

Appendix E: *Species Reports*



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: Hermantown Industrial

Project Proposer: Harmony Group LLC

Project Type: Development, Commercial/Institutional/Industrial

Project Type Activities: Wetland impacts (e.g., dewatering, tiling, drainage, discharge, excavation, fill, runoff, sedimentation, changes in hydrology); Waterbody or watercourse impacts (e.g., dewatering, discharge, excavation, fill, runoff, sedimentation, changes in hydrology)); Tree Removal; Grading

TRS: T50 R15 S30, T50 R15 S31

County(s): St. Louis

DNR Admin Region(s): Northeast

Reason Requested: Other

Project Description: The study area is planned to be developed for a light industrial project.

Existing Land Uses: Mostly undeveloped grasslands and forested areas with some residential houses along the perimeters.

Landcover / Habitat Impacted: Grassland, forest, wetland, impervious surface

Waterbodies Affected: Impacts to wetlands will be minimized or avoided to the extent practicable. Impacts to wetland (fill) could occur.

Groundwater Resources Affected: N/A

Previous Natural Heritage Review: Yes, ERDB#: 2025-00299

Previous Habitat Assessments / Surveys: No

SUMMARY OF AUTOMATED RESULTS

Category	Results	Response By Category
Project Details	Comments	Tree Removal - Recommendations
Ecologically Significant Area	No Comments	No Further Review Required
State-Listed Endangered or Threatened Species	No Comments	No Further Review Required
State-Listed Species of Special Concern	Comments	Recommendations
Federally Listed Species	No Records	Visit IPaC For Federal Review



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

January 29, 2026

Project ID: MCE #2026-00097

Twin Cities - Environmental (Kimley-Horn)
Kimley-Horn and Associates, Inc.
767 North Eustis Street, Suite 100
St. Paul, MN 55114

RE: Automated Natural Heritage Review of the proposed Hermantown Industrial
See Cover Page for location and project details.

Dear Twin Cities - Environmental (Kimley-Horn),

As requested, the above project has been reviewed for potential effects to rare features. Based on this review, the following rare features may be adversely affected by the proposed project:

Project Type and/or Project Type Activity Comments

- 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 below, all 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.

Ecologically Significant Area

No ecologically significant areas have been documented in the vicinity of the project.

State-Listed Endangered or Threatened Species

No state-listed endangered or threatened species have been documented in the vicinity of the project.

State-Listed Species of Special Concern

Taxonomic Group	Common Name	Scientific Name	Water Regime	Habitat	Federal Status
Vertebrate Animal	American Goshawk	Astur atricapillus		Fire Dependent Forest, Mesic Hardwood Forest	

- The above table identifies state-listed species of special concern that have been documented in the vicinity of your project. If suitable habitat for any of these species occurs within your project footprint or activity impact area, the project may negatively impact those species. To avoid impacting state-listed species of special concern, the DNR recommends modifying the location of project activities to avoid suitable habitat or modifying the timing of project activities to avoid the presence of the species. 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. Species-specific comments, if any, appear below.

Federally Listed Species

The Natural Heritage Information System does not contain any records for federally listed species within one mile of the proposed project. Please note, however, that not all federally listed species are tracked within the NHIS. To ensure compliance with federal law, please conduct a federal regulatory review using the U.S. Fish and Wildlife Service's online [Information for Planning and Consultation \(IPaC\) tool](#).

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 the project description provided on the cover page. If project details change or construction has not occurred within one year, please resubmit the project for review before 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. 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, *The Natural Heritage Review Team* [Natural Heritage Review Program](#)
Review.NHIS@state.mn.us

Links: USFWS Information for Planning and Consultation (IPaC) tool
[Information for Planning and Consultation \(IPaC\) tool](#)
DNR Regional Environmental Assessment Ecologist Contact Info
https://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html

Hermantown Industrial

Aerial Imagery With Locator Map



0 0.17 0.35 0.7 1.05 1.4 Miles

 Project Boundary

Project Type: Development, Commercial/Institutional/Industrial

Project Size (acres): 278.79

County(s): St. Louis

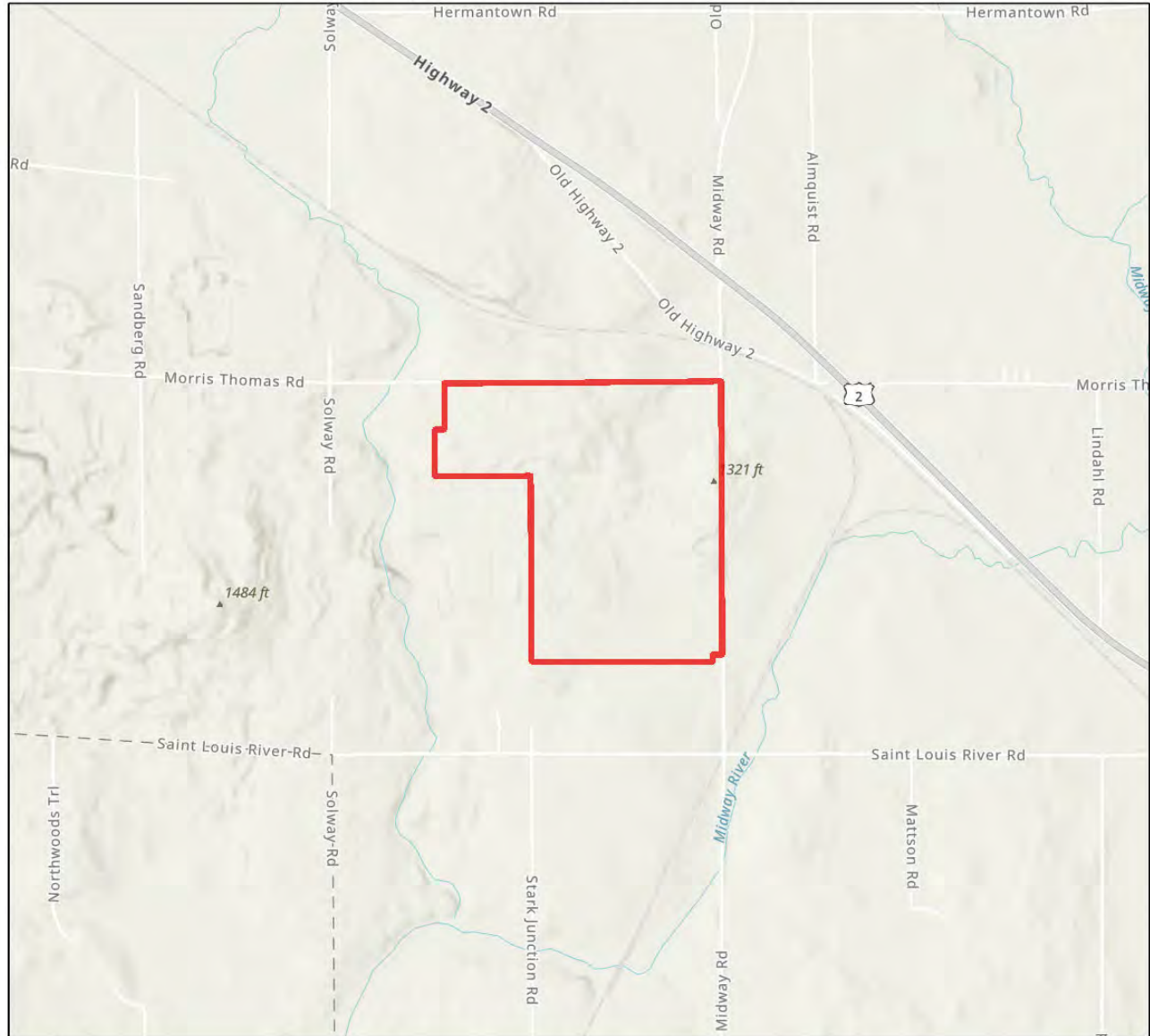
TRS: T50 R15 S30, T50 R15 S31

Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
Earthstar Geographics
St. Louis County (MN), Fond du Lac Reservation, MN Dept Natural Resources,



Hermantown Industrial

USA Topo Basemap With Locator Map



 Project Boundary

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Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
Esri, NASA, NGA, USGS, FEMA
St. Louis County (MN), Fond du Lac Reservation, MN Dept Natural Resources,



MEMORANDUM

To: Chris Bates
Mortenson Development Inc.
Ashley Payne
From: Cassie Baumgartner
Kimley-Horn and Associates, Inc.
Date: January 30, 2026
Subject: *Hermantown, St. Louis County, Minnesota – Hermantown Industrial Threatened and Endangered Species Memorandum*

INTRODUCTION

Kimley-Horn was contracted by Harmony Group LLC % Mortenson Development Inc. to review the Project Loon – Hermantown project study area for potential species constraints. See **Figure 1** for project location and **Figure 2** for the study area boundary. The project is located in Hermantown, St. Louis County, Minnesota. The threatened and endangered species investigation included 24 parcels totaling 279.1 acres and is bound to the north by Morris Thomas Road and to the east by Midway Road. The western boundary of the study area extends parallel to Solway Road, and the southern boundary extends parallel to Saint Louis River Road. The western and southern boundaries are located approximately 0.27 miles east and 0.25 miles north of the roads, respectively (the “study area”). The study area is located in Section 31 of Township 50N, Range 15W. Kimley-Horn reviewed available background data in addition to conducting a field survey to assist in determining if there are any potential species constraints for the study area.

