands often near edges of bogs (muskegs), winters in saltwater and brackish environments, and uses stopover sites in a variety of manmade environments during migration (impoundments, sewage ponds, flooded farm fields, etc.)
Willet	<i>Tringa semipalmata</i>	Open beaches, bayshores, marshes, mudflats, rocky coastal zones, wetlands, prairie pothole ponds, wet fields, saltmarshes, barrier islands, and barrier beaches

Source: USFWS IPaC and Cornell Lab of Ornithology

One additional species, the bald eagle (*Haliaeetus leucocephalus*), is not listed on the USFWS IPaC as a BCC species but warrants attention under the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d). This Act prohibits anyone from taking (i.e., “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb”) bald eagles or golden eagles (*Aquila chrysaetos*), including their parts, nests, or eggs. Regulations further define “disturb” as “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior”³². According to the USFWS IPaC results, the bald eagle has the potential to occur

³² USFWS. undated. Bald and Golden Eagle Protection Act. Available at: <https://www.fws.gov/law/bald-and-golden-eagle-protection-act>.

within the AUAR area. This species nests in forested areas adjacent to large bodies of water generally away from human activity. They prefer tall, mature coniferous or deciduous trees for perching and nesting, and will forage around dams, dumps, and fish processing plants as well as open water features³³. The trees within the AUAR area are not ideal for nesting sites due to their smaller size and proximity to human developments; however, open water features within and nearby the AUAR area may provide foraging sites for this species. Therefore, incidental take of the bald eagle is unlikely as a result of the Project.

State – Listed Species

Under Stantec’s Limited License to Use Copyrighted Material (LA-2022-023) related to Rare Features Data, the DNR NHIS database was searched in May 2023 to identify species within the AUAR area and within a one-mile radius of the AUAR area. The NHIS search indicated one record within the AUAR area: the Garita skipperling (*Oarisma garita*; threatened). One additional record was identified outside of the AUAR area, but within the one-mile radius of the AUAR area: the peregrine falcon (*Falco peregrinus*; special concern). The 2018 review included the Garita skipperling, which was observed in 1968, but did not include the 2014 peregrine falcon observation within the one-mile radius of the AUAR area. A request for concurrence was submitted to the DNR through their Minnesota Conservation Explorer tool on June 2, 2023.

Garita skipperling

The Garita skipperling inhabits dry to moist prairie in old dune formations or outwash deposits. Additional habitat features can consist of hollows, bases of hills, moist swales, and swells. When found in drier prairies, the dominant grasses often consist of little bluestem (*Schizachyrium scoparium* var. *scoparium*), needle-and-thread grass (*Hesperostipa comata*), prairie junegrass (*Koeleria macrantha*), and porcupine grass (*Hesperostipa spartea*)³⁴.

Suitable habitat for the Garita skipperling (dry or moist prairie) is not present within the AUAR area, which is primarily cropland. The one record for this species is from 1968 and is located in the northwest portion of the AUAR area. Additionally, this record is disputed and is listed as likely to have been an accidental occurrence as the species has been searched for since 1968 and was never found. Given the lack of suitable habitat and the fact that the species has not been observed in the area for approximately 54 years, it is unlikely that the Project will have any impacts on the Garita skipperling.

Peregrine falcon

The peregrine falcon utilizes cliff ledges along rivers and lakes in bluff areas as well as on tall manmade structures, such as buildings and bridges, in urban settings. When hunting, this species prefers open, non-forested areas that provide room for direct aerial pursuit of avian prey³⁵.

The peregrine falcon is listed as a special concern species and is not regulated by the DNR at this time. Suitable nesting habitat for this species (cliff ledges or tall manmade structure) is not present within the AUAR area. However, suitable hunting habitat (open, non-forested areas) is present within the AUAR

Accessed May 2023.

³³ Cornell Lab of Ornithology. 2023. All About Birds – Bald Eagle Life History. Available at: https://www.allaboutbirds.org/guide/Bald_Eagle/lifehistory#habitat. Accessed May 2023.

³⁴ DNR. 2023a. Rare Species Guide – Garita Skipperling. Available at: <https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=IILEP57020>. Accessed May 2023.

³⁵ DNR. 2023b. Rare Species Guide – Peregrine Falcon. Available at: <https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABNKD06070>. Accessed May 2023.

area in the form of cropland. The species was last observed in 2014 as of this 2023 review and was recorded approximately one mile west of the AUAR area. Given that open areas for hunting are plentiful outside of the AUAR area and the addition of urban growth within the AUAR area may add additional potential nesting sites for the species, it is unlikely that the Project will have any adverse impacts on the peregrine falcon.

Native Plant Communities and Sites of Biodiversity and Ecological Significance

DNR NHIS data also provides information regarding the presence of DNR native plant communities, sites of biodiversity significance, and regionally significant ecological areas. According to a review of this database using Stantec's limited license (LA-2022-023), no such sites are located within the AUAR area; however, there is a stretch of the Ottertail Valley Railroad located approximately 0.1 mile southwest of the AUAR area that contains a wetland prairie system and a site of moderate biodiversity significance. Given that this area is located outside of the AUAR area, impacts to the wetland prairie system and the associated site of biodiversity significance are not anticipated.

- c. *Discuss how the identified fish, wildlife, plant communities, rare features and ecosystems may be affected by the project including how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Include a discussion on introduction and spread of invasive species from the project construction and operation. Separately discuss effects to known threatened and endangered species.*

Urban wildlife may be impacted with the removal of woodland within the AUAR area; however, these habitat generalist species are typically adaptive to development activities and would likely relocate to undeveloped areas in the vicinity or continue to live in the remaining undeveloped areas within the AUAR area.

Development of the East Growth Area is not anticipated to have significant adverse impacts on federally or state listed threatened or endangered species, state special concern species, or candidates for listing.

Federally-Listed Species

Northern long-eared bat

Although a limited area (16.91 acres; <1 percent) of the AUAR area may provide suitable roosting habitat for the NLEB and up to five acres of tree clearing are anticipated for the Project, adverse impacts to the NLEB are not anticipated due to the lack of documented roosts or hibernacula within and in the vicinity of the AUAR area, and the lack of contiguous forested habitat. It is recommended that tree clearing occur during the bat inactive season of November 15 to March 31. While impacts are not anticipated from the Project, climate change is anticipated to impact this species. Based on the climate discussion in Item 7, the state of Minnesota is getting warmer and wetter. These changes in temperature and precipitation may influence the NLEB's available suitable roosting and foraging habitat, as well as prey availability (USFWS 2022b)³⁶. Although a less significant stressor compared to white-nose syndrome, climate change variables may negatively affect the NLEB³⁷.

Monarch butterfly

³⁶ USFWS. 2022b. Northern Long-Eared Bat Overview. Available at: [fws.gov/species/northern-long-eared-bat-myotis-septentrionalis](https://www.fws.gov/species/northern-long-eared-bat-myotis-septentrionalis). Accessed September 2022

³⁷ USFWS. 2022c. Proposed Rule 87 FR 16442: Endangered and Threatened Wildlife and Plants; Endangered Species Status for Northern Long-Eared Bat. Available at: <https://www.federalregister.gov/d/2022-06168>. Accessed January 2023.

The monarch butterfly is a candidate for federal listing and is not regulated by the USFWS at this time. The AUAR area is unlikely to support this species given that it is located within a primarily agricultural area that lacks high densities of nectar sources and milkweed. Therefore, impacts are not anticipated for this species. As discussed in Item 7, climate change is anticipated to result in increasing temperatures, which may increase the number of days and the area in which monarch butterfly populations would be exposed to unsuitably high temperatures. This can result in them using up fat stores too quickly at their overwintering sites and may result in them incorrectly judging when to enter and exit states of dormancy³⁸.

Migratory birds

Construction activities in grasslands, roadsides, shrublands, or woodland habitats within the AUAR area may result in the taking of migratory birds, eggs, young, and/or active nests, if present. Although the provisions of the MBTA are applicable throughout the entire year, most migratory bird nesting activity in Minnesota occurs approximately from mid-March to August 15. When possible, removal of vegetation is recommended to occur outside of this timeframe to minimize potential take of migratory birds. Beyond the Project, the threats to migratory birds are many, but climate change, according to the National Audubon Society, is the largest concern. It is estimated that 389 North American bird species are at increasing risk of extinction as a result of warming temperatures altering their range³⁹.

State-Listed Species

Garita skipperling

Habitat for the Garita skipperling (dry or moist prairie) is not present within the AUAR area and the species has not been observed in the area for approximately 54 years, therefore, it is unlikely the Project will have impacts on this species. In terms of impacts from climate change, increased temperatures in Minnesota can lead to the desiccation of vegetation and more prevalent wildfires. Based on what is known about the Poweshiek skipperling (*Oarisma poweshiek*), Garita skipperling larvae are likely highly sensitive to even the low energy output of fires³³.

Peregrine falcon

The peregrine falcon is listed as special concern and is not regulated by the DNR at this time. Nesting habitat for the peregrine falcon (cliff ledges or tall manmade structures) is not present within the AUAR area. Open, non-forested habitat that could be used for hunting by this species is within the AUAR area but given the abundance of this habitat in the vicinity of the AUAR area and that the Project may add nesting sites in the form of tall manmade structures, the Project is not anticipated to adversely impact this species. As a result of climate change, temperatures in Minnesota are rising. According to the National Audubon Society, a 1.5 degree Celsius increase in average global temperature would result in an approximate seven percent summer range loss for the peregrine falcon, including a large portion of the state of Minnesota. Increase this temperature change to three degrees Celsius on average, 14 percent of the falcon's summer range is approximated to be lost⁴⁰.

³⁸ Kobilinsky, D. 2019. Watch: Temperature drives internal clock for monarchs. The Wildlife Society. Available at: <https://wildlife.org/watch-temperature-drives-internal-clock-for-monarchs/>. Accessed September 2022.

³⁹ National Audubon Society. undated(a). Survival by Degrees: 389 Bird Species on the Brink. Available at: <https://www.audubon.org/climate/survivalbydegrees>. Accessed May 2023.

⁴⁰ National Audubon Society. undated(b). Peregrine Falcon – Climate Vulnerability. Available at: <https://www.audubon.org/field-guide/bird/peregrine-falcon>. Accessed May 2023.

Native Plant Communities and Sites of Biodiversity and Ecological Significance

The railroad wetland prairie system and associated site of biodiversity significance located approximately 0.1 miles southwest of the AUAR area are not anticipated to be impacted as a result of potential development; however, the projected Minnesota climate trends of warmer temperatures and increased precipitation may impact the species and thus the biodiversity of this site, depending on how vulnerable the present species are to climatic change.

Invasive Species

Noxious weeds and invasive species in Minnesota are managed through the Department of Agriculture (MDA) under Minnesota Statutes Section 18.78, the DNR, and local ordinances. BMPs during construction activities and operation within the AUAR area should be implemented to minimize the introduction or spread of noxious weeds and invasive species. These practices include cleaning vehicles and equipment of mud and dirt from other construction areas, removing seeds that attach to clothing or equipment, minimizing soil disturbance, not moving potentially contaminated materials between sites, and staying on designated roads/trails^{41,42}.

- d. Identify measures that will be taken to avoid, minimize, or mitigate the adverse effects to fish, wildlife, plant communities, ecosystems, and sensitive ecological resources.*

Sightings of any rare species during construction activities would be reported to the DNR Nongame Wildlife specialist. The City of Moorhead would follow the guidance that is received to avoid impacts.

It is recommended that tree clearing be conducted during the bat inactive season of November 15 to March 31 to avoid impacts to the NLEB.

It is recommended that vegetation removal be conducted outside of the migratory bird nesting timeframe of mid-March to August 15 to avoid take of migratory bird species.

MITIGATION STRATEGIES

As of 2023, the main update for mitigation strategies relates to the NLEB and the reclassification from threatened to endangered, and the nullification of the 4(d) Rule of the ESA, both of which took effect on March 31, 2023. Once available, new tools from the USFWS should be reviewed to provide guidance on this species and how to mitigate any impacts. Tree clearing is still recommended to occur between November 15 and March 31 to avoid the bat active season.

Mitigation strategies that remain valid from the 2018 review are as follows:

If tree clearing cannot be avoided during the peak breeding season for migratory birds (approximately mid-March to August 15), it is recommended that a qualified biologist conduct a pre-construction breeding bird survey within the AUAR area to determine the absence or presence of breeding birds and their nests. Pre-construction breeding bird surveys may include:

- 1) Pre-construction surveys that occur no more than two weeks before tree and shrub*

⁴¹ USDA National Invasive Species Information Center. undated(b). Best Management Practices. Available at: <https://www.invasivespeciesinfo.gov/subject/best-management-practices>. Accessed January 2023.

⁴² DNR. 2023c. Terrestrial invasive species. Available at: <https://www.dnr.state.mn.us/invasives/terrestrial/index.html>. Accessed January 2023.

- clearing activities commence. The area surveyed will include the areas where potential suitable habitat has been identified and tree or shrub clearing has not been completed.
- 2) If an occupied nest is observed during the survey, tree and shrub clearing activities will not be permitted within a 660-foot buffer of the nest site during the breeding season or until the fledglings have left the area. Consult with the USFWS to avoid take of migratory bird species.

Upon completion, the survey results would be submitted to the USFWS, as appropriate. If breeding birds are not present, construction can proceed with no restrictions. If breeding birds or active nests are present, additional consultation may be required.

The results of the DNR NHIS review are typically valid for one year. The NHIS database should be consulted prior to the commencement of construction activities within the AUAR area to identify any new records of rare or otherwise significant species, native plant communities, and other natural features within the AUAR area vicinity.

BMPs such as erosion and sediment control devices would be used during construction activities to prevent the flow of sediment into wetlands and open water features within or adjacent to the AUAR area and to avoid adverse effects to water quality and aquatic species, if present. Wildlife-friendly erosion control materials would be used whenever feasible.

15. Historic Properties

Describe any historic structures, archeological sites, and/or traditional cultural properties on or in close proximity to the site. Include: 1) historic designations, 2) known artifact areas, and 3) architectural features. Attach letter received from the State Historic Preservation Office (SHPO). Discuss any anticipated effects to historic properties during project construction and operation. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to historic properties.

The Minnesota State Historic Preservation Office (SHPO) was contacted regarding the presence of architectural or archaeological resources. No archaeological sites and four architectural resources are located within the AUAR area. An additional 23 architectural resources are located within a mile of the AUAR area. The architectural resources within the AUAR area include the Mueller farmstead, an unnamed farmstead, an unnamed Clay County ditch, and State highway 10. Of the four resources within the AUAR area, none of the resources have been listed or determined eligible. The architectural resources within the vicinity represent bridges, ditches, houses, farmsteads, commercial buildings, the state highway and the railroad. One of these resources a barn (CY-DWC-004) is considered eligible and the remaining resources have not been evaluated.

If proposed development should be conducted within 150 feet of a previously recorded architectural resource a Phase II evaluation should be conducted to provide recommendations for eligibility of the resource if it cannot be avoided. If any of the buildings are determined eligible as a result of Phase II evaluation, direct and indirect effects should be taken into account and coordination with the SHPO should occur. Appendix C provides correspondence from SHPO.

16. Visual

Describe any scenic views or vistas on or near the project site. Describe any project related visual effects such as vapor plumes or glare from intense lights. Discuss the potential visual effects from

the project. Identify any measures to avoid, minimize, or mitigate visual effects.

The AUAR area is not located near any scenic views or vistas. The AUAR anticipates a development pattern similar to those in the surrounding area and does not anticipate any adverse visual impacts as a result of the development scenario.

Industrial development is proposed south of Interstate 94 as part of Scenario 2, the maximum development scenario. Future industrial development and uses may have visual impacts on surrounding properties. These impacts can include light pollution from spotlights and flares, smoke, and visual obstructions. Given that the area to the west is existing industrial, to the north is Interstate 94 and to the east is the Moorhead Municipal airport there will be minimal significant visual impacts to existing properties.

17. Air

- a. Stationary source emissions - Describe the type, sources, quantities and compositions of any emissions from stationary sources such as boilers or exhaust stacks. Include any hazardous air pollutants, criteria pollutants. Discuss effects to air quality including any sensitive receptors, human health or applicable regulatory criteria. Include a discussion of any methods used assess the project's effect on air quality and the results of that assessment. Identify pollution control equipment and other measures that will be taken to avoid, minimize, or mitigate adverse effects from stationary source emissions.***

Stationary source emissions will not be produced by future development. Furthermore, in accordance with the EQB's AUAR guidance document⁴³, this item is not applicable to an AUAR as any stationary air emission sources large enough to merit environmental review would require individual review.

- b. Vehicle emissions - Describe the effect of the project's traffic generation on air emissions. Discuss the project's vehicle-related emissions effect on air quality. Identify measures (e.g. traffic operational improvements, diesel idling minimization plan) that will be taken to minimize or mitigate vehicle-related emissions.***

Motorized vehicles affect air quality by emitting air borne pollutants. The changes in traffic volumes, travel patterns, and roadway locations resulting from either development scenario could affect air quality by changing the number of vehicles and the congestion levels in the AUAR area. The criteria pollutants identified by the EPA are ozone, particulate matter, carbon monoxide, nitrogen dioxide, lead, and sulfur dioxide. Potential impacts resulting from these pollutants are assessed by comparing projected concentrations to National Ambient Air Quality Standards (NAAQS).

NAAQS – Criteria Pollutants

Section 109(b) of the Clean Air Act (CAA) requires that the EPA to establish NAAQS “requisite to protect” public health and public welfare (40 CFR Part 50). The CAA identifies two class types of NAAQS: primary standards and secondary standards. Primary standards are limits set to protect the public health of the most sensitive populations, such as asthmatics, children and the elderly. Secondary standards are limits set to protect public welfare, such as protection against visibility impairment or damage to vegetation, wildlife and structures. The CAA requires the EPA to periodically review and, if

⁴³ EQB. Alternative Urban Areawide Review Documents: Recommended Content and Format. Updated September 2008.
<https://www.eqb.state.mn.us/sites/default/files/documents/AUAR%20guidance%20%28form%29%20-9-09.pdf>

new data indicate, update the NAAQS.

The EPA has promulgated NAAQS for six criteria pollutants: ozone, particulate matter (PM), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), carbon monoxide (CO) and lead. Standards for PM are categorized on the size of the PM based on the aerodynamic diameter of the PM. PM₁₀ represents particulate matter with an aerodynamic diameter of less than 10 microns and PM_{2.5} is PM with a diameter of less than 2.5 microns.

In Minnesota, the MPCA monitors and regulates air pollution. MPCA is required to develop regulations, referred to as the State Implementation Plan (SIP) to outline how the areas under their jurisdiction will attain and maintain ambient air concentration levels in compliance with the NAAQS. Within their SIP, MPCA has developed state air quality regulations under Section 7009.0800 of the Minnesota Administrative Rules. In general, the state standards mirror the EPA NAAQS. The primary difference is the state has developed ambient air quality standards for hydrogen sulfide (H₂S).

Minnesota had several areas designated as nonattainment for lead, PM₁₀, and SO₂ during the 1980s and 1990s. These areas were primarily located in the seven-county Twin Cities Metropolitan Area. The majority of these areas were all redesignated to attainment by 2002 and considered maintenance areas, which require the state to regularly assess monitoring information, changes to emission patterns, and perform evaluation of the SIP requirements to assure that the areas continue to maintain their attainment status. Since the 2018 AUAR Update, the Twin Cities 20-year maintenance period for this area ended on November 29, 2019. No maintenance or nonattainment areas currently encompass the Moorhead area.

Carbon monoxide (CO) levels are elevated near roadway intersections due to the emission of this pollutant from the vehicles idling and passing by. The State of Minnesota has ambient CO standards that are designed to protect human health and the environment. The state standards are:

- 1-hour average: 35 parts per million (ppm); and
- 8-hour average: 9 ppm.

Concentrations near or above these levels are most likely to occur near intersections that are congested and have high traffic volumes. The Minnesota Department of Transportation (MnDOT) has developed a screening method designed to identify intersections that may cause a CO impact above the State standards. The EPA has approved a CO hot spot screening method designed to identify intersections that may result in CO emissions that exceed air quality standards. This screening method assumes that intersections with a total daily traffic volume exceeding 82,300 vehicles per day may result in potential CO impacts that exceed air quality standards. As described in further detail in Item 20 (Transportation), 2045 forecasted daily volumes would range from 2,100 vehicles per day (vpd) to 5,100 vpd, below the hot spot screening threshold.

Sulfur dioxide emissions are primarily associated with power plants and specific industrial activities. Automotive traffic is not a major source of sulfur dioxide emissions. Diesel engines were formerly a source of sulfur dioxide emissions, but recent federal air pollution regulations mandated that all on-road diesel fuel be converted to ultra-low sulfur diesel, which contains less than 15 parts per million sulfur. Therefore, truck traffic is no longer a significant source of sulfur dioxide emissions.

Like carbon monoxide, nitrogen dioxide emissions are elevated near roadway intersections due to the emission of this pollutant from the vehicles idling and passing by. MPCA has performed long time ambient air monitoring for this pollutant throughout the Twin Cities area at heavily trafficked intersections. No exceedances of the NAAQS for nitrogen dioxide have been monitored. Therefore, none of the intersections in the AUAR area under any of the traffic scenarios would result in a

violation of the air quality standard for nitrogen dioxide.

Nitrogen dioxide and volatile organic compound emissions from vehicular traffic contribute to the formation of ozone. Ground-level ozone, also known as smog, is produced on hot, sunny days by a chemical reaction between VOCs and oxides of nitrogen (NO_x). VOCs are released from activities such as the use of paints and solvents. NO_x emissions are released from motor vehicles, power plants, and other activities that require fuel combustion. Levels of ozone are dependent on the amount of VOCs and NO_x in the air as well as weather conditions including sunlight, temperature, and wind speed and direction. In Minnesota, the highest levels of ozone occur on hot and sunny summer days. Due to the conditions necessary to create ozone, ozone is considered a regional pollutant and is not associated with small, localized changes in traffic conditions. Since the development being analyzed within this AUAR will not result in any significant changes to the vehicular emissions within the Moorhead metropolitan area and the Moorhead area currently attains the ozone NAAQS, the nitrogen dioxide and volatile organic compound traffic emissions associated with this project would not result in a violation of the air quality standard for ozone.

Vehicular traffic is not a significant contributor to particulate or lead emissions. Lead was removed as an additive from gasoline in the 1970s. Federal regulations have been implemented over the past two decades that have substantially reduced particulate emissions from diesel truck engines. Continued turnover of current truck fleets in the coming years will result in reductions of diesel particulate impacts from vehicular traffic throughout the nation and within the AUAR study area. Since the AUAR study area currently attains the lead and particulate matter NAAQS, this project will not result in a violation of the air quality standards.

Mobile Source Air Toxics

In addition to the criteria air pollutants, the EPA also regulates air toxics. The Federal Highway Administration (FHWA) provides guidance for the assessment of Mobile Source Air Toxic (MSAT) effects for transportation projects. A qualitative evaluation of MSATs has been performed for the AUAR, the scope and methods of which have been developed in collaboration with MnDOT, MPCA, and FHWA.

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the EPA regulate 188 air toxics, also known as hazardous air pollutants. The EPA assessed this expansive list in its rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are part of EPA's Integrated Risk Information System (IRIS).⁴⁴ In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the 2011 National Air Toxics Assessment (NATA).⁴⁵ These are *1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter*. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules.

Motor Vehicle Emissions Simulator (MOVES)

According to EPA, MOVES3 is a major revision to MOVES2014 and improves upon it in many respects. MOVES3 includes new data, new emissions standards, and new functional improvements and features. It

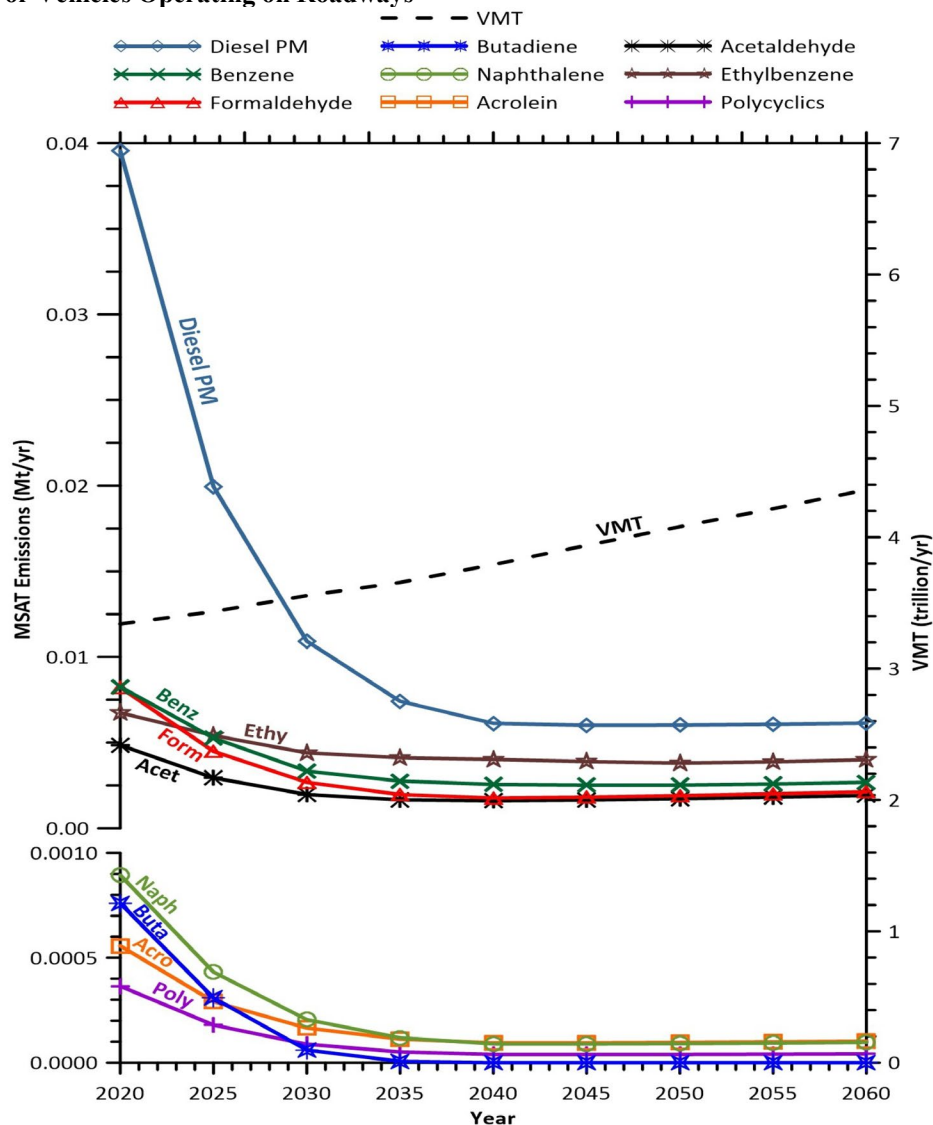
⁴⁴ <https://www.epa.gov/iris>

⁴⁵ <https://www.epa.gov/national-air-toxics-assessment>

incorporates substantial new data for emissions, fleet, and activity developed since the release of MOVES2014. These new emissions data are for light- and heavy-duty vehicles, exhaust and evaporative emissions, and fuel effects. MOVES3 also adds updated vehicle sales, population, age distribution, and vehicle miles travelled (VMT) data. In the November 2020 EPA issued MOVES3 Mobile Source Emissions Model Questions and Answers⁴⁶ EPA states that for on-road emissions, MOVES3 updated heavy-duty (HD) diesel and compressed natural gas (CNG) emission running rates and updated HD gasoline emission rates. They updated light-duty (LD) emission rates for hydrocarbon (HC), carbon monoxide (CO) and nitrogen oxide (NOx) and updated light-duty (LD) particulate matter rates, incorporating new data on Gasoline Direct Injection (GDI) vehicles.