SITE DESCRIPTION

The majority of the study area is currently mixed forest and deciduous forest, herbaceous land, and wetland, with areas of impervious surface throughout the site. There are several residences along the northern and eastern perimeter of the study area. The western portion of the study area is adjacent to a power plant and includes associated access roads. Portions of the central forested area of the study area appear to have been recently logged. The study area location and characteristics are shown in **Figure 1** and **Figure 2**.

THREATENED AND ENDANGERED SPECIES

USFWS Federally Listed Threatened and Endangered Species

Kimley-Horn conducted a preliminary review of the potential for federally listed threatened, endangered, and proposed species to occur within the study area. These species and their preferred habitat were assessed for the potential to be affected by the proposed project for the purposes of due diligence in compliance with the Endangered Species Act (ESA). The project is privately funded and is not anticipated to have a federal nexus; therefore, an effects determination for federal species was assessed under Section 9 and 10 of the ESA. If a federal nexus is later anticipated, the project should be reevaluated under Section 7 of the ESA. A list of the threatened, endangered, and proposed species along with the designated critical habitat that could occur in St. Louis County was obtained on January 28, 2026, from the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) online planning tool. The resource list is not considered official USFWS correspondence for ESA

consultation. Habitat descriptions for the identified species were compared to the land cover within or near the study area. The resource list obtained via the USFWS IPaC for the project identified four species that should be considered in an effects analysis. The resource list is included in **Attachment A**, and the identified species are described below in **Error! Reference source not found.**

Table 1. USFWS Federally Listed Threatened and Endangered Species

Species	Federal Status	Preferred Habitat
<i>Lynx canadensis</i> (Canada lynx)	Threatened	The Canada lynx generally inhabits boreal forested ecosystems, but also extends south to subalpine forests in the western United States and boreal/hardwood transitional zones in the eastern United States. Lynx are most commonly found in areas that receive heavy snowfall and inhabit snowshoe hares, the primary prey of Canada lynx. The study area is not located within critical habitat for the Canada lynx.
<i>Canis Lupus</i> (Gray wolf)	Threatened	Gray wolves are found in a wide range of habitats including temperate forests and herbaceous land. Wolves' habitat heavily depends on availability of prey such. The study area is not located within critical habitat for the gray wolf.
<i>Danaus plexippus</i> (Monarch butterfly)	Proposed Threatened	The monarch butterfly requires herbaceous habitats where milkweed and flowers are present. North American populations of the monarch butterfly typically follow a seasonal migration pattern. The study area is not located within the proposed critical habitat for the monarch butterfly.
<i>Bombus suckleyi</i> (Suckley's cuckoo bumble bee)	Proposed Endangered	Suckley's cuckoo bumble bee is typically found throughout northern America in prairies, herbaceous land, and meadows. It is considered a parasitic bee and lives primary of nests of western bumblebees, which are typically found underground cavities but can also be seen in stumps and logs as well. No critical habitat has been designated for this species

Migratory Birds

The Migratory Bird Treaty Act (MBTA) makes it illegal for anyone to “take, possess, import, export, transport, sell, purchase, barter, or offer for sale, 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 by the USFWS”. The phrase “incidental take” is used when migratory birds are taken or killed because of an otherwise lawful activity but the “take” is not the purpose of that activity. According to the IPaC resource list, eight migratory species on the Birds of Conservation Concern (BCC) list have been identified within the study area. The BCC list was updated in 2023 by the USFWS and is an effort to “identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act.”

Bald and Golden Eagles

According to the USFWS, the Bald and Golden Eagle Protection Act (BGEPA) prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests,

or eggs. In addition to immediate impacts, this definition also covers impacts that result from human induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment. Kimley-Horn conducted a preliminary review of the potential for Bald and Golden Eagle habitat to occur on the study area or be affected by the project for the purposes of due diligence in complying with the BGEPA. Kimley-Horn downloaded and reviewed the IPaC official species list to assess the potential for Bald and Golden Eagles to occur within the study area. The USFWS data noted the potential for bald eagles in the vicinity of the study area.

Minnesota Department of Natural Resources Natural Heritage Information System Review

Kimley-Horn contacted the Minnesota Department of Natural Resources (MnDNR) for an updated Natural Heritage Review for the proposed project in January 2026.

Additionally, Kimley-Horn reviewed the Natural Heritage Information System (NHIS) data per license agreement LA-2024-006 for state listed species within one mile of the project study area. The database includes known occurrences of any state endangered, threatened, or special concern species. The identity of the species and location are restricted and should not be shared publicly.

One state-listed species was identified within one mile of the study area and is described in **Table 2**. The identification of this species is consistent with previous Natural Heritage Reviews received from the DNR for the study area vicinity.

Table 2: Minnesota State Listed Species

Species	State Status	NHIS Listing Location and Preferred Habitat
<i>Accipiter atricapillus</i> (American goshawk)	Species of Special Concern	The NHIS database shows a mapped record for the American goshawk approximately 0.9 miles outside of the study area boundary. The preferred habitat of the American goshawk includes large tracts of mature and older upland forest. Preferred cover types for foraging include aspen, paper birch, pine, and spruce forests. Nesting areas tend to have taller and larger diameter trees and fewer understory trees than foraging areas.

A previous Natural Heritage Review letter requested for the study area vicinity stated “The Natural Heritage Information System tracks bat roost trees and hibernacula plus some acoustic data, but this information is not exhaustive. Even if there are no bat records listed all 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.

No Minnesota Biological Survey (MBS) Sites of Biodiversity Significance or Native Plant Communities were identified within the project study area.

SUITABLE HABITAT FIELD INVESTIGATION

Field Habitat Assessment

Kimley-Horn conducted a protected species field habitat assessment in 2024 on September 26 and October 3, and in 2025 on June 2 and 3, and September 11 and 22. Potential suitable habitat for federally listed species was identified within the study area during the field investigation and is described below in **Table 3** and is depicted in **Figure 3** and **Figure 4**. While wetland wasn't specifically identified as suitable habitat for any of the listed species, most wetlands within the study area were observed to contain an herbaceous layers and/or deciduous trees, and therefore could be considered suitable habitat.

Table 3. Potential Listed Species Habitat

Land Cover Type	Potential Suitable Habitat?	Area (acres)	Notes
Deciduous Forest	Gray wolf, American goshawk, Northern long-eared bat, Canada lynx	132	Areas of deciduous forest are present in the northeastern and northwestern portions of the study area. The dominant tree species observed were a mix of alders, aspens, maples, oaks, and hickories. Deciduous forest provides suitable habitat for the gray wolf, American goshawk, and the northern long-eared bat. Deciduous forest may provide marginal, but not preferred, habitat for the Canada lynx.
Mixed Forest	Gray wolf, American goshawk, Northern long-eared bat, Canada lynx	19	Areas of mixed forest are present throughout the study area. The dominant tree species observed were a mix of alders, aspens, maples, oaks, and hickories with some conifers present. Mixed forest provides suitable habitat for the gray wolf, American goshawk, and northern long-eared bat. Mixed forest may provide marginal, but not preferred, habitat for the Canada lynx.
Wetland	See notes	58	Areas of wetland were observed throughout the study area. While wetland wasn't specifically identified as suitable habitat for any of the listed species, most wetlands within the study area were observed to contain an herbaceous layer and/or deciduous trees and therefore could be considered suitable habitat.
Herbaceous land	Canada Lynx, Gray wolf, Monarch butterfly, Suckley's cuckoo bumble bee	59	Herbaceous areas are present throughout the study area. This area could provide suitable habitat for the Canada lynx, gray wolf, monarch butterfly, and Suckley's cuckoo bumble bee.

Impervious Surface	None	12	Impervious surface areas are not considered suitable habitat for species identified by the MnDNR or IPaC.
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FINDINGS

Based on the information reviewed, Kimley-Horn has identified potential species constraints that could require additional planning.