Using EPA's MOVES3 model, as shown in Exhibit 6, FHWA estimates that even if VMT increases by 31 percent from 2020 to 2060 as forecast, a combined reduction of 76 percent in the total annual emissions for the priority MSAT is projected for the same time period.

**Exhibit 6. FHWA Projected National MSAT Emission Trends 2020 - 2060
For Vehicles Operating on Roadways**



⁴⁶ <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P1010M06.pdf>

Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

Source: EPA MOVES3 model runs conducted by FHWA, March 2021.

Diesel PM is the dominant component of MSAT emissions, making up 36 to 56 percent of all priority MSAT pollutants by mass, depending on calendar year. Users of MOVES3 will notice some differences in emissions compared with MOVES2014. MOVES3 is based on updated data on some emissions and pollutant processes compared to MOVES2014, and also reflects the latest Federal emissions standards in place at the time of its release. In addition, MOVES3 emissions forecasts are based on slightly higher VMT projections than MOVES2014, consistent with nationwide VMT trends.

Qualitative MSAT Analysis

For either development scenario in this AUAR, the amount of MSAT emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same. The VMT estimated for either development scenario would be slightly higher than that for the No Build condition, because of the additional activity associated with the proposed development. This increase in VMT would lead to higher MSAT emissions in the vicinity of the AUAR area. The higher emissions could be offset somewhat by a decrease in regional traffic due to increased use of transit. The extent to which these emissions decreases will offset vehicle related emissions increases is not known. Also, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 76 percent from 2020 to 2060.⁴⁷ Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in virtually all locations.

- c. Dust and odors - Describe sources, characteristics, duration, quantities, and intensity of dust and odors generated during project construction and operation. (Fugitive dust may be discussed under item 17a). Discuss the effect of dust and odors in the vicinity of the project including nearby sensitive receptors and quality of life. Identify measures that will be taken to minimize or mitigate the effects of dust and odors.*

Per EQB Guidance, dust and odors need not be addressed in an AUAR unless there is some unusual reason to do so. There is no unusual reason to do so with respect to the proposed development scenarios.

18. Greenhouse Gas (GHG) Emissions/Carbon Footprint

- a. GHG Quantification: For all proposed projects, provide quantification and discussion of project GHG emissions. Include additional rows in the tables as necessary to provide project-specific emission sources. Describe the methods used to quantify emissions. If calculation methods are not readily available to quantify GHG emissions for a source, describe the process used to come to that conclusion and any GHG emission sources not included in the total calculation.*

The EQB's Revised EAW Guidance (January 2022) was used to develop the carbon footprint for this AUAR. At this point in the East Growth Area planning, approximate land use category changes have been

⁴⁷ FHWA. Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents. January 18, 2023. https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/fhwa_nepa_msat_memorandum_2023.pdf

determined, but specific development projects have not yet been identified. As such, only GHG emissions associated with the land use changes (changes in the amount of carbon sequestered by changing from agricultural land use to wetlands or developed areas, for example), are presented in this AUAR. The analysis conducted in this AUAR Update has been customized to be appropriate for an AUAR Update.

As prescribed by the EQB's Draft EAW Guidance, GHG emissions associated with changes in land use were quantified using the Chapter 6: Land Use, Land-Use Change and Forestry, of the EPA's Inventory of Sources and Sinks of Greenhouse Gases, which provides an assessment of greenhouse gas fluxes resulting from land use and land use change in the U.S. The term "flux" describes the exchange of carbon dioxide to and from the atmosphere. A negative flux is a removal of carbon dioxide from the atmosphere, or carbon sequestration.

For this AUAR study, GHG emissions were calculated based on the proposed land use changes for the AUAR area of 4,313.5 acres provided in Table 1 (see Item 6a. above). As prescribed in the EQB carbon footprint guidance, emission factors (tons of CO₂e per acre) for the entire U.S. were determined based on net CO₂ emissions flux (tons CO₂e) and total land area land use change information from the most recent version of the U.S. EPA's Inventory of Sources and Sinks, 1990-2021⁴⁸. Total emissions associated with the proposed East Growth Area land use changes would increase CO₂e emissions by approximately 4,215 tons per year of CO₂e. Detailed calculations are provided in Appendix D.

Additional GHG emissions associated with construction and operation of future developments in the East Growth Area depend on the type and size of the developments (residential, commercial, industrial). Since the planned developments are unknown at this time, GHG emission calculations cannot yet be performed.

b. GHG Assessment

i. Describe any mitigation considered to reduce the project's GHG emissions.

Mitigation options will be evaluated when specific development types are identified.

ii. Describe and quantify reductions from selected mitigation, if proposed to reduce the project's GHG emissions. Explain why the selected mitigation was preferred.

N/A – mitigation options will be evaluated when specific development types are identified.

iii. Quantify the proposed projects predicted net lifetime GHG emissions (total tons/#of years) and how those predicted emissions may affect achievement of the Minnesota Next Generation Energy Act goals and/or other more stringent state or local GHG reduction goals.

Lifetime GHG emissions will be evaluated when specific developments are identified.

19. Noise

Describe sources, characteristics, duration, quantities, and intensity of noise generated during project construction and operation. Discuss the effect of noise in the vicinity of the project including 1) existing noise levels/sources in the area, 2) nearby sensitive receptors, 3) conformance to state noise standards, and 4) quality of life. Identify measures that will be taken to minimize or mitigate the effects of noise.

⁴⁸ <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>

1) *Existing noise levels/sources in the area*

Existing noise sources include vehicle traffic along I-94, Highway 10, Highway 336, and other connecting local roadways. Other existing noise sources would include noise generated by operations and equipment associated with existing agricultural and industrial uses within the AUAR area, the BNSF railroad along the northern boundary of the AUAR area, and the Moorhead Municipal Airport located in the southeastern portion of the AUAR area.

2) *Nearby sensitive receptors*

The majority of the AUAR area consists of agricultural and undeveloped land. Nearby sensitive receptors would include rural residences present within and adjacent to the AUAR area. Additional sensitive receptors include residential neighborhoods located along 40th street South and public/institutional uses such as Dorothy Dodds Elementary School and Horizon Shores Park.

3) *Conformance to state noise standards*

Minnesota Rules Chapter 7030 provides the Minnesota standards for noise. These standards describe the limiting levels of sound established on the basis of present knowledge for the preservation of health and welfare. These standards are designed to be consistent with sleep, speech, annoyance, and hearing conservation requirements for receivers within areas grouped according to land use activities. The Minnesota standards are as follows:

Table 10. Minnesota Pollution Control Agency State Noise Standards

Land Use	Code	Day (7:00 a.m. - 10:00 p.m.) dBA		Night (10:00 p.m. - 7:00 a.m.) dBA	
Residential	NAC-1	L10 of 65	L50 of 60	L10 of 55	L50 of 50
Commercial	NAC-2	L10 of 70	L50 of 65	L10 of 70	L50 of 65
Industrial	NAC-3	L10 of 80	L50 of 75	L10 of 80	L50 of 75
Notes:					
1. NAC-1 includes household units, transient lodging and hotels, educational, religious, cultural entertainment, camping and picnicking land uses.					
2. NAC-2 includes retail and restaurants, transportation terminals, professional offices, parks, recreational and amusement land uses.					
3. NAC-3 includes industrial, manufacturing, transportation facilities (except terminals), and utilities land uses.					
4. From Minnesota Pollution Control Agency, Minn. Rules sec. 7030.0040					

L10 means the sound level which is exceeded for 10 percent of the time for a one-hour period. L50 means the sound level that is exceeded 50 percent of the time for a one-hour period. Sound levels are expressed in dBA. A dBA is a unit of sound level expressed in decibels and weighted for the purpose of approximating the human response to sound.

Minnesota Statutes, Section 116.07, Subd. 2a, exempt noise from local and county roads from the requirements of these noise rules unless full control of access to the road has been acquired. This statute exempts noise from all roadways in the AUAR area.

4) *Quality of life*

Scenario 2 (Maximum Development) includes residential, commercial, mixed use, industrial, public/institutional, parkland, and agricultural uses. Future industrial and other potential noise-generating uses would be required to comply with state noise standards and local noise regulations.

MITIGATION STRATEGIES

- The AUAR area would be developed, such that where feasible, setbacks would protect land use activities sensitive to noise from noise producing sources. Once future projects are further defined, setback distances and potential mitigation measures should be reviewed relative to the sensitive receptors described in the above section to determine the potential for the project to exceed state noise standards.
- Future proposers would be advised to coordinate with the MPCA and MnDOT during project development and planning, as needed, to review roadway noise levels and setbacks.
- If needed, a traffic noise analysis would be conducted to model the existing and build condition near the AUAR area. The traffic noise modeling will be completed using the FHWA Traffic Noise Model (TNM). Prior to beginning the noise analysis, future project proposers should meet with MnDOT staff to discuss the proposed traffic noise analysis methodology to ensure that State Standards will be met. Daytime noise monitoring will be conducted at predetermined locations on the project site. A build condition noise model will be developed for specified locations and be compared to State daytime and nighttime noise standards. If State Standards are exceeded, an analysis of potential noise barriers would be evaluated in accordance with MnDOT guidance.

20. Transportation

- a. Describe traffic-related aspects of project construction and operation. Include: 1) existing and proposed additional parking spaces, 2) estimated total average daily traffic generated, 3) estimated maximum peak hour traffic generated and time of occurrence, 4) indicate source of trip generation rates used in the estimates, and 5) availability of transit and/or other alternative transportation modes.***

The basis of this East AUAR is to assess impacts to Moorhead's transportation system because of revised growth assumptions, future land uses and proposed transportation improvements associated with the approved 2045 Fargo-Moorhead Metropolitan Transportation Plan. This AUAR considers the updated 2045 Fargo-Moorhead Metropolitan Transportation Plan which was developed, reviewed, and approved by the Fargo-Moorhead Metropolitan Council of Governments (Metro COG), MnDOT, Federal Highway Administration (FHWA), Clay County, and the City of Moorhead. The 2045 Fargo-Moorhead Metropolitan Transportation Plan guides how the region grows and invests transportation dollars out to the year 2045.

For the purposes of transportation planning, this AUAR identified transportation system needs out to the year 2045. Since specific developments in the East Growth Area are not yet proposed, traffic-related specifics such as number of existing/proposed parking spaces could not be considered. As future development occurs in the east growth area, subsequent AUAR's would re-assess traffic related impacts to the transportation system through detailed traffic impact analyses.

The growth assumptions outlined in the 2045 Fargo-Moorhead Metropolitan Transportation Plan for population, households, and persons per household are shown in Table 11. Moorhead is projected to continue steady growth in population and households out to 2045.

Table 11. Household/Population Projections

Growth Category	2015	2045	% Change 2015-2045
Population	43,840	58,870	34.3%
Households	15,920	22,560	41.7%
Persons Per Household	2.75	2.61	-5.1%

Existing Metro COG travel demand model (TDM) results were used to reflect traffic conditions in the East Growth Area. 2045 model runs were utilized to document capacity issues, identify mitigation methods, and define network revisions.

Table 12. TDM Forecasted AADT

Link	Functional Class	2021 Existing Daily Volumes	2045 Forecasted Daily Volumes on Fiscally Constrained Network
12 th Ave S (west of 50 th St S)	Minor Arterial	450	5100
45 th St S	Collector	400	3,800
50 th St S	Collector/local	250	2,100
28 th Ave S	Collector	1,700	3,600

The forecasted Annual Average Daily Traffic (AADT) volumes on links within the East Growth Area is shown in Table 12. The percentage of AADT occurring during the peak hour was estimated using MnDOT Automated Traffic Recorder (ATR) 43, which is in a similar area type along TH 10. Table 13 shows that peak hour traffic was determined to be 9.4 percent of AADT occurring on a weekday between 3-5PM.

Table 13. Percent of AADT in Peak Hour for East Growth Area

ATR #	2020	2021	2022	Average
043	9.4	9.4	9.4	9.4

The Metro COG TDM forecasts the magnitude of additional trips added to the network by applying trip production equations to demographic and socioeconomic data. The resulting trip production rates are balanced with attraction rates obtained from NCHRP 714 and the ITE trip generation manual. Forecasted trips are distributed and assigned to the network to generate future AADT. Forecasted AADT for a 2045 buildout is shown in Table 12.

Metro Area Transit Bus (MATBUS) is the public transportation system serving the communities of Fargo ND, West Fargo ND, Moorhead MN, and Dilworth MN. They currently provide 22 fixed routes linking riders to employment, education, healthcare, entertainment and more. Currently, the only MATBUS route within in the east growth area is Route 9. Route 9 runs in a north-south direction along 40th Street between 12th Avenue Northwest and 24th Avenue South.

Additional transit options include 24/7 taxi cab services, ride sharing services, and a variety of transport options for disabled or senior residents.

- b. Discuss the effect on traffic congestion on affected roads and describe any traffic improvements necessary. The analysis must discuss the project's impact on the regional transportation system. If the peak hour traffic generated exceeds 250 vehicles or the total daily trips exceeds 2,500, a traffic impact study must be prepared as part of the EAW. Use the format and procedures described in the Minnesota Department of Transportation's Access Management Manual, Chapter 5 (available at: <http://www.dot.state.mn.us/accessmanagement/resources.html>) or a similar local guidance.***

The impact to the regional transportation system was assessed using the Metro COG's TDM developed as part of the 2045 Fargo-Moorhead Metropolitan Transportation Plan. The model was updated considering committed improvements out to the year 2045. Forecasted traffic through 2045 utilizing did not suggest major impacts to the transportation system.

Fargo-Moorhead Metro COG's TDM assigns capacity based on the functional class, number of lanes, and intersection configuration. Base capacities for each functional class were modified according to the number of lanes. Link volume to capacity ratios for existing roadways within the east growth area are summarized in Table 14.

Table 14. Link Volume to Capacity Ratios 2045

Link	Functional Class	V/C 2021 Existing Daily	V/C 2045 Forecasted Daily on Fiscally Constrained Network
12 th Ave S (west of 50 th St S)	Minor Arterial	0.03	0.36
45 th St S	Collector	0.04	0.40
50 th St S	Collector/local	0.03	0.22
28 th Ave S	Collector	0.18	0.38

Table 20.4 shows that links within the east growth area would operate below capacity using projected traffic through 2045. A demand-to-capacity ratio less than 0.85 suggests that the links are operating below capacity with no excessive delay experienced. Poor operation is indicated by demand-to-capacity ratio between 0.95 and 1.0.

- c. Identify measures that will be taken to minimize or mitigate project related transportation effects.***

Proposed roadway improvements needed to accommodate full buildout of the East Growth Area beyond 2045 are summarized below:

- Construction of 55th Street minor arterial

- Construction of 65th Street South collector
- Construction of 24th Avenue South collector from 45th Street South to 28th Avenue South
- Connection of 45th Street South to Main Street and 12th Avenue South
- Re-alignment of 28th Avenue South collector north of I-94
- Elimination of 50th Street South local collector beyond 28th Avenue South
- Construction of 60th Street South local collector
- Construction of 55th Street South future interchange connection with Interstate-94 (I-94)
- Construction of 12th Avenue South future interchange connection with TH 336.
- Construction of 55th Street South BNSF overpass connecting the east growth area to TH 10 and 12th Street NE.

The proposed 55th Street South minor arterial is intended to provide mobility through the growth area from north-south with speed limits in the 35-40 mph range. Its main function is to connect collector roadways, such as 4th Avenue South, to principal arterials or interstate highways. The 4th Avenue South, 65th Street South and 28th Avenue South collector roadways would provide access to adjacent land uses while connecting local collector roadways to minor arterials.

21. Cumulative Potential Effects

(Preparers can leave this item blank if cumulative potential effects are addressed under the applicable EAW Items)

- a. Describe the geographic scales and timeframes of the project related environmental effects that could combine with other environmental effects resulting in cumulative potential effects.**

Full build-out of the AUAR area is expected to occur over the next 20+ years, depending on market conditions. The geographic scale of potential effects is assumed to be a one-mile radius of the AUAR area. No significant developments have been identified within this area. The capacity of the City's sanitary sewer system limits the growth potential in this area, and therefore new development has been limited to areas of the city with sufficient existing capacity.

Anticipated cumulative impacts are associated with normal growth and development as discussed in the 2022 Comprehensive Plan Update and the five-year updates of the AUAR.

- b. Describe any reasonably foreseeable future projects (for which a basis of expectation has been laid) that may interact with environmental effects of the proposed project within the geographic scales and timeframes identified above.**

All cumulative impacts associated with anticipated development within the AUAR area have been accounted for within the responses to AUAR questions. No reasonably foreseeable future projects have been identified at this time.

- c. Discuss the nature of the cumulative potential effects and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to these cumulative effects.**

All cumulative impacts associated with known proposed development within the AUAR area have been accounted for within the responses to the questions contained in this AUAR.

22. Other Potential Environmental Effects

If the project may cause any additional environmental effects not addressed by items 1 to 19, describe the effects here, discuss the how the environment will be affected, and identify measures that will be taken to minimize and mitigate these effects.

No other potential environmental effects are anticipated that are not addressed by Items 1 through 21.

RGU CERTIFICATION

*(The Environmental Quality Board will only accept **SIGNED** Environmental Assessment Worksheets for public notice in the EQB Monitor.)*

I hereby certify that:

- The information contained in this document is accurate and complete to the best of my knowledge.
- The EAW describes the complete project; there are no other projects, stages or components other than those described in this document, which are related to the project as connected actions or phased actions, as defined at Minnesota Rules, parts 4410.0200, subparts 9c and 60, respectively.
- Copies of this EAW are being sent to the entire EQB distribution list.

Signature _____

Date _____

Title _____

Appendix A- Figures

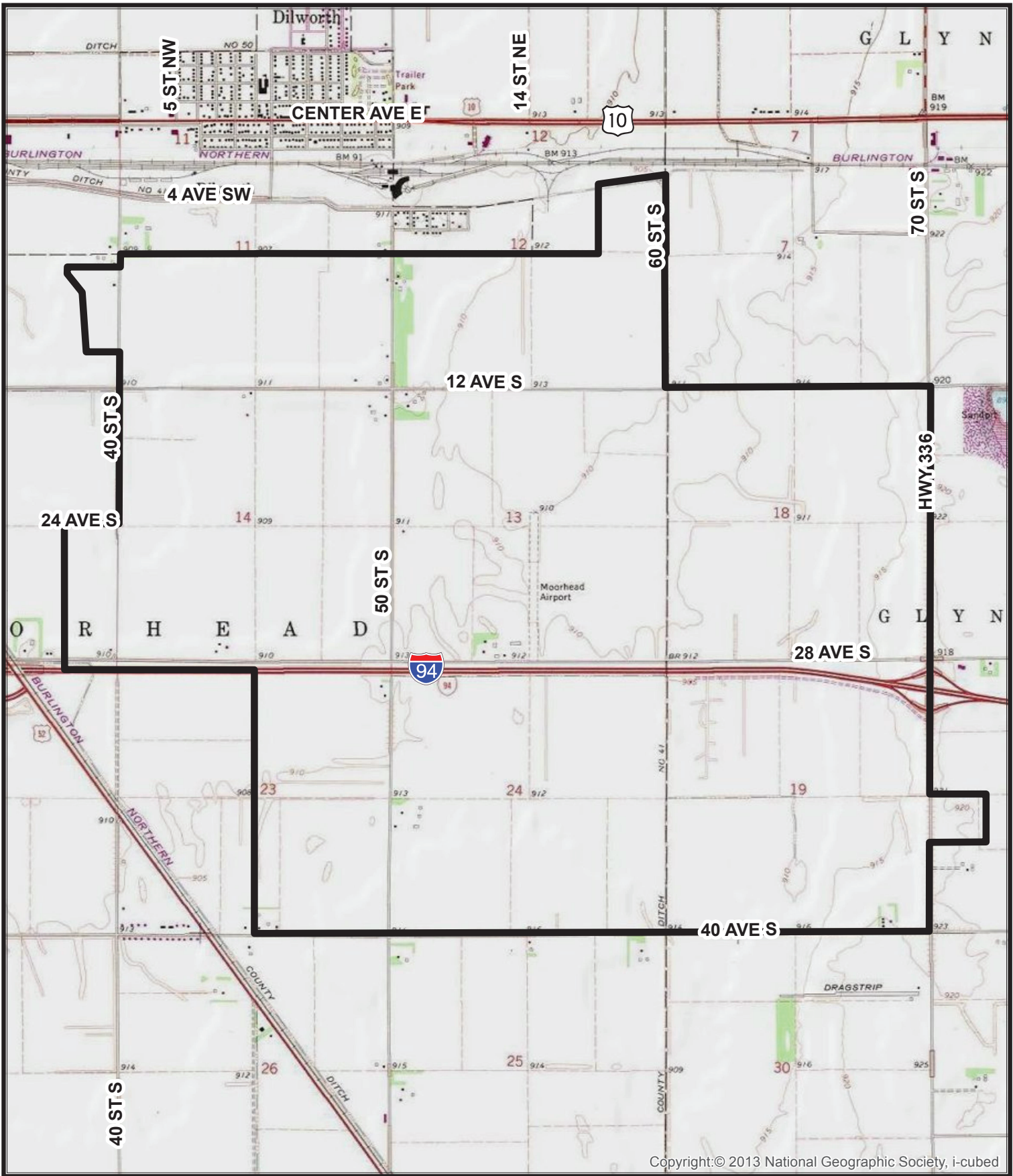
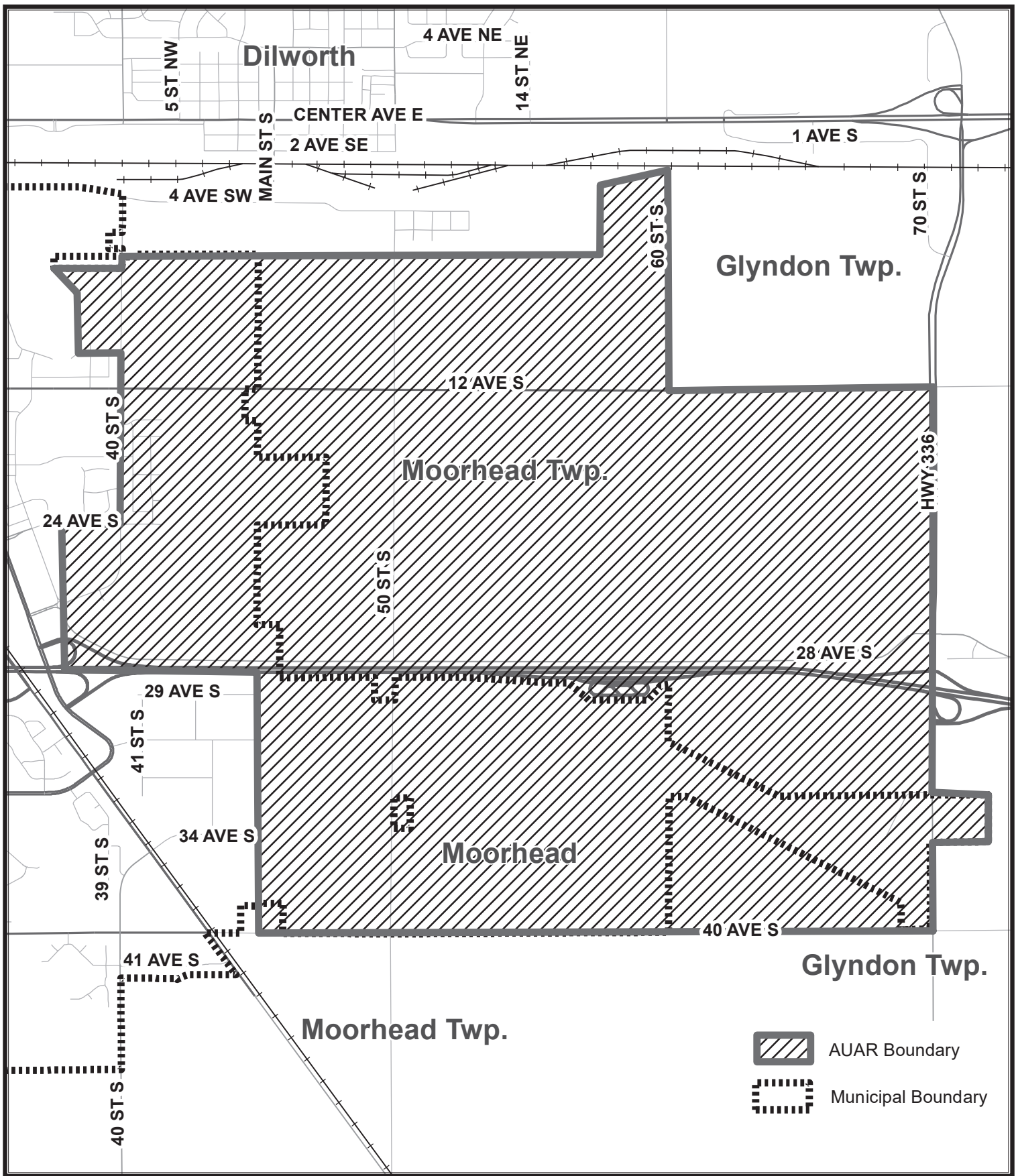