Federally Listed Species

- Based on the known preferred habitat for the Canada lynx, and the presence of marginal suitable habitat identified during the site visit (mixed deciduous forest) and suitable habitat identified through the desktop review (boreal forest), the Canada lynx has the potential to occur within the study area. However, the study area is known to be disturbed. Due to the generalist nature of the Canada lynx, and because preferred suitable habitat (contiguous, undisturbed boreal forests) is present adjacent to the study area, it is unlikely for the Canada lynx to occur within the project area. Therefore, impacts to the Canada lynx are not anticipated.
- Based on the known preferred habitat for the gray wolf, as well as the presence of suitable habitat identified during the site visit (herbaceous land and deciduous forest), the gray wolf has the potential to occur within the study area. However, the study area is known to be disturbed. Due to the generalist nature of the gray wolf and because higher quality, undisturbed preferred suitable habitat is present in the surrounding area, it is unlikely for the gray wolf to occur within the project area. Therefore, impacts to the gray wolf are not anticipated.
- Based on the known preferred habitat for the monarch butterfly, as well as the presence of suitable habitat identified during the site visit, the species has the potential to occur within herbaceous land observed within the study area. The proposed project may affect vegetation that could harbor monarch butterflies and/or suitable monarch habitat; however, ground and vegetation disturbing activities are not expected to appreciably diminish the quality or extent of available suitable habitat within the project area. The project is not likely to jeopardize the continued existence of the monarch butterfly; however, a re-evaluation of project impacts to the monarch butterfly will be required if the project is not completed prior to when the final rule is published.
- Based on the known preferred habitat for the Suckley's cuckoo bumble bee, as well as the presence of suitable habitat identified during the site visit, the species has the potential to occur within herbaceous land observed within the study area. The proposed project may affect vegetation that could harbor Suckley's cuckoo bumble bee and/or suitable bee habitat; however, ground and vegetation disturbing activities are not expected to appreciably diminish the quality or extent of available suitable habitat within the project area. The project is not likely to jeopardize the continued existence of the Suckley's cuckoo bumble bee; however, a re-evaluation of project impacts to the bee will be required if the project is not completed prior to when the final rule is published.

State Listed Species

- Based on the known preferred habitat for the American goshawk, as well as the suitable habitat presence identified during the site visit, the species has the potential to occur within forested areas observed within the study area.
- Based on the known preferred habitat for bats, and because all of Minnesota's bats (including the federally endangered northern long-eared bat) can be found throughout Minnesota, bats have the potential to occur within the study area.

- To avoid impacts to state-listed species, the DNR recommends modifying the location of project activities to avoid suitable habitat or modifying the timing of project activities to avoid the presence of the species. No specific species recommendations were identified.

MITIGATION

Federally Listed Species

- Mitigation for the Canada lynx, gray wolf, monarch butterfly, and Suckley's cuckoo bumble bee is not anticipated.

State Listed Species

- With regard to the American goshawk, no specific mitigation requirements were requested by the MnDNR.
- There are no additional mitigation requirements requested by MnDNR.

VOLUNTARY CONSERVATION MEASURES

Federally Listed Species

- Reseeding disturbed herbaceous land with native seed mix is recommended to avoid potential impacts to the monarch butterfly and Suckley's cuckoo bumble bee.

State Listed Species

- With regard to the American goshawk, while not required, impacts to wooded areas should be minimized or avoided where practicable. Additionally, tree disturbance could avoid the American goshawk nesting season, which occurs between April and July.
- To minimize impacts to bats, the DNR recommends that tree removal be avoided from June 1 through August 15.

Figures

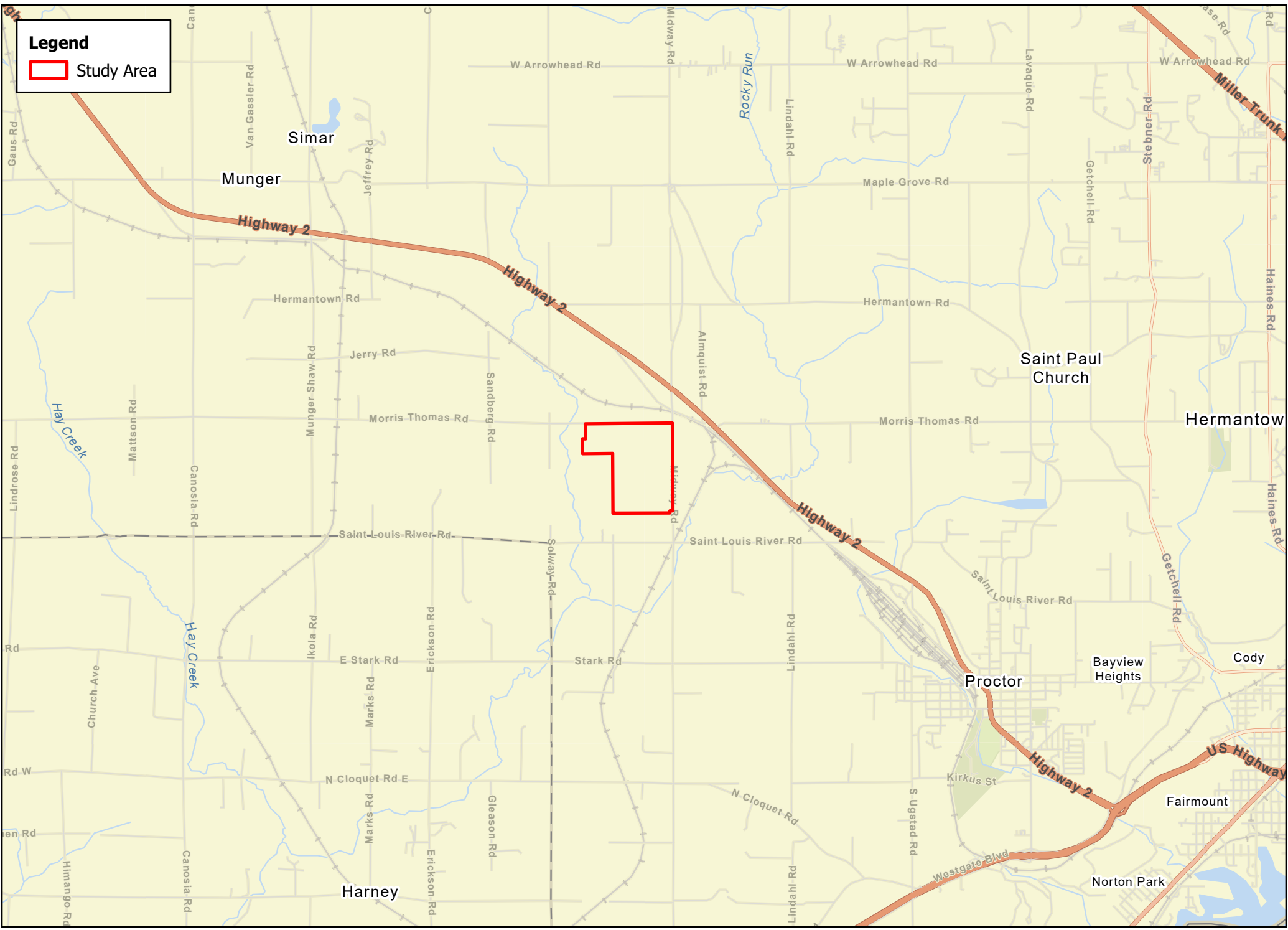
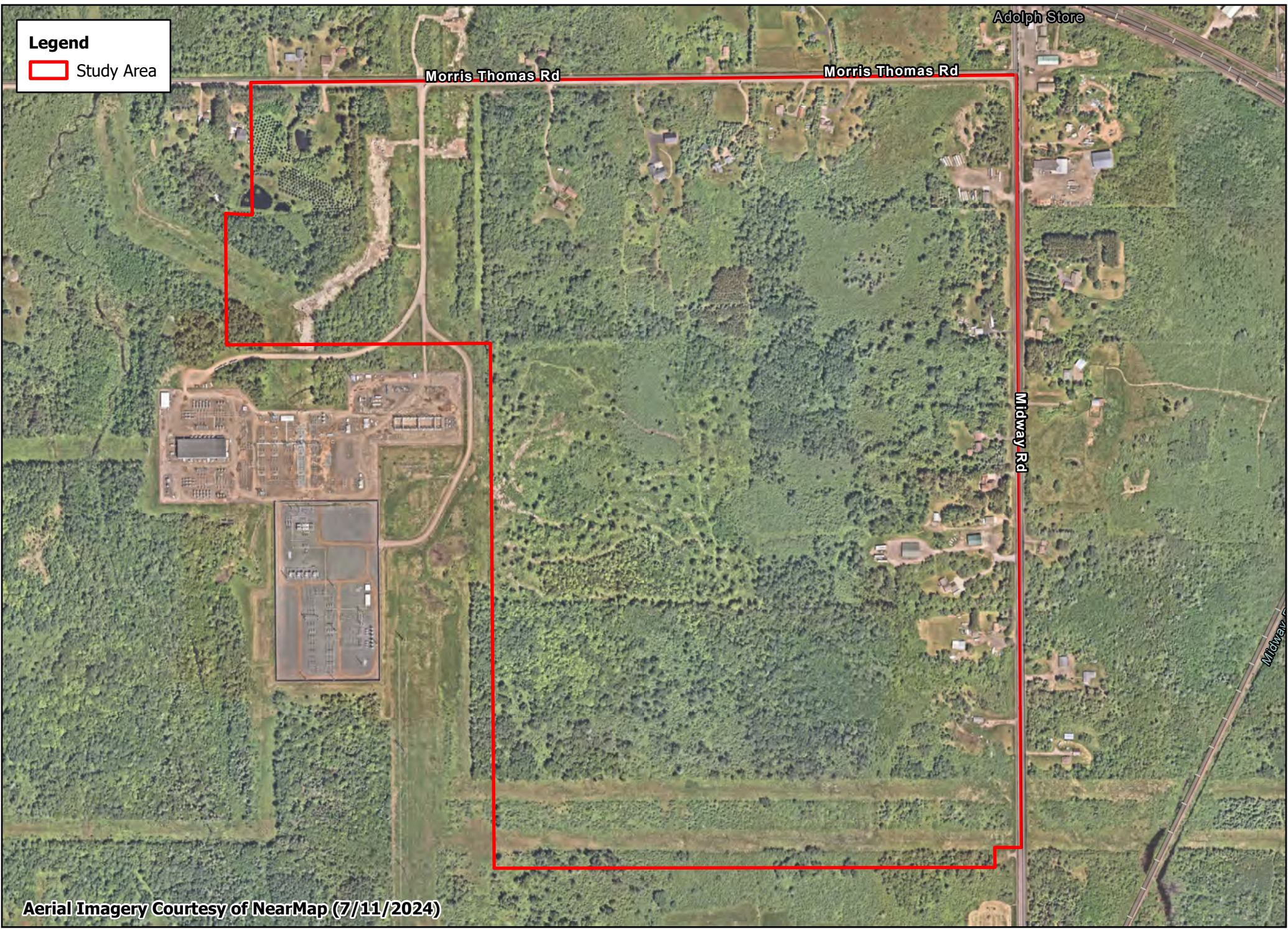


Figure 1. Project Location
Hermantown, Minnesota
St. Louis County



Legend
Study Area

Morris Thomas Rd

Morris Thomas Rd

Adolph Store

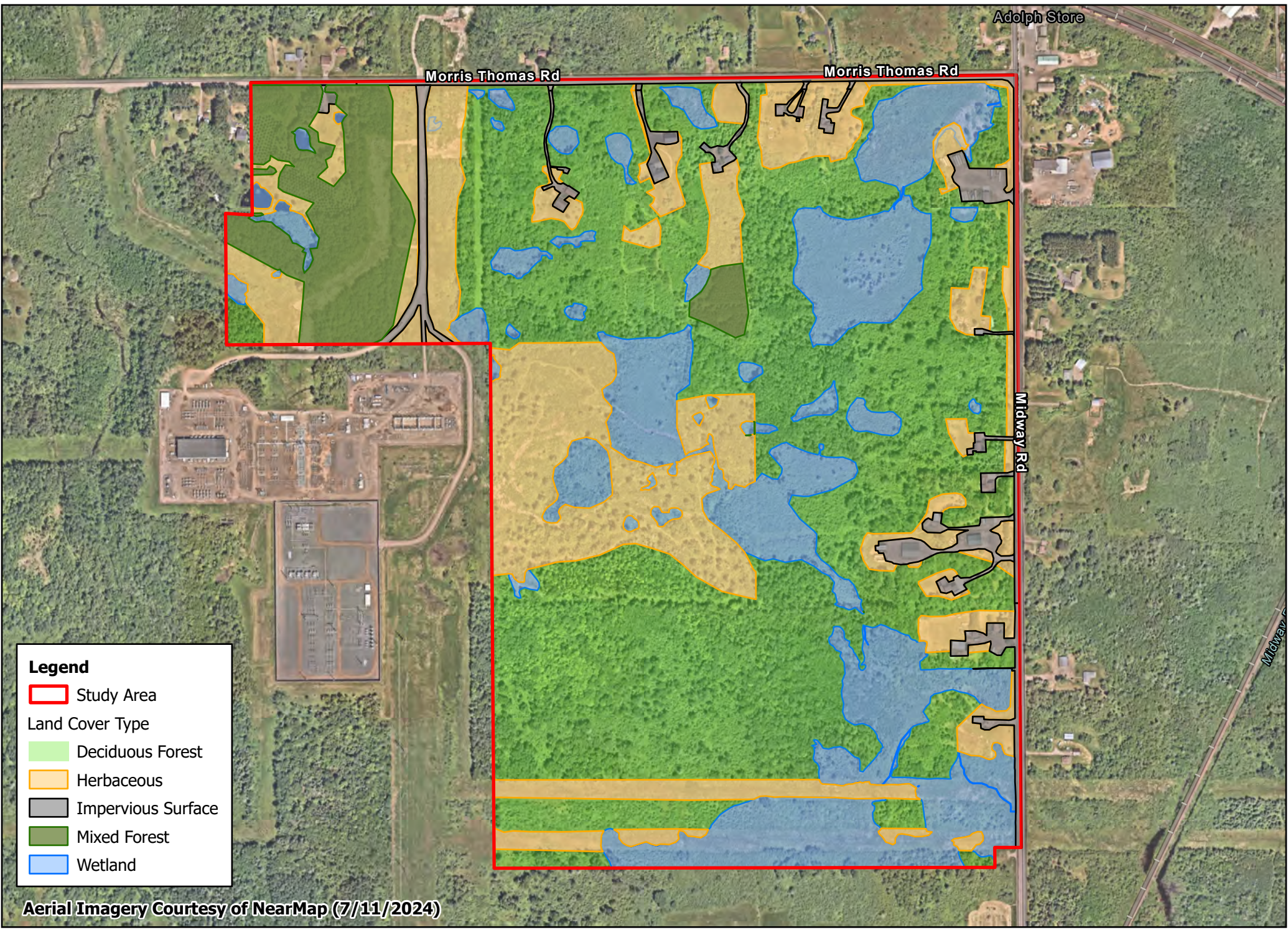
Midway Rd

Aerial Imagery Courtesy of NearMap (7/11/2024)

0 300 600
Feet



Figure 2. Study Area
Hermantown, Minnesota
St. Louis County



Adolph Store

Morris Thomas Rd

Morris Thomas Rd

Midway Rd

Midway Rd

Legend

- Study Area
- Land Cover Type
 - Deciduous Forest
 - Herbaceous
 - Impervious Surface
 - Mixed Forest
 - Wetland

Aerial Imagery Courtesy of NearMap (7/11/2024)

0 300 600
Feet



Figure 3. Land Cover
Hermantown, Minnesota
St. Louis County

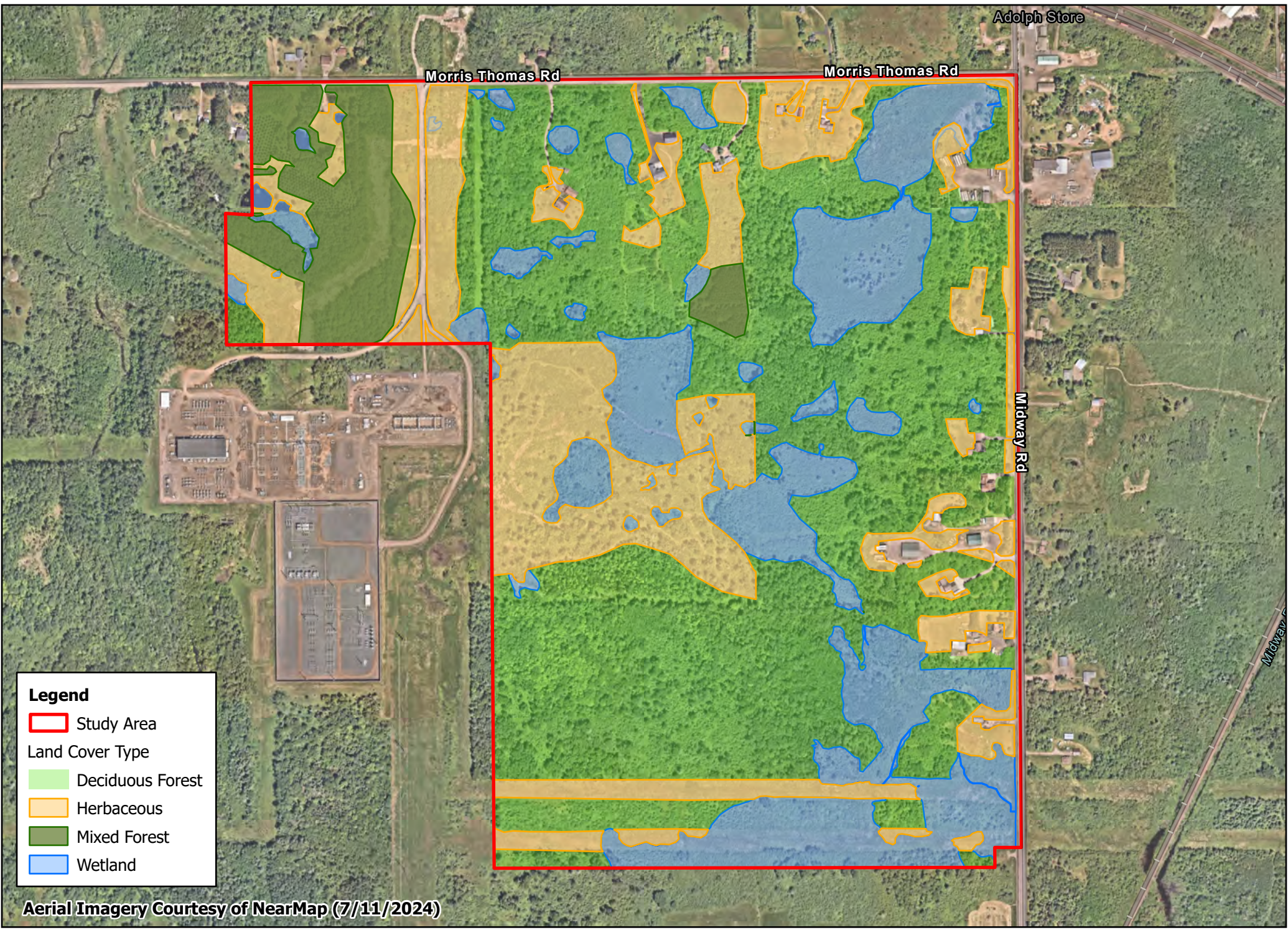


Figure 4. Potential Suitable Habitat
Hermantown, Minnesota
St. Louis County

ATTACHMENT A

Species Resources



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
Phone: (952) 858-0793



In Reply Refer To:
Project Code: 2026-0042483
Project Name: Hermantown Industrial

01/28/2026 22:10:10 UTC

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

This response has been generated by the Information, Planning, and Conservation (IPaC) system to provide information on natural resources that could be affected by your project. The U.S. Fish and Wildlife Service (Service) provides this response under the authority of the Endangered Species Act of 1973 (16 U.S.C. 1531-1543), the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), the Migratory Bird Treaty Act (16 U.S.C. 703-712), and the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*).