Figure 5-1



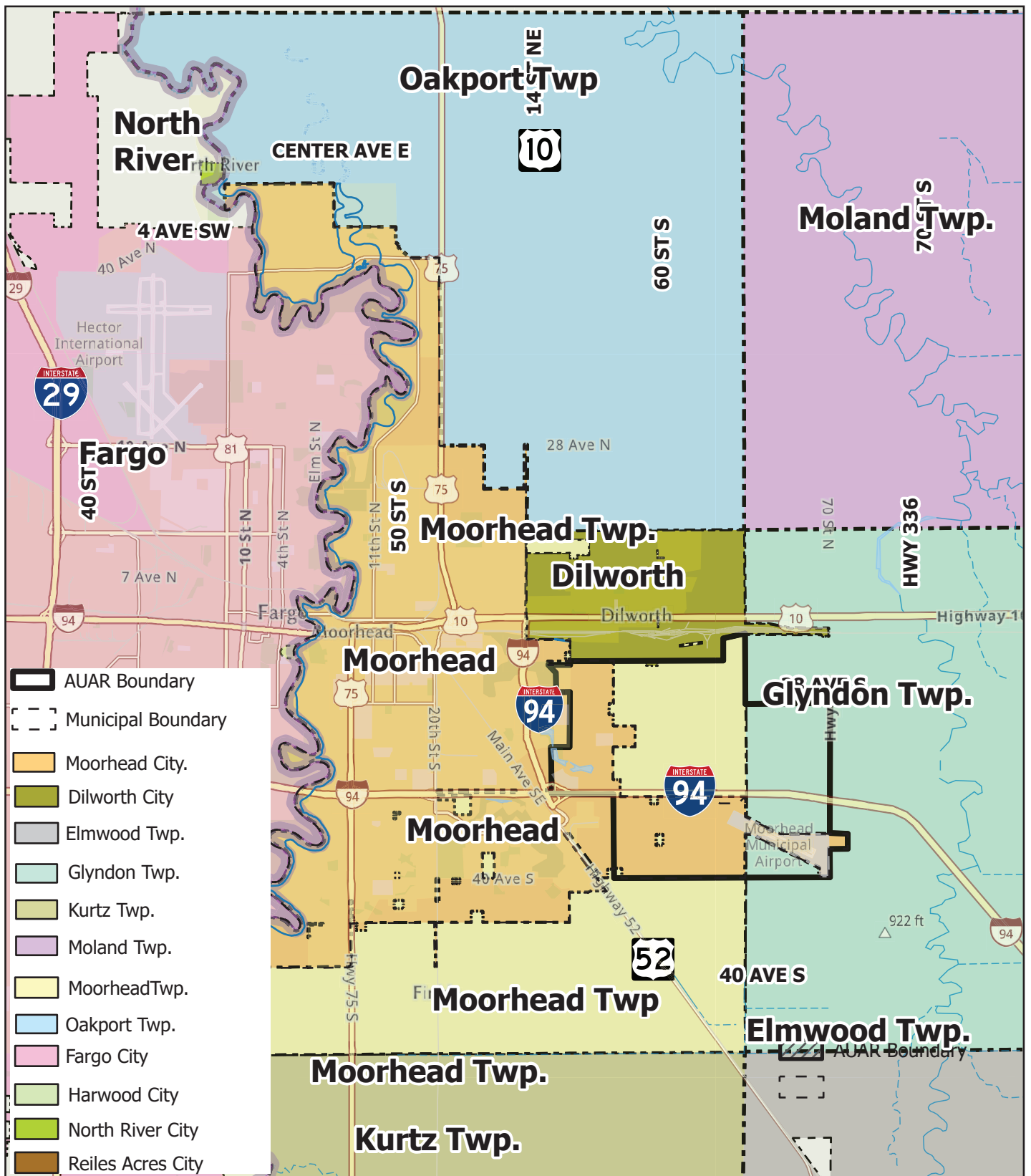
 AUAR Boundary



AUAR Boundary

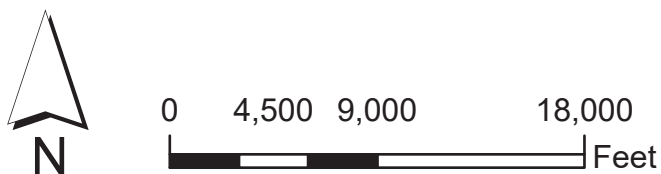
East Moorhead/Dilworth AUAR

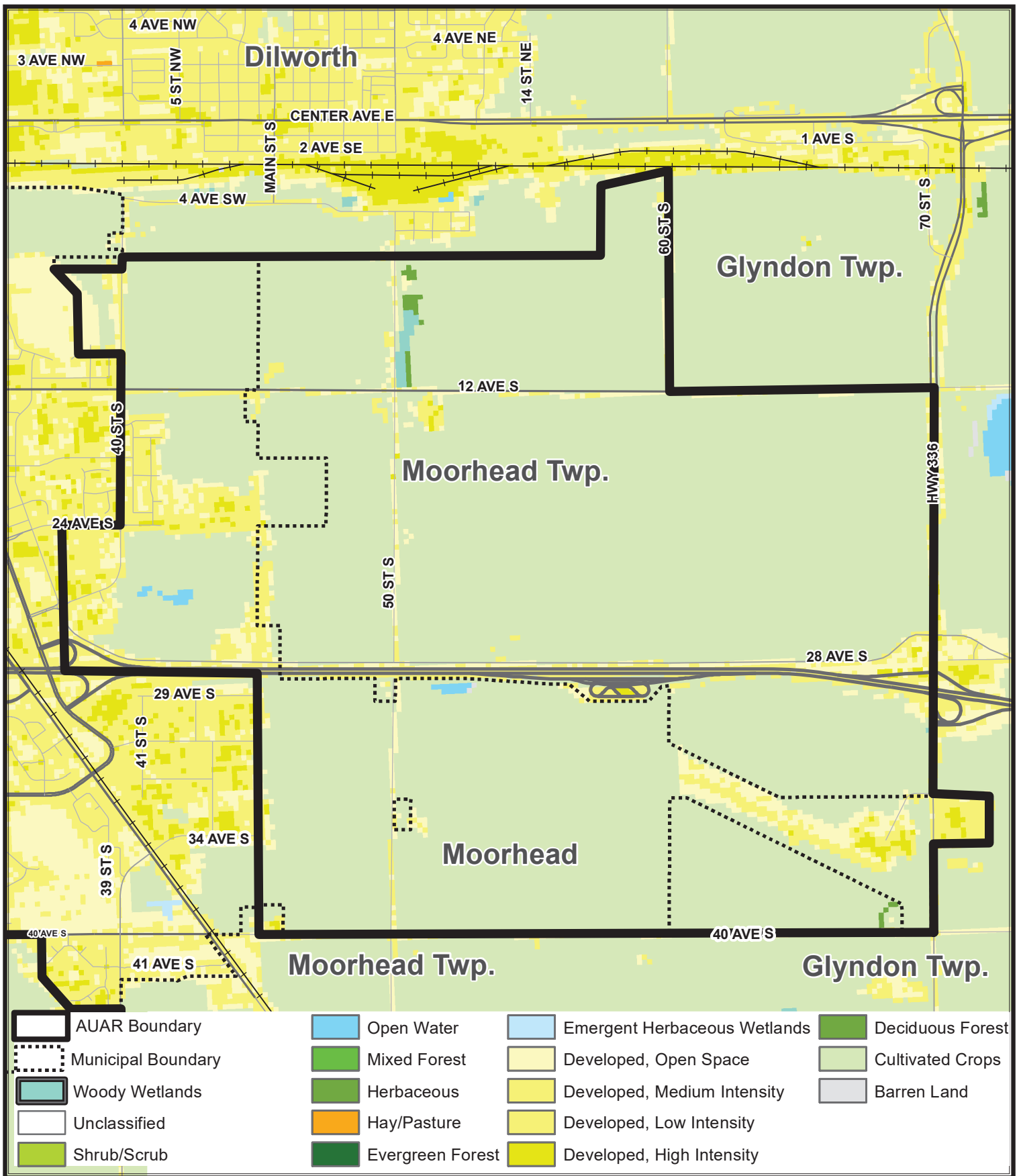
Figure 5.2



Project Location
East Moorhead/Dilworth AUAR

Figure 5-3



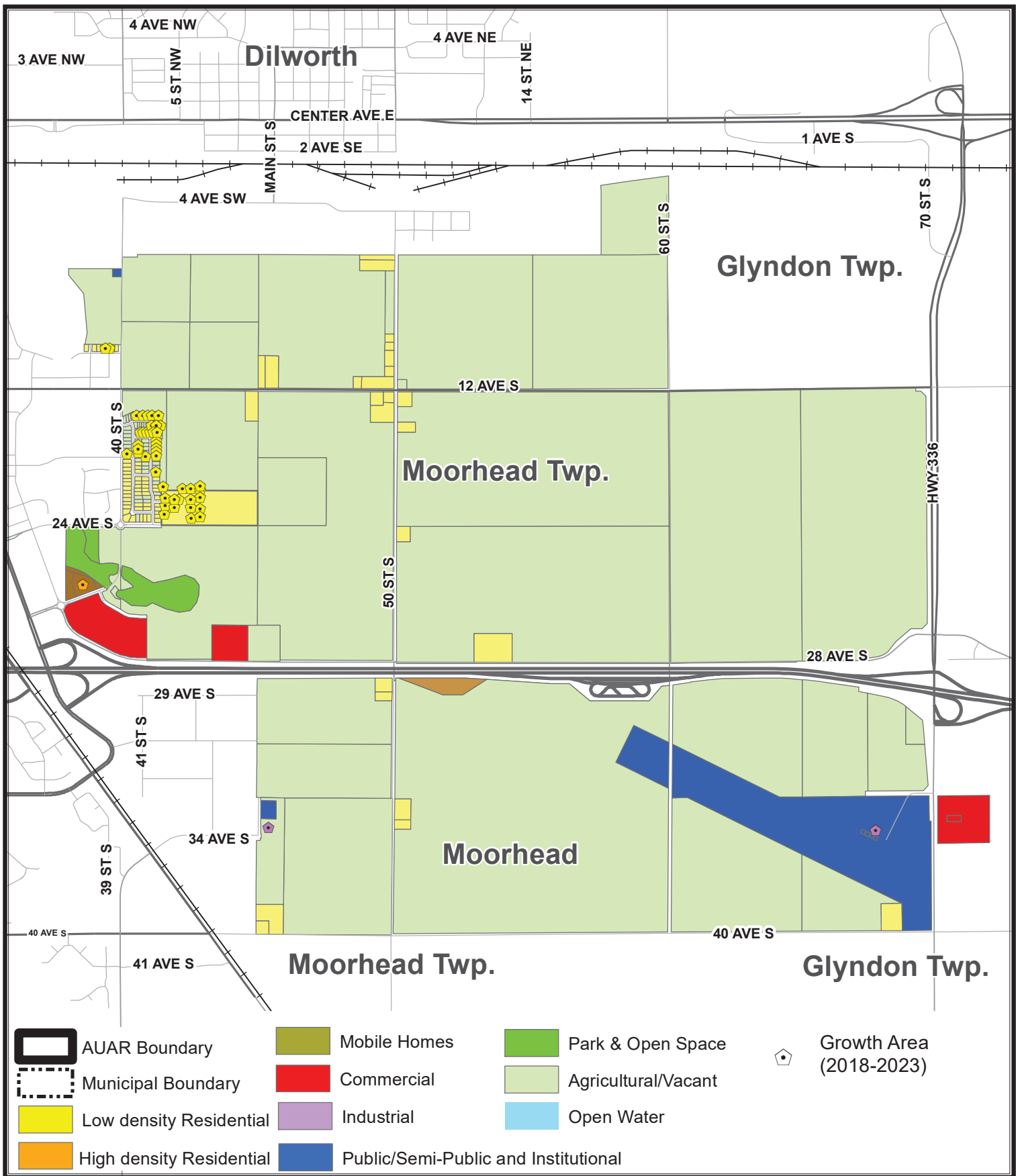


Land Cover Types

East Moorhead/Dilworth AUAR

Figure 8-1



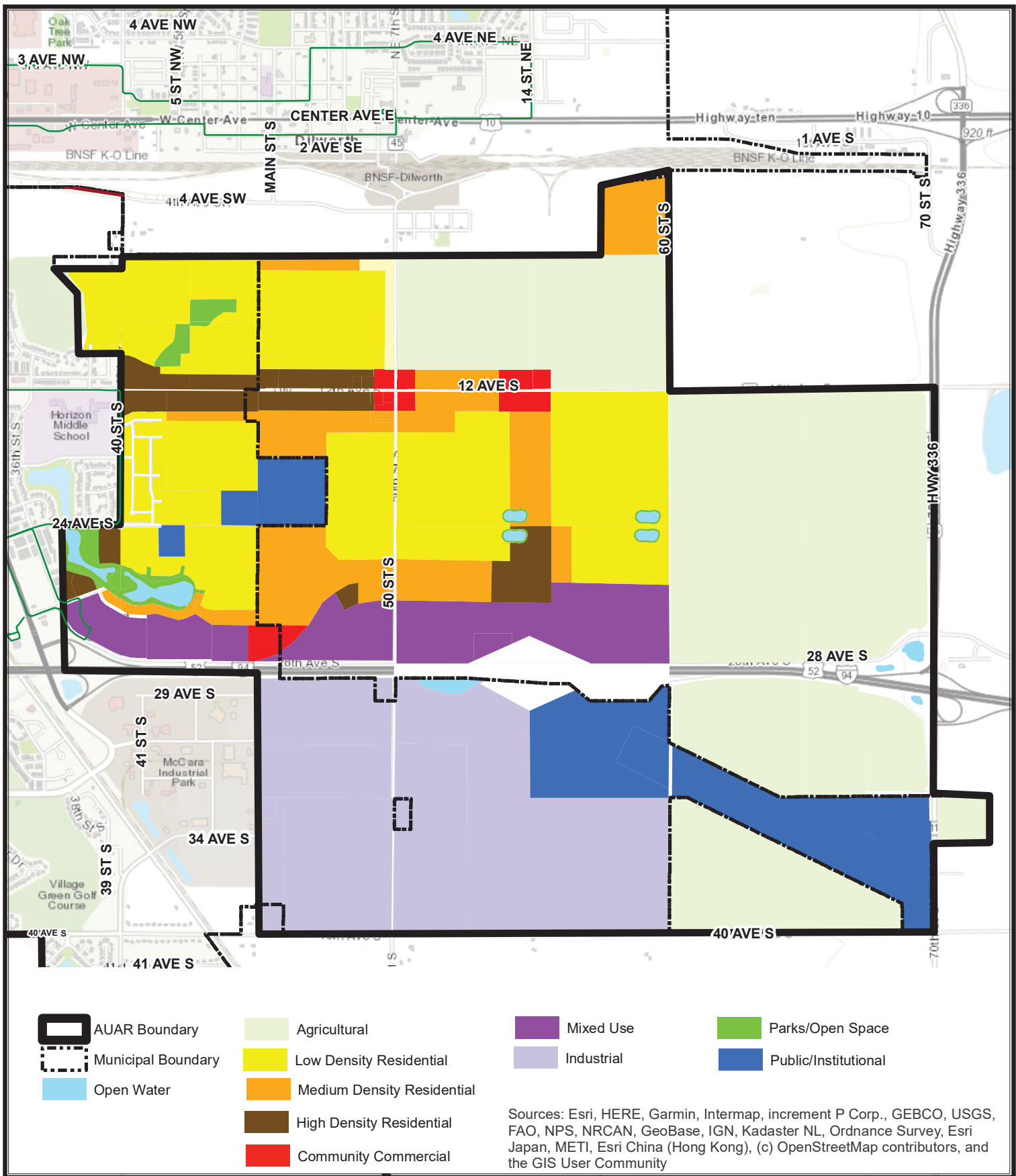


Existing Land Use

East Moorhead/Dilworth AUAR

Figure 10-1



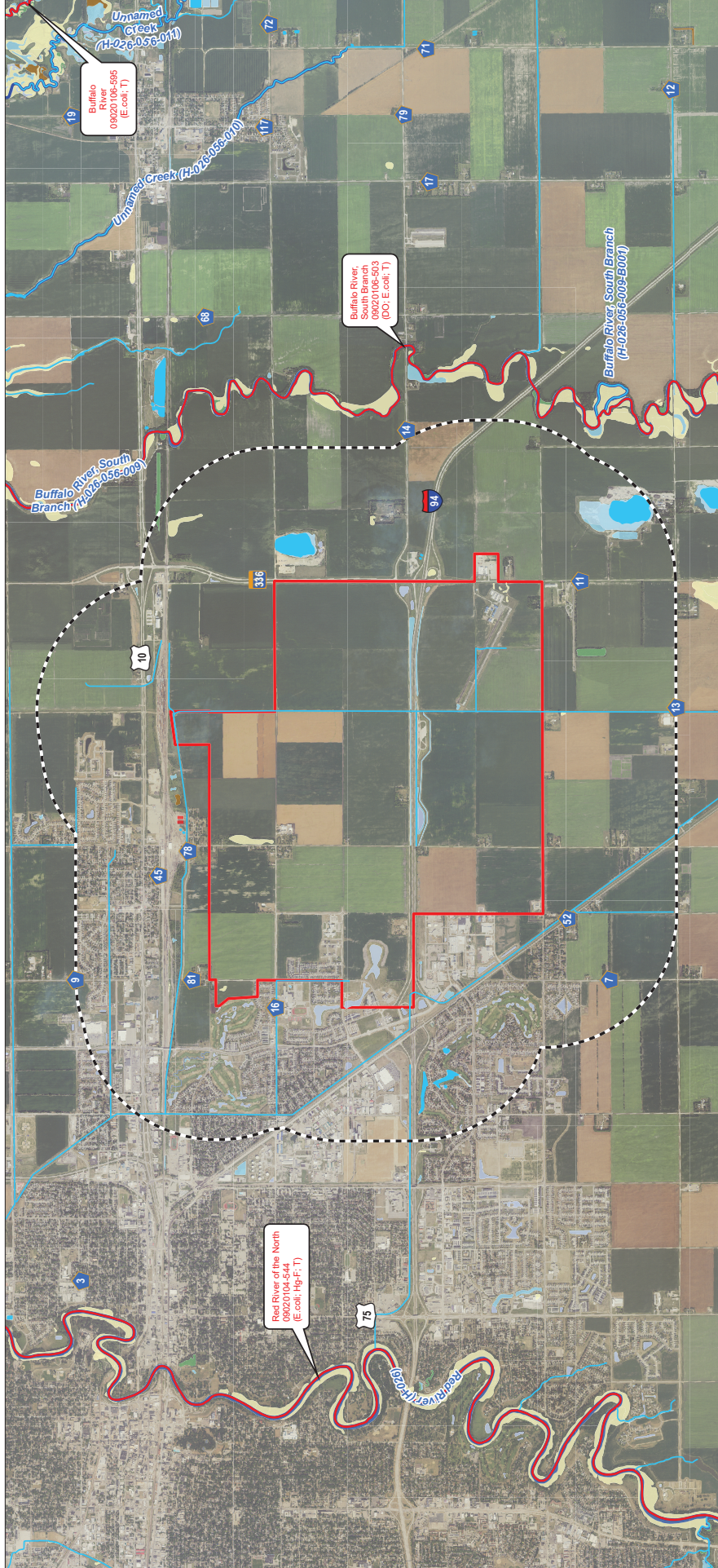


Planned Future Land Use

East Moorhead AUAR

Figure 10-2





Stantec

Project Location: City of Moorhead, MN
Client/Project: City of Moorhead, MN
East Project
Figure No.: 12-1
Title: Water Resources Map

Prepared by KJM on 2023-06-21
193800099

0 2,000 4,000 Feet
(At original document size of 11x17)