Threatened and Endangered Species

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and may be affected by your proposed project. The species list fulfills the requirement for obtaining a Technical Assistance Letter from the U.S. Fish and Wildlife Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Consultation Technical Assistance

Please refer to our [Section 7 website](#) for guidance and technical assistance, including [step-by-step instructions](#) for making effects determinations for each species that might be present and for specific guidance on the following types of projects: projects in developed areas, HUD, CDBG, EDA, USDA Rural Development projects, pipelines, buried utilities, telecommunications, and requests for a Conditional Letter of Map Revision (CLOMR) from FEMA.

We recommend running the project (if it qualifies) through our **Minnesota-Wisconsin Federal Endangered Species Determination Key (Minnesota-Wisconsin ("D-key"))**. A [demonstration video](#) showing how-to access and use the determination key is available. Please note that the Minnesota-Wisconsin D-key is the third option of 3 available d-keys. D-keys are tools to help Federal agencies and other project proponents determine if their proposed action has the potential to adversely affect federally listed species and designated critical habitat. The Minnesota-Wisconsin D-key includes a structured set of questions that assists a project proponent in determining whether a proposed project qualifies for a certain predetermined consultation outcome for all federally listed species found in Minnesota and Wisconsin (except for the northern long-eared bat- see below), which includes determinations of "no effect" or "may affect, not likely to adversely affect." In each case, the Service has compiled and analyzed the best available information on the species' biology and the impacts of certain activities to support these determinations.

If your completed d-key output letter shows a "No Effect" (NE) determination for all listed species, print your IPaC output letter for your files to document your compliance with the Endangered Species Act.

For Federal projects with a "Not Likely to Adversely Affect" (NLAA) determination, our concurrence becomes valid if you do not hear otherwise from us after a 30-day review period, as indicated in your letter.

If your d-key output letter indicates additional coordination with the Minnesota-Wisconsin Ecological Services Field Office is necessary (i.e., you get a "May Affect" determination), you will be provided additional guidance on contacting the Service to continue ESA coordination outside of the key; ESA compliance cannot be concluded using the key for "May Affect" determinations unless otherwise indicated in your output letter.

Note: Once you obtain your official species list, you are not required to continue in IPaC with d-keys, although in most cases these tools should expedite your review. If you choose to make an effects determination on your own, you may do so. If the project is a Federal Action, you may want to review our section 7 step-by-step instructions before making your determinations.

Using the IPaC Official Species List to Make No Effect and May Affect Determinations for Listed Species

1. If IPaC returns a result of "There are no listed species found within the vicinity of the project," then project proponents can conclude the proposed activities will have **no effect** on any federally listed species under Service jurisdiction. Concurrence from the Service is not required for **no effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.
2. If IPaC returns one or more federally listed, proposed, or candidate species as potentially present in the action area of the proposed project – other than bats (see below) – then project proponents must determine if proposed activities will have **no effect** on or **may affect** those species. For assistance in determining if suitable habitat for listed, candidate, or proposed species occurs within your project area or if species may be affected by project activities, you can obtain [Life History Information for Listed and Candidate Species](#) on our office website. If no impacts will occur to a species on the IPaC species list (e.g., there is no habitat present in the project area), the appropriate determination is **no effect**. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.

3. Should you determine that project activities **may affect** any federally listed, please contact our office for further coordination. Letters with requests for consultation or correspondence about your project should include the Consultation Tracking Number in the header. Electronic submission is preferred.

Northern Long-Eared Bats

Northern long-eared bats occur throughout Minnesota and Wisconsin and the information below may help in determining if your project may affect these species.

Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥ 3 inches dbh for northern long-eared bat that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat and evaluated for use by bats. If your project will impact caves or mines or will involve clearing forest or woodland habitat containing suitable roosting habitat, northern long-eared bats could be affected. For bat activity dates, please review Appendix L in the [Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines](#).

Examples of unsuitable habitat include:

- Individual trees that are greater than 1,000 feet from forested or wooded areas,
- Trees found in highly developed urban areas (e.g., street trees, downtown areas),
- A pure stand of less than 3-inch dbh trees that are not mixed with larger trees, and
- A monoculture stand of shrubby vegetation with no potential roost trees.

If IPaC returns a result that northern long-eared bats are potentially present in the action area of the proposed project, project proponents can conclude the proposed activities **may affect** this species **IF** one or more of the following activities are proposed:

- Clearing or disturbing suitable roosting habitat, as defined above, at any time of year,
- Any activity in or near the entrance to a cave or mine,
- Mining, deep excavation, or underground work within 0.25 miles of a cave or mine,
- Construction of one or more wind turbines, or
- Demolition or reconstruction of human-made structures that are known to be used by bats based on observations of roosting bats, bats emerging at dusk, or guano deposits or stains.

If none of the above activities are proposed, project proponents can conclude the proposed activities will have **no effect** on the northern long-eared bat. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC

species list report for your records.

If any of the above activities are proposed, and the northern long-eared bat appears on the user's species list, the federal project user will be directed to either the northern long-eared bat and tricolored bat range-wide D-key or the Federal Highways Administration, Federal Railways Administration, and Federal Transit Administration Indiana bat/Northern long-eared bat D-key, depending on the type of project and federal agency involvement. Similar to the Minnesota-Wisconsin D-key, these d-keys help to determine if prohibited take might occur and, if not, will generate an automated verification letter. Additional information about available tools can be found on the Service's [northern long-eared bat website](#).

Whooping Crane

Whooping crane is designated as a non-essential experimental population in Wisconsin and consultation under Section 7(a)(2) of the Endangered Species Act is only required if project activities will occur within a National Wildlife Refuge or National Park. If project activities are proposed on lands outside of a National Wildlife Refuge or National Park, then you are not required to consult. For additional information on this designation and consultation requirements, please review "[Establishment of a Nonessential Experimental Population of Whooping Cranes in the Eastern United States](#)."

Other Trust Resources and Activities

Bald and Golden Eagles - Although the bald eagle has been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. It is the responsibility of the project proponent to survey the area for any migratory bird nests. If there is an eagle nest on-site while work is on-going, eagles may be disturbed. We recommend avoiding and minimizing disturbance to eagles whenever practicable. If you cannot avoid eagle disturbance, you may seek a [permit](#). A [nest take permit](#) is always required for removal, relocation, or obstruction of an eagle nest. For communication and wind energy projects, please refer to additional guidelines below.

Migratory Birds - The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Service. The Service has the responsibility under the MBTA to proactively prevent the mortality of migratory birds whenever possible and we encourage implementation of [recommendations that minimize potential impacts to migratory birds](#). Such measures include clearing forested habitat outside the nesting season (generally March 1 to August 31) or conducting nest surveys prior to clearing to avoid injury to eggs or nestlings.

Communication Towers - Construction of new communications towers (including radio, television, cellular, and microwave) creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. However, the Service has developed [voluntary guidelines for minimizing impacts](#).

Transmission Lines - Migratory birds, especially large species with long wingspans, heavy bodies, and poor maneuverability can also collide with power lines. In addition, mortality can occur when birds, particularly hawks, eagles, kites, falcons, and owls, attempt to perch on uninsulated or unguarded power poles. To minimize these risks, please refer to [guidelines](#) developed by the Avian Power Line Interaction Committee and the Service. Implementation of these measures is especially important along sections of lines adjacent to wetlands or other areas that support large numbers of raptors and migratory birds.

Wind Energy - To minimize impacts to migratory birds and bats, wind energy projects should follow the Service's [Wind Energy Guidelines](#). In addition, please refer to the Service's [Eagle Conservation Plan Guidance](#), which provides guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities.

State Department of Natural Resources Coordination

While it is not required for your Federal section 7 consultation, please note that additional state endangered or threatened species may also have the potential to be impacted. **Please contact the Minnesota or Wisconsin Department of Natural Resources for information on state listed species that may be present in your proposed project area.**

Minnesota

[Minnesota Department of Natural Resources - Endangered Resources Review Homepage](#)

Email: Review.NHIS@state.mn.us

Wisconsin

[Wisconsin Department of Natural Resources - Endangered Resources Review Homepage](#)

Email: DNRERReview@wi.gov

We appreciate your concern for threatened and endangered species. Please feel free to contact our office with questions or for additional information.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Minnesota-Wisconsin Ecological Services Field Office

3815 American Blvd East

Bloomington, MN 55425-1659

(952) 858-0793

PROJECT SUMMARY

Project Code: 2026-0042483
Project Name: Hermantown Industrial
Project Type: Commercial Development
Project Description: Planned industrial development.
Project Location:

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@46.7714873,-92.28538941227187,14z>



Counties: St. Louis County, Minnesota

ENDANGERED SPECIES ACT SPECIES

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Canada Lynx <i>Lynx canadensis</i> Population: Wherever Found in Contiguous U.S. There is final critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3652	Threatened
Gray Wolf <i>Canis lupus</i> Population: MN There is final critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4488	Threatened

INSECTS

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> There is proposed critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened
Suckley's Cuckoo Bumble Bee <i>Bombus suckleyi</i> Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10885	Proposed Endangered

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act ² and the Migratory Bird Treaty Act (MBTA) ¹. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow

appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

1. The [Bald and Golden Eagle Protection Act](#) of 1940.
2. The [Migratory Birds Treaty Act](#) of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are Bald Eagles and/or Golden Eagles in your [project](#) area.

Measures for Proactively Minimizing Eagle Impacts

For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the [National Bald Eagle Management Guidelines](#). You may employ the timing and activity-specific distance recommendations in this document when designing your project/activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to [Bald Eagle Nesting and Sensitivity to Human Activity](#).

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional [Migratory Bird Office](#) or [Ecological Services Field Office](#).

If disturbance or take of eagles cannot be avoided, an [incidental take permit](#) may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the [Do I Need A Permit Tool](#). For assistance making this determination for golden eagles, please consult with the appropriate Regional [Migratory Bird Office](#) or [Ecological Services Field Office](#).

Ensure Your Eagle List is Accurate and Complete

If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the [Supplemental Information on Migratory Birds and Eagles](#), to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31

NAME	BREEDING SEASON
Golden Eagle <i>Aquila chrysaetos</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "[Supplemental Information on Migratory Birds and Eagles](#)", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)

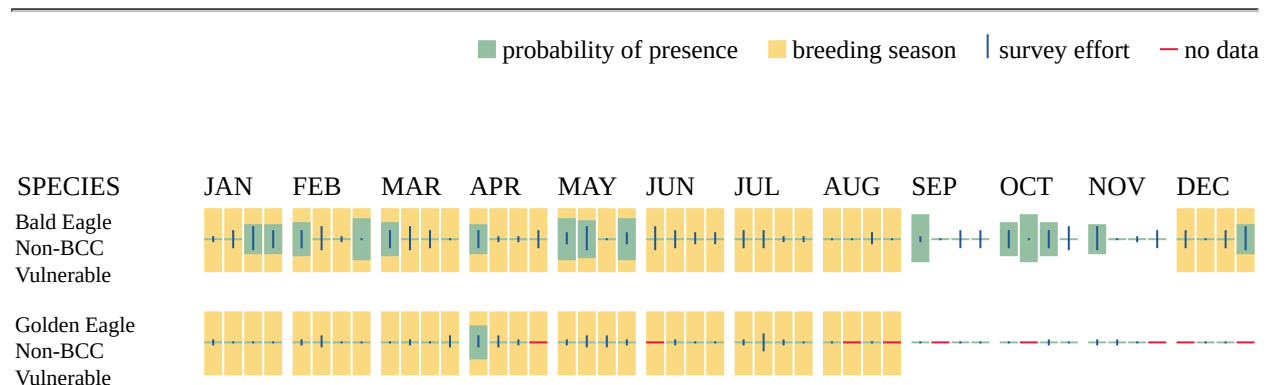
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)

Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (—)

A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>

- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incident-take-migratory-birds>
- Nationwide avoidance and minimization measures for birds <https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>
- Supplemental Information for Migratory Birds and Eagles in IPaC <https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) ¹ prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black-billed Cuckoo <i>Coccyzus erythrophthalmus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Bobolink <i>Dolichonyx oryzivorus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9454	Breeds May 20 to Jul 31
Canada Warbler <i>Cardellina canadensis</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9643	Breeds May 20 to Aug 10

NAME	BREEDING SEASON
Evening Grosbeak <i>Coccothraustes vespertinus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9465	Breeds May 15 to Aug 10
Golden Eagle <i>Aquila chrysaetos</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31
Golden-winged Warbler <i>Vermivora chrysoptera</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Le Conte's Sparrow <i>Ammospiza leconteii</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9469	Breeds Jun 1 to Aug 15
Olive-sided Flycatcher <i>Contopus cooperi</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Veery <i>Catharus fuscescens fuscescens</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/11987	Breeds May 15 to Jul 15
Wood Thrush <i>Hylocichla mustelina</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "[Supplemental Information on Migratory Birds and Eagles](#)", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)

Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)

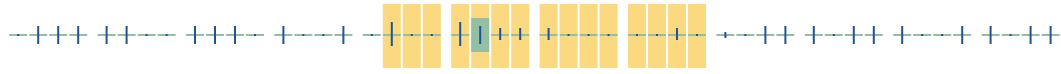
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (—)

A week is marked as having no data if there were no survey events for that week.



Wood Thrush
BCC Rangewide
(CON)



Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>
- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds>
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC <https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

WETLANDS

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED.
PLEASE VISIT [HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML](https://www.fws.gov/wetlands/data/mapper.html) OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Cassie Baumgartner
Address: 767 N. Eustis Street
Address Line 2: Suite 100
City: St. Paul
State: MN
Zip: 55114
Email: cassie.baumgartner@kimley-horn.com
Phone: 6517600185

Appendix F: *Cultural Resources Studies*



7630 Executive Drive
Eden Prairie, MN 55344
Ph: 952-658-8891
Web: www.insitucrm.com

March 10, 2025

Brian M. Wurdeman, P.E.
Kimley-Horn
11995 Singletree Lane, Suite 225
Eden Prairie, MN 55344
Brian.Wurdeman@kimley-horn.com

Subject: Phase IA Cultural Resource Literature Review and Preliminary Reconnaissance for Project Loon – Hermantown, St. Louis County, Minnesota [Public Version]

Dear Mr. Wurdeman,

On behalf of Kimley-Horn, this report presents the results of a Phase Ia cultural resource literature review and preliminary reconnaissance conducted by In Situ Archaeological Consulting, LLC (In Situ) for Project Loon - Hermantown, St. Louis County, Minnesota (Figures 1-2). The proposed development project area is located within the legal locations listed in Table 1.

Table 1: Legal Locations of the Proposed Project Area		
Township (T)	Range (R)	Section(s)
50 North	15 West	31

The proposed project is for a desktop literature review of the approximately 243-acre project area near Hermantown as well as a preliminary reconnaissance site visit of the Umpierre and Patrick Parcels within the project area. The literature review was conducted by In Situ staff on November 1, 2024, using files maintained by the Minnesota State Historic Preservation Office (SHPO) and Minnesota Office of the State Archaeologist (OSA). On November 4, 2024, In Situ conducted a preliminary reconnaissance of the project area. The literature review will assist in identifying the locations of previous cultural resources, locations on the National Register of Historic Places (NRHP), previous cultural resource inventories, and the potential for cultural resources within and around the project area.

At the present time, the project is not subject to review under Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (54 U.S.C. § 306108 [36 CFR 800]), as the Project will not require nor will seek any federal assistance, permitting, or authorization. However, this cultural resource assessment is being completed as part of an Alternative Urban Areawide Review (AUAR) for future development.

Attached to this letter are the cultural resource literature review maps (Figures 3-7) and photographs from the preliminary reconnaissance of the project area (Figures 8-15).

Detailed site location information, including legal descriptions, coordinates, and contextual information from archaeological resources, has been redacted from this public version of the report

in accordance with applicable cultural resource protection laws in order to protect archaeological resources. Full Project documentation, including professional qualifications, field staff, and authorship, is on file with the appropriate reviewing agencies.

BACKGROUND RESEARCH

A literature review consisted of identifying any previously recorded archaeological sites and architectural properties within a 2-mile study area surrounding the proposed project area (1 mile from each side of the project area). The task was completed using site data files and previous inventory files maintained by the Minnesota SHPO and OSA. In addition, background research was completed by reviewing NRHP data, historic maps, atlases, current aerial photographs, soil maps, topographic and geomorphic data, and other sources that might provide information for the locations of historic-era sites, areas of prior disturbance, etc. (Figures 3-6). The literature/records search revealed no previous cultural resource inventories/surveys, one previously recorded archaeological site, and three previously recorded architectural resources within the study area.

The data gathered revealed one previously recorded archaeological site within the study area (Table 2). The previously recorded archaeological site is *unevaluated* for the NRHP and is not located within the proposed project area.