N

Legend

1 Mile Radius
AUA Boundary
2022 MPCA Impaired Streams (Draft)
Minnesota Public Waters Delineations
Public Water Watercourse
National Hydrography Dataset
NHD - Flowline
NHD - Waterbody

NWI Circular 39 Class
1 - Seasonally Flooded Basin or Flat
2 - Wet Meadow
3 - Shallow Marsh
4 - Deep Marsh
5 - Shallow Open Water
6 - Shrub Swamp
7 - Wooded Swamp
Municipal and Industrial Activities
Riverine Systems

Map

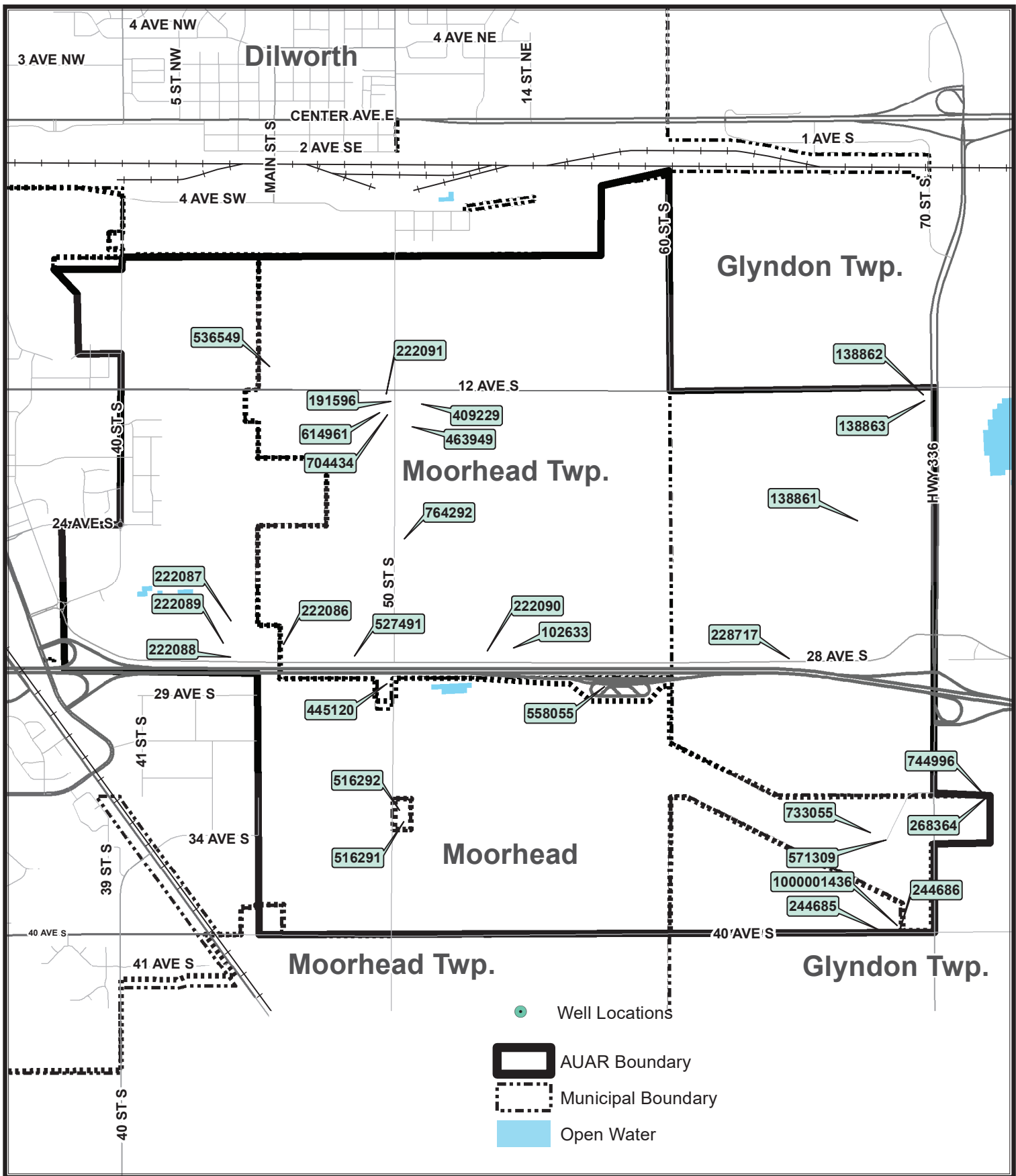
Becker County
Clay County
Otter Tail County
Richland County
Wilkin County

Minnesota
North Dakota

Cass County

Notes:
1. Coordinate System: NAD 1983 HARN Ad MN City Feet
2. Data Source: Minnesota Department of Natural Resources, MN DNR, MN DNR
3. Background: City Co. 2021

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.