Table 2: Previously Recorded Archaeological Sites within the Study Area.

Site	Legal Description	Cultural Affiliation	Site Type	NRHP Eligibility	Within Project Area
21SL1274	[Legal description and the mapped location of archaeological sites are redacted from the text and report figures to protect archaeological resources.]	Post-Contact (Euro-American)	Artifact Scatter/ Structural Ruin	Unevaluated	No

The literature review revealed three previously recorded architectural resources within the study area (Table 3). All three resources are *unevaluated* for the NRHP, and none of the previously recorded architectural resources are located within the proposed project area.

Table 3: Previously Recorded Architectural Resources within the Study Area.

Site Number	Site Name/Type	Address/Location	NRHP Eligibility	Within Project Area
SL-HER-00013	Bridge 88790	Lindahl Road over Midway River	Unevaluated	No
SL-MID-00007	Bridge 88789	Stark Junction Road over Midway River	Unevaluated	No
XX-ROD-00176	Trunk Highway 2	From the WI state line in Duluth to the ND state line in E. Grand Forks	Unevaluated	No

BASIC ENVIRONMENT OF THE PROJECT AREA

The project area is located within the Northern Lakes and Forests (50) Level III ecoregion, and more specifically, the Toimi Drumlins (50p) Level IV ecoregion. The Toimi Drumlins are described as “drumlins covered with forest, interspersed with wetland depressions” (Omernik et al. 2000). The physiography of the project area is located within the Brainerd-Automba Drumlin Area. This area is characterized by marked drumlin fields including the Pierz, the Brainerd, and the Mille Lacs Lake areas. The entire region is interrupted by outwash plains in some places, the largest being the Mississippi River valley train, which enlarges into a complex of pitted plains north of Brainerd (Wright 1972). The elevation within the project area is approximately 1,260-1,350 ft above mean sea level. This area is located within the Miami stony loam soil association (U.S. Department of Agriculture 1906). The two most prevalent soil series (61.4%) within the project area include the Hermantown-Canosia-Giese, depressional, complex (F135A) and the Normanna-Canosia-Hermantown complex (F137B) which contain very poorly to somewhat poorly drained soils (Natural Resources Conservation Service 2025).

PRELIMINARY ARCHAEOLOGICAL RECONNAISSANCE FIELD METHODS

The reconnaissance survey consisted of a site visit by an archaeologist in order to assess the potential for cultural resources and to observe any indications of cultural resources or the potential for cultural resources. The site visit was completed using visual inspection methods. The preliminary reconnaissance survey was limited to areas where field crew could safely access strictly within public rights-of-way, as well as parcels with approved access (Umpierre and Paitrick parcels). The general terrain, geomorphological setting, and topographic factors were observed and assessed in order to assess the absence or likelihood of any cultural resources within the project area. Areas identified as disturbed areas, areas with a slope greater than 20 degrees, areas of poorly drained soils, and low lying-wet areas are considered to have a low potential for containing archaeological sites. However, for an area to be considered to have a potential for an archaeological site, the following factors are considered:

- Located within undisturbed land (excluding plowed agricultural fields);
- Located on a topographically significant landscape feature;
- Proximity of a suitable former or existing water source (named waterbody and perennial streams; within 150 m for high potential and within 200 m for moderate potential);
- Proximity of a previously recorded archaeological site or historic structure (within 100 m).

Using these parameters, In Situ identified any areas of cultural resource potential within the project area. This cultural resource potential generated by In Situ revealed areas of archaeological resource potential within the Project area (Figure 7).

Photographs of the project area as well as observational notes on the general terrain, features within the project area, and other pertinent information regarding the landscape of the project area were collected. All field notes, maps, and photos will be maintained at the In Situ's Eden Prairie, MN office.

PRELIMINARY RECONNAISSANCE RESULTS

On November 4, 2024, In Situ conducted a site visit review of the project area. The project area consists of established roadways, rights-of-way, transmission line corridors, wooded/grassy areas, and wetland areas (Figures 8-15). Vegetation consisted of mixed grasses, wooded vegetation, and wetland vegetation. The topography consisted of fairly flat to undulating terrain. The area has been impacted by natural erosion, rural development (roads, utilities, driveways), and agricultural activities.

During this visit, it was noted indications that the project parcel area has a low to high potential for significant cultural resources, as portions of the project area are not developed, not within wetlands, and the project area is located between two suitable water sources (Midway River to the southeast and an unnamed perennial stream to the west). There are several areas of interest noted within the project area that occur on landforms of higher elevation located between the two nearby water sources that have a high potential for intact cultural resources. Portions of the project area have been subject to previous disturbances and development, as two transmission line corridors cross through the southern project area and residential parcels are present along the northern and eastern edges of the project area and other portions were within low lying marshlands. Due to these factors, it was noted that approximately 22.8 acres of the project area identified as areas of interest may have a high potential for significant cultural resources.

CULTURAL RESOURCE POTENTIAL

The project is located in an area of roadways, rights-of-way, transmission line corridors, wooded/grassy areas, and wetland areas. The project area consists of fairly flat to undulating terrain and is on a landform with topographically significant landscape features, as the area contains points of higher elevation with flood plains from suitable water sources on either side. The project area lies between the Midway River to the southeast and an unnamed perennial stream to the west, both of which are natural suitable water sources. Sources of fresh water and landforms such as river terraces have high potential for archaeological sites (Hobbs 2019; Hudak et al. 2002). Long-term occupation sites are more likely to occur along permanent water sources, as more resources are readily available (Anderson and Smith 2003; Hobbs 2019; Hudak et al. 2002). Historic maps did not indicate any prior cultural sites within the project area, nor are there any previously recorded sites located within the proposed project area. In addition, there is a lack in the number of previously recorded significant sites within the study area. There are existing transmission line corridors that cut through the parcel horizontally in the south, as well as residential parcels along the northern and eastern edges of the Project area; it is likely that these portions of the project area may likely have been heavily impacted by rural and sub-urban construction as well as road and utility construction. It is probable that those activities would have significantly, if not totally impacted any archaeological resources that may or may not have been present in relation to these portions of the project area, leaving a nominal potential for the intact presence of significant archaeological remains within these areas. Also, portions of the project area are located within low-lying areas with marshlands present, as indicated on historic maps. Low lying/marsh areas are not typically suitable for long term occupation, as the area may be subject to frequent flooding. However, there are portions of the project area identified as areas of interest that are not developed, not within wetlands, and located landforms of higher elevation between two suitable water sources

(Midway River to the southeast and an unnamed perennial stream to the west). Due to these factors, it was noted that approximately 22.8 acres of the project area identified as areas of interest may have a high potential for significant cultural resources, with the remaining areas having a low potential for significant cultural resources.

CONCLUSIONS AND RECOMMENDATIONS

In Situ completed a Phase Ia cultural resource literature review and preliminary reconnaissance for Project Loon - Hermantown, St. Louis County, Minnesota. The literature/records search revealed no previous cultural resource inventories/surveys, one previously recorded archaeological site, and three previously recorded architectural resources within the study area. None of these resources are located within the proposed project area.

While portions of the project area have been subject to previous disturbances and development and/or are within marshlands, a preliminary assessment of archaeological resource potential within the proposed project area by In Situ found that due to the location of the project between two suitable water sources (Midway River to the southeast and an unnamed perennial stream to the west) and the presence topographically significant landforms, approximately 22.8 acres of the project area identified as areas of interest may have a high potential for significant cultural resources, and the remaining areas have a low potential for significant cultural resources. Therefore, In Situ recommends that a Phase I archaeological survey is warranted for at least the areas of high potential for this project (approximately 22.8 acres), and the survey area may require expansion if the initial survey of high potential areas yields positive results. However, if these areas of high cultural resource potential are avoided and no development takes place within these areas, then In Situ recommends that a Phase I archaeological survey is not warranted for this project.

Please contact me should you have any further questions or concerns regarding the information assembled.

Sincerely,

A handwritten signature in black ink, appearing to read 'Abraham Ledezma', with a stylized, cursive script.

Abraham Ledezma, M.S., RPA
Principal Investigator

Enclosures: Figures 1-15: Project Maps, Literature Review Maps, and Recon Photos

REFERENCES CITED

Anderson, David G. and Steven D. Smith

- 2003 *Archaeology, History, and Predictive Modeling: Research at Fort Polk, 1972-2002*. University of Alabama Press, Tuscaloosa, Alabama.

Hobbs, Elizabeth

- 2019 *MnModel Phase 4: Project Summary and Statewide Results*. Electronic document. <https://www.dot.state.mn.us/mnmodel/>, Accessed January 25, 2025.

Hudak, Joseph G., Elizabeth Hobbs, Allyson Brooks, Carol Ann Sersland, and Crystal Phillips (Editors)

- 2002 *MnModel Final Report Phases 1-3, 2002: A Predictive Model of Precontact Archaeological Site Location for the State of Minnesota*. Available at: https://www.dot.state.mn.us/mnmodel/P3FinalReport/final_report.html. Minnesota Department of Transportation. Accessed September 6, 2022.