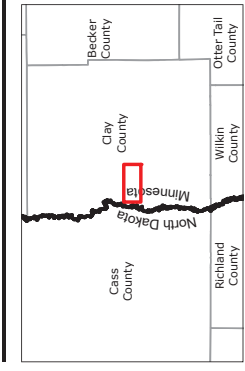
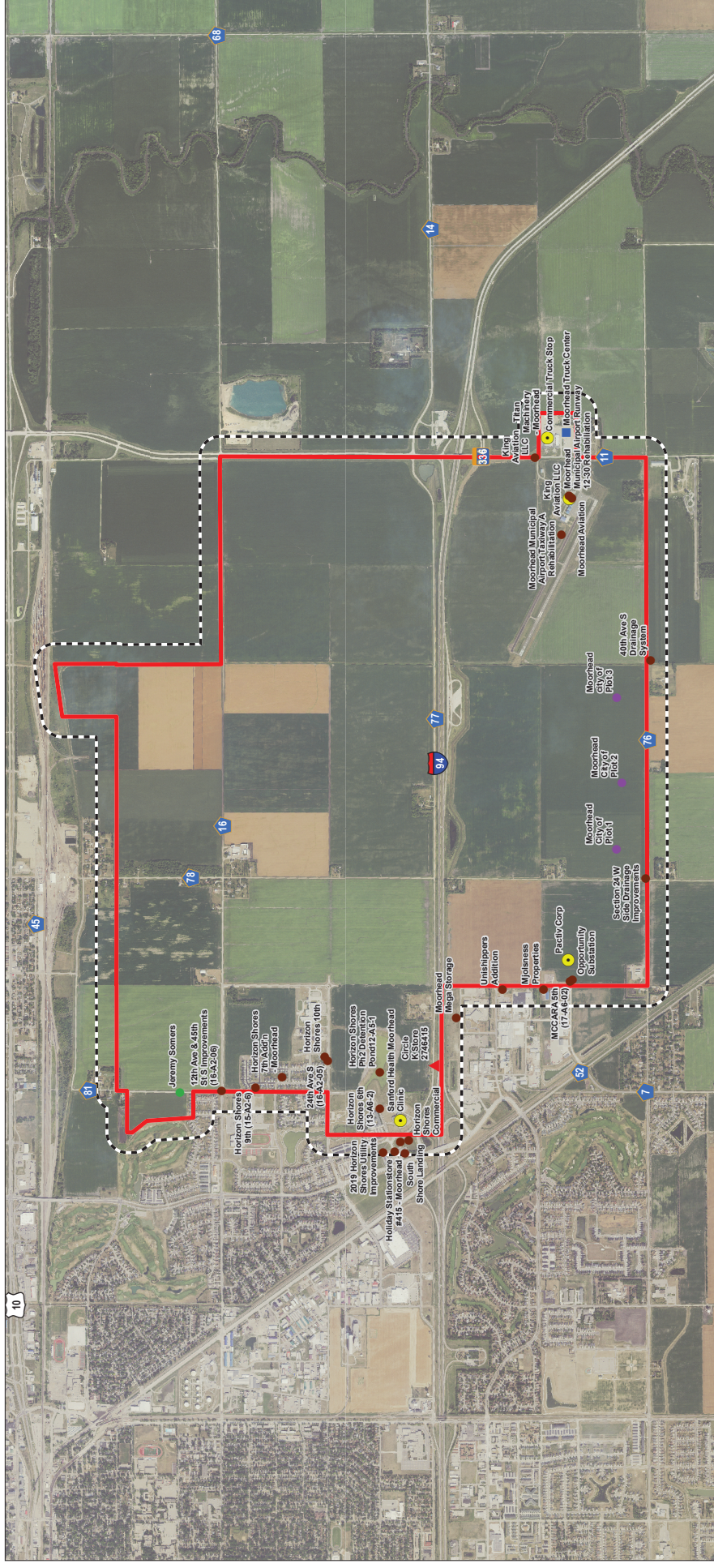
Well Locations

East Moorhead/Dilworth AUAR

Figure 12-2



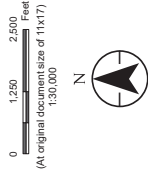




- Legend**
- AUAR Boundary
 - 500 ft Buffer
 - MPCA Sites
 - Program Name
 - Hazardous Waste
 - Investigation and Cleanup
 - Multiple Programs
 - Solid Waste
 - Stormwater
 - Tanks



Project Location	City of Moorhead, MN
Client/Project	City of Moorhead, MN Moorhead Growth Areas AUAR
Figure No.	13-1
Title	MPCA WIMN Potentially Contaminated Sites



Notes

- Coordinate System: NAD 1983 HARN Ad MN Clay Feet
- Background: Esri, DeLorme, Garmin, Mapbox, Microsoft, OpenStreetMap, Swatch, USGS
- Background: City of Moorhead, MN

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Appendix B - NHIS



Minnesota Department of Natural Resources
Division of Ecological & Water Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

August 21, 2023

Correspondence # MCE 2023-00425

Kevin Mueller
Stantec

RE: Natural Heritage Review of the proposed Moorhead East Growth Area AUAR Update
T39N R48W Sections 10-15, 22-24, T39N R47W Sections 18-20; Clay County

Dear Kevin Mueller,

As requested, the [Minnesota Natural Heritage Information System](#) has been reviewed to determine if the proposed project has the potential to impact any rare species or other significant natural features. Based on the project details provided with the request, the following rare features may be impacted by the proposed project:

State-listed Species

- Great Plains toad (*Anaxyrus cognatus*), a state-listed species of special concern, was documented in the vicinity of the proposed project. This species is found in remnant prairies and grasslands in Western Minnesota. They breed from May to July in highly ephemeral water-filled prairie depressions and have adapted to breed in flooded agricultural fields. Given the presence of these rare toads, the DNR recommends that the use of erosion control mesh, if any, be limited to [wildlife-friendly materials](#).
- The Natural Heritage Information System (NHIS) tracks bat roost trees and hibernacula plus some acoustic data, but this information is not exhaustive. Even if there are no bat records listed nearby, all seven of Minnesota's bats, including the federally endangered northern long-eared bat ([Myotis septentrionalis](#)), can be found throughout Minnesota. During the active season (approximately April-November) bats roost underneath bark, in cavities, or in crevices of both live and dead trees. Tree removal can negatively impact bats by destroying roosting habitat, especially during the pup rearing season when females are forming maternity roosting colonies and the pups cannot yet fly. To minimize these impacts, the DNR recommends that tree removal be avoided from June 1 through August 15.

- Please visit the [DNR Rare Species Guide](#) for more information on the habitat use of these species and recommended measures to avoid or minimize impacts. For further assistance with these species, please contact the appropriate [DNR Regional Nongame Specialist](#) or [Regional Ecologist](#).

Federally Protected Species

- To ensure compliance with federal law, conduct a federal regulatory review using the U.S. Fish and Wildlife Service's (USFWS) online [Information for Planning and Consultation \(IPaC\) tool](#).

Environmental Review and Permitting

- Given the potential presence of state protected species, we encourage submission of Natural Heritage Review requests to ensure avoidance of take for these species and to determine survey needs as individual projects are planned.
- Please include a copy of this letter and the MCE-generated Final Project Report in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location and project description provided with the request. If project details change or the project has not occurred within one year, please resubmit the project for review within one year of initiating project activities.

The Natural Heritage Review does not constitute project approval by the Department of Natural Resources. Instead, it identifies issues regarding known occurrences of rare features and potential impacts to these rare features. Visit the [Natural Heritage Review website](#) for additional information regarding this process, survey guidance, and other related information. For information on the environmental review process or other natural resource concerns, you may contact your [DNR Regional Environmental Assessment Ecologist](#).

Thank you for consulting us on this matter and for your interest in preserving Minnesota's rare natural resources.

Sincerely,

A handwritten signature in cursive script that reads "James Drake". The ink is dark and the signature is fluid.

James Drake
Natural Heritage Review Specialist
James.F.Drake@state.mn.us

Cc: Owen Baird



Formal Natural Heritage Review - Cover Page

See next page for results of review. A draft watermark means the project details have not been finalized and the results are not official.

Project Name: Moorhead East Growth Area AUAR Update

Project Proposer: City of Moorhead

Project Type: Development, Mixed Use

Project Type Activities: Tree Removal;Groundwater Impacts (e.g., groundwater appropriation, change in recharge, contamination);Waterbody, watercourse, streambed impacts (e.g., discharge, runoff, sedimentation, fill, excavation);Wetland impacts (e.g., discharge, runoff, sedimentation, fill, excavation)

TRS: T139 R47 S17, T139 R47 S18, T139 R47 S19, T139 R47 S20, T139 R47 S30, T139 R47 S7, T139 R47 S8, T139 R48 S10, T139 R48 S11, T139 R48 S12, T139 R48 S13, T139 R48 S14 +

County(s): Clay

DNR Admin Region(s): Northwest

Reason Requested: Other

Project Description: The City of Moorhead recognizes the need for more detailed land use planning that facilitates development in a cohesive manner and ensures that the public ...

Existing Land Uses: Land within the East Growth Area is almost entirely agricultural or vacant in use. A few single-family residences are present along main roadways in the ...

Landcover / Habitat Impacted: The primary land cover anticipated to be impacted is cropland. This would be converted in large part to impervious surface. Tree clearing would occur up ...

Waterbodies Affected: According to NWI, there is a forested wetland along 50th Street South in the northern portion of the AUAR area as well as freshwater emergent wetlands ...

Groundwater Resources Affected: Development of the AUAR area would increase water demand such that further appropriations of surface or groundwater may be required in the future.

Previous Natural Heritage Review: No

Previous Habitat Assessments / Surveys: No

SUMMARY OF AUTOMATED RESULTS

Category	Results	Response By Category
Project Details	No Comments	No Further Review Required
Ecologically Significant Area	No Comments	No Further Review Required
State-Listed Endangered or Threatened Species	Needs Further Review	State-protected Species in Vicinity
State-Listed Species of Special Concern	Comments	Recommendations

Category	Results	Response By Category
Federally Listed Species	No Records	Visit IPaC For Federal Review



June 2, 2023

Project Name: Moorhead East Growth Area AUAR Update

Project Proposer: City of Moorhead

Project Type: Development, Mixed Use

Project ID: MCE #2023-00425

AUTOMATED RESULTS: FURTHER REVIEW IS NEEDED

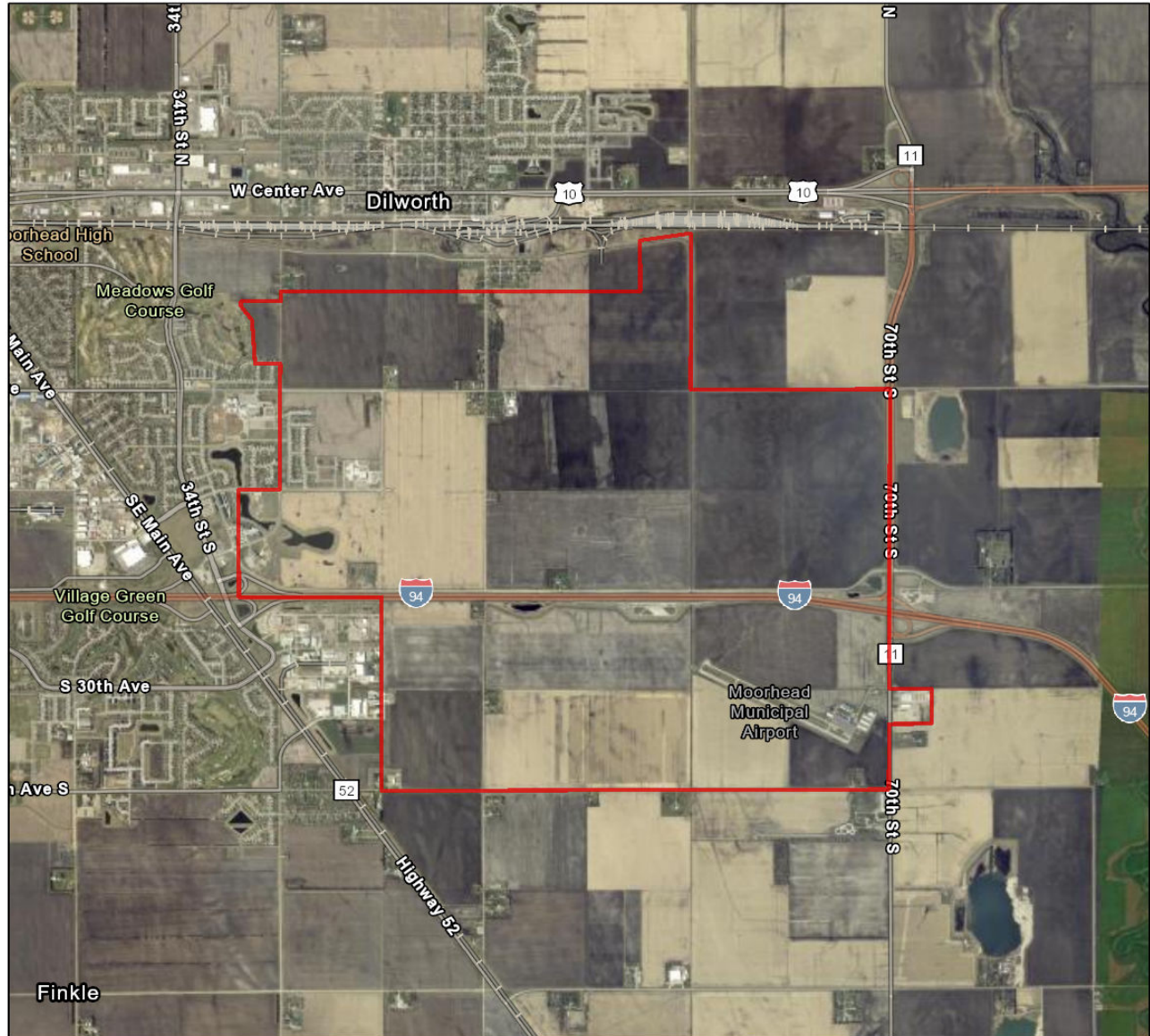
As requested, the above project has undergone an automated review for potential impacts to rare features. Based on this review, one or more rare features may be impacted by the proposed project and further review by the Natural Heritage Review Team is needed. You will receive a separate notification email when the review process is complete and the Natural Heritage Review letter has been posted.

Please refer to the table on the cover page of this report for a summary of potential impacts to rare features. For additional information or planning purposes, use the Explore Page in Minnesota Conservation Explorer to view the potentially impacted rare features or to create a Conservation Planning Report for the proposed project.

If you have additional information to help resolve the potential impacts listed in the summary results, please attach related project documentation in the Edit Details tab of the Project page. Relevant information includes, but is not limited to, additional project details, completed habitat assessments, or survey results. This additional information will be considered during the project review.

Moorhead East Growth Area AUAR Update

Aerial Imagery With Locator Map



0 0.33 0.65 1.3 1.95 2.6 Miles

Project Boundary

Project Type: Development, Mixed Use

Project Size (acres): 4,317.42

County(s): Clay

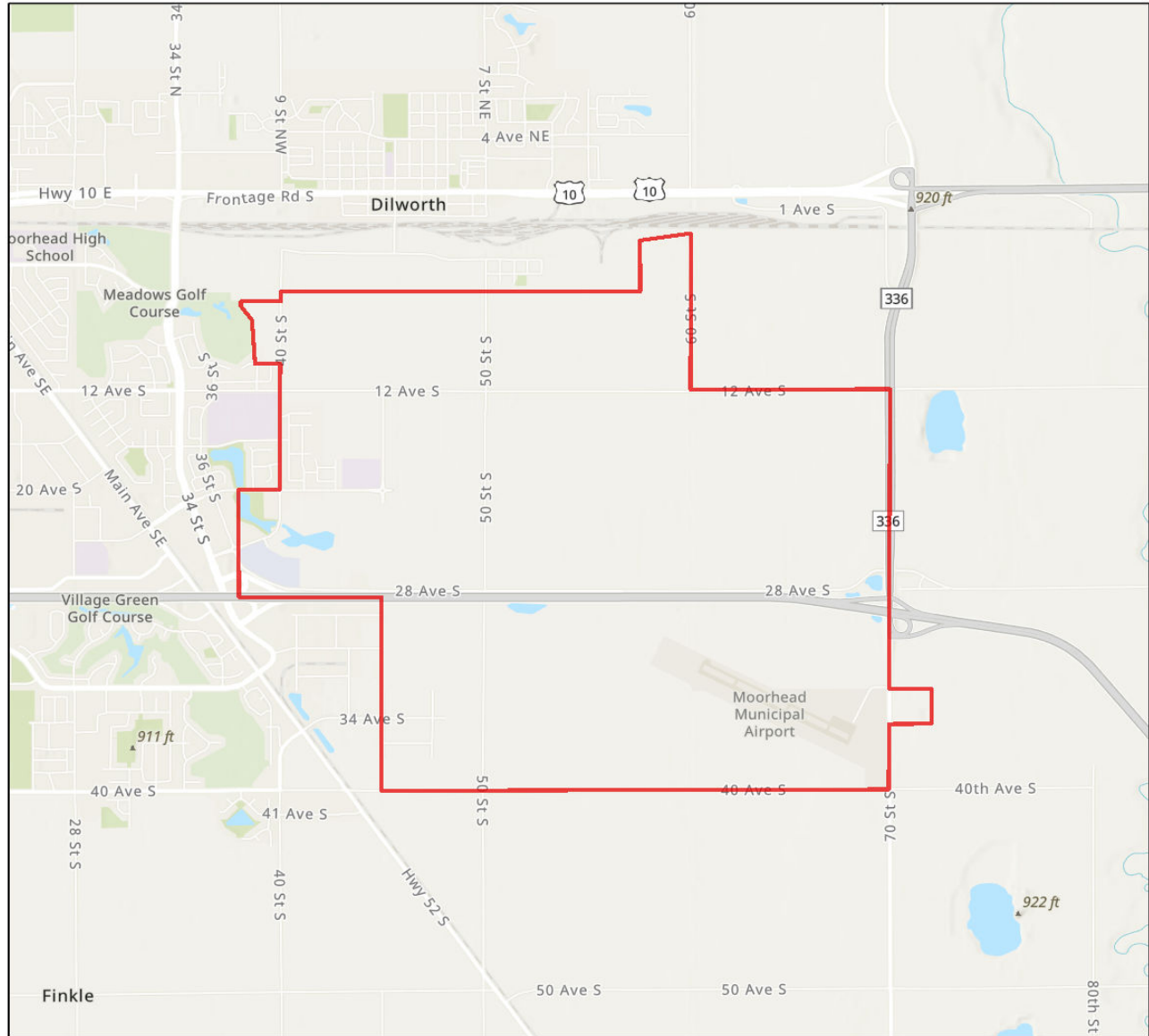
TRS: T139 R47 S17, T139 R47 S18, T139 R47 S19, T139 R47 S20, T139 R47 S30 +

Fargo, North Dakota, Earthstar Geographics
City of Moorhead, State of North Dakota, Esri, HERE, Garmin, SafeGraph,
GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA



Moorhead East Growth Area AUAR Update

USA Topo Basemap With Locator Map



0 0.33 0.65 1.3 1.95 2.6 Miles

Project Boundary

Project Type: Development, Mixed Use

Project Size (acres): 4,317.42

County(s): Clay

TRS: T139 R47 S17, T139 R47 S18, T139 R47 S19, T139 R47 S20, T139 R47 S30 +

Esri, NASA, NGA, USGS, FEMA
City of Moorhead, State of North Dakota, Esri, HERE, Garmin, SafeGraph,
GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA



Appendix C- SHPO Query

From: [MN MNIT Data Request SHPO](#)
To: [Walburg, Lauren](#)
Subject: RE: Moorhead East Growth Area - AUAR Update - SHPO Database Query Request
Date: Friday, May 12, 2023 2:48:45 PM
Attachments: [~WRD0001.jpg](#)
[image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[History.xls](#)

Hello Lauren,

Please see attached. Our database has no archaeological records for the given project area.

Jim



SHPO Data Requests
Minnesota State Historic Preservation Office
50 Sherburne Avenue, Suite 203
Saint Paul, MN 55155
(651) 201-3299
datarequestshpo@state.mn.us

Notice: This email message simply reports the results of the cultural resources database search you requested. The database search is only for previously known archaeological sites and historic properties. **IN NO CASE DOES THIS DATABASE SEARCH OR EMAIL MESSAGE CONSTITUTE A PROJECT REVIEW UNDER STATE OR FEDERAL PRESERVATION LAWS** – please see our website at <https://mn.gov/admin/shpo/protection/> for further information regarding our Environmental Review Process.

Because the majority of archaeological sites in the state and many historic/architectural properties have not been recorded, important sites or properties may exist within the search area and may be affected by development projects within that area. Additional research, including field surveys, may be necessary to adequately assess the area's potential to contain historic properties or archaeological sites.

Properties that are listed in the National Register of Historic Places (NRHP) or have been determined eligible for listing in the NRHP are indicated on the reports you have received, if any. The following codes may be on those reports:

NR – National Register listed. The properties may be individually listed or may be within the boundaries of a National Register District.

CEF – Considered Eligible Findings are made when a federal agency has recommended that a property is eligible for listing in the National Register and MN SHPO has accepted the recommendation for the purposes of the Environmental Review Process. These properties need to be further assessed before they are officially listed in the National Register.

SEF – Staff eligible Findings are those properties the MN SHPO staff considers eligible for listing in the National Register, in circumstances other than the Environmental Review Process.

DOE – Determination of Eligibility is made by the National Park Service and are those properties that are eligible for listing in the National Register, but have not been officially listed.

CNEF – Considered Not Eligible Findings are made during the course of the Environmental Review Process. For the purposes of the review a property is considered not eligible for listing in the National Register. These properties may

need to be reassessed for eligibility under additional or alternate contexts.

Properties without NR, CEF, SEF, DOE, or CNEF designations in the reports may not have been evaluated and therefore no assumption to their eligibility can be made. Integrity and contexts change over time, therefore any eligibility determination made ten (10) or more years from the date of the current survey are considered out of date and the property will need to be reassessed.

If you require a comprehensive assessment of a project's potential to impact archaeological sites or historic/architectural properties, you may need to hire a qualified archaeologist and/or historian. If you need assistance with a project review, please contact Kelly Gragg-Johnson, Environmental Review Specialist @ 651-201-3285 or by email at kelly.graggjohnson@state.mn.us.

The Minnesota SHPO Archaeology and Historic/Architectural Survey Manuals can be found at <https://mn.gov/admin/shpo/identification-evaluation/>.

Please [subscribe to receive SHPO notices](#) for the most current updates regarding office hours, accessing research files, or changes in submitting materials to the SHPO.

To access historic resource information please visit our webpage on [Using SHPO's Files](#).



From: Walburg, Lauren <Lauren.Walburg@stantec.com>

Sent: Thursday, May 4, 2023 12:39 PM

To: MN_MNIT_Data Request SHPO <DataRequestSHPO@state.mn.us>

Subject: Moorhead East Growth Area - AUAR Update - SHPO Database Query Request

This message may be from an external email source.

Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.

Good afternoon,

On behalf of the City of Moorhead, Stantec is preparing an Alternative Urban Areawide Plan Update for the proposed Moorhead East Growth Area. The City of Moorhead is updating the East Growth Area AUAR for the first time since its adoption in 2018. No new development has occurred in the growth area since 2018. The 2023 Update includes assumptions in the adopted 2022 Comprehensive Plan Update and the AUAR update incorporates questions regarding climate change adopted by the EQB in December 2022.

This is a discretionary AUAR completed by the City of Moorhead.

The Project Area includes **Sections 11-15, Township 139N, Range 48W; Sections 18-19, Township 139N, Range 47W; Sections 23-24, Township 139N, Range 48W**. Attached, please also find project location figures for reference.

Could you please provide information regarding any known historic properties and/or other cultural resources on or near the site from the state database of cultural resources and historic properties?

Information received will be used in preparation of the AUAR update.

Please do not hesitate to contact me if you have any questions or require additional information to complete this database review request.

Thank you!

Lauren Walburg AICP

Urban Planner

Pronouns: she, her, hers

Direct: 612 712-2071

Lauren.Walburg@stantec.com

Stantec

733 Marquette Avenue Suite 1000

Minneapolis MN 55402-2309



We do what is right for our communities and our world. Learn more about our [net-zero pledge](#) and commitment to sustainability.

The content of this email is the confidential property of Stantec and should not be copied, modified, retransmitted, or used for any purpose except with Stantec's written authorization. If you are not the intended recipient, please delete all copies and notify us immediately.

Caution: This email originated from outside of Stantec. Please take extra precaution.

Attention: Ce courriel provient de l'extérieur de Stantec. Veuillez prendre des précautions supplémentaires.

Atención: Este correo electrónico proviene de fuera de Stantec. Por favor, tome precauciones adicionales.

Appendix D- GHG Calculations

Moorhead AUAR Update

Greenhouse Gas Emissions Associated with Land Use Changes - East Development

Land Use Change ¹	Description	Land Use Emissions or Reductions						
		Land Area (acres)	Net CO2 Emissions Flux (tons CO2e) ²	Total Area Land Use Change (hectares) ³	Emission Factor (tons CO2e/acre)	Emissions (tons CO2e, negative value represents sink/removal of carbon)	Project Lifetime Multiplier (assume 50+ years)	Emission Rate (ton/yr)
Wetland Remaining Wetland (includes stormwater ponds)		25.8	45,400,000	38,613,000	0.48	12.3	1	12.3
Cropland to Wetland		6.58	255,000	221,000	0.47	3.1	1	3.1
Settlement Remaining Settlement		608.99	15,900,000	43,189,000	0.149	90.73	1	91
Cropland Remaining Cropland		1284.25	-18,900,000	150,586,000	-0.051	-65.23	1	-65.23
Cropland to Settlement	Settlement includes developed areas, including residential, industrial, commercial and institutional land.	2387.88	5,900,000	1,366,000	1.75	4,173.9	1	4174
Total		4313.5						4215

1. Stormwater ponds are not represented in the U.S. Greenhouse Gas Emissions Sources and Sinks: 1990-2020 document. Conservatively assume the stormwater ponds have the same carbon sequestration as wetlands. Settlements

2. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021. Net Flux from Soil, Dead Organic Matter and Biomass Carbon Stock Changes.

Wetlands Remaining Wetlands: Table 6-1.

Settlements Remaining Settlements: Table 6-112

Cropland to Wetlands: Tables 6-92, 6-94, 6-103.

Cropland Remaining Cropland: Table 6-28.

Cropland Converted to Settlements: Table 6-129.

3. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020. Land Use and Land-Use Change for the U.S. Managed Land Base for All 50 States, Table 6-5.