Natural Resources Conservation Service

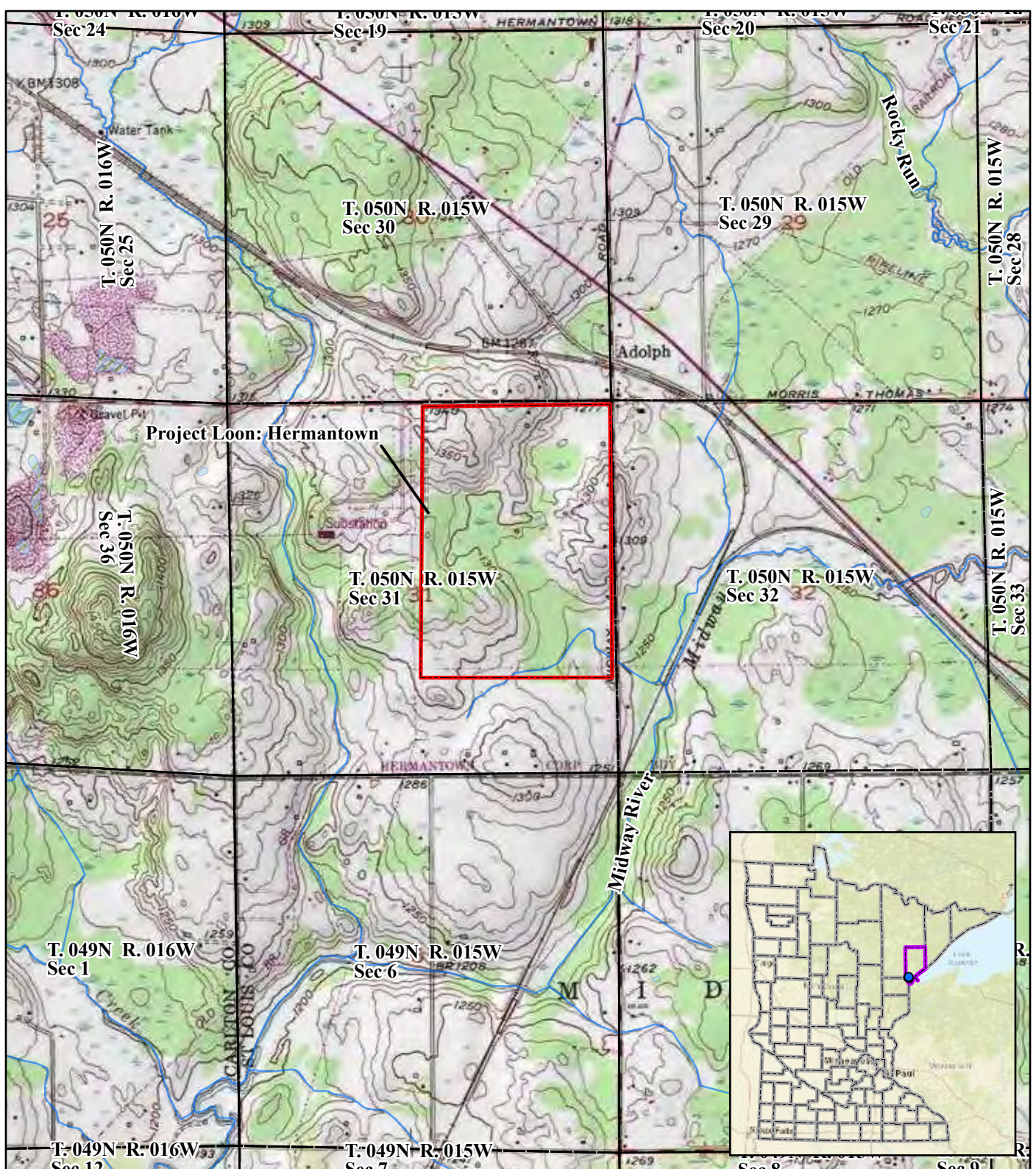
- 2025 Web Soil Survey. Available at: <http://websoilsurvey.nrcs.usda.gov>. Accessed March 3, 2025.

U.S. Department of Agriculture

- 1906 *Soil Survey of the Carlton Area, Minnesota-Wisconsin*. U.S. Government Printing Office. Washington.

Wright, H. E. Jr.

- 1972 Physiology of Minnesota. In *Geology of Minnesota: A Centennial Volume*. pp. 561-578. Minnesota Geological Society.



Legend

- Project Area
- Waterbody
- Township/Range/Section
- Project Location
- Stream/River
- St. Louis County



1:24,000
Approximate Scale in Feet
1 inch equals 2,000 feet
2,000 0 2,000 4,000

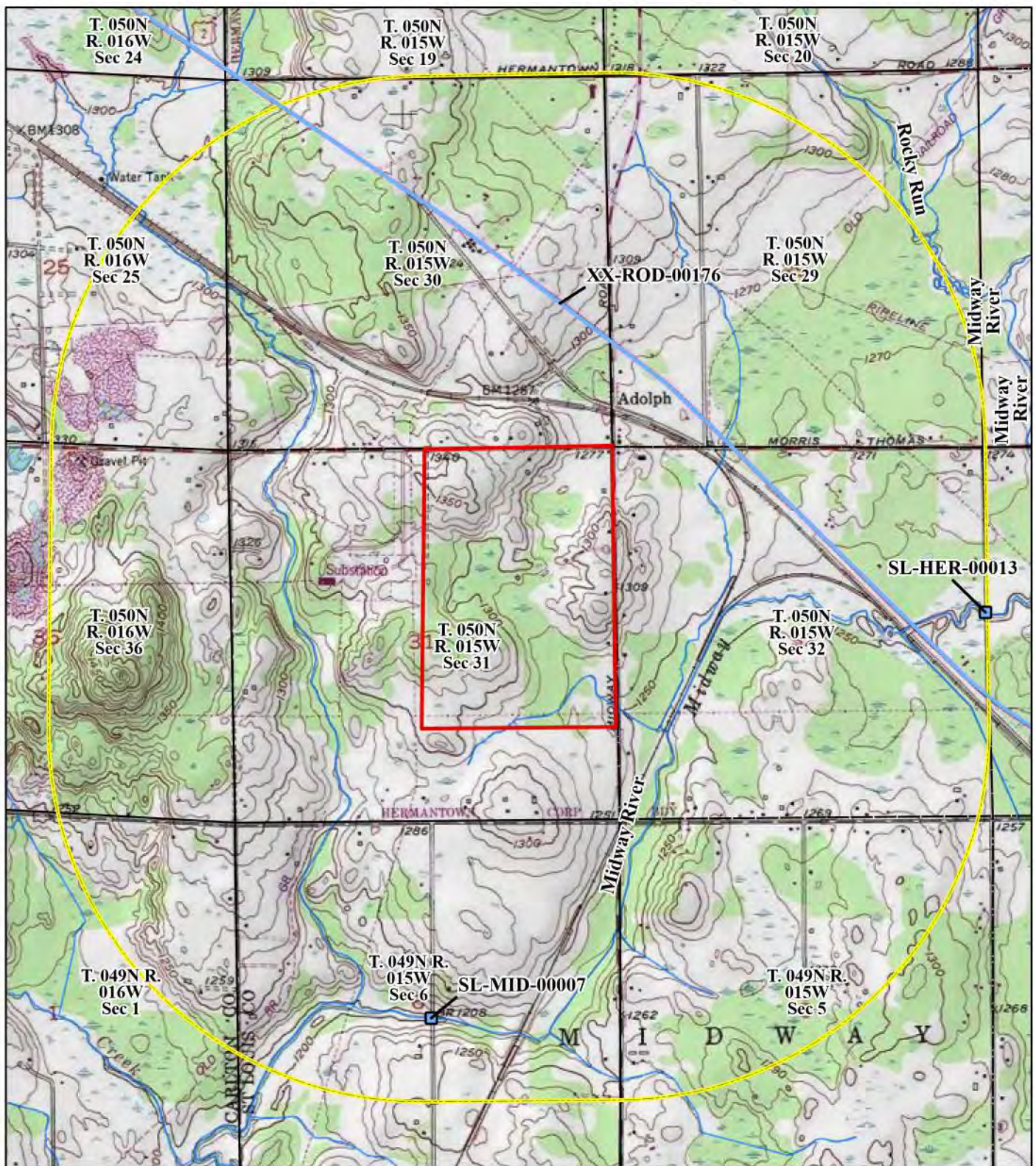
TOPOGRAPHIC MAP

Project Loon: Hermantown
St. Louis County, Minnesota

Note: Imagery courtesy of ESRI

Figure 1. Project location on the USGS 1993 Adolph, MN 7.5 minute series topographic map.





Legend

- | | |
|--|------------------------|
| Unevaluated Architecture Resource | Township/Range/Section |
| Unevaluated Linear Architecture Resource | Stream/River |
| Project Area | Waterbody |
| 1-Mile Study Area | |



1:24,000
Approximate Scale in Feet
1 inch equals 2,000 feet
2,000 0 2,000 4,000

LITERATURE REVIEW TOPOGRAPHIC MAP

Project Loon - Hermantown

St. Louis County, Minnesota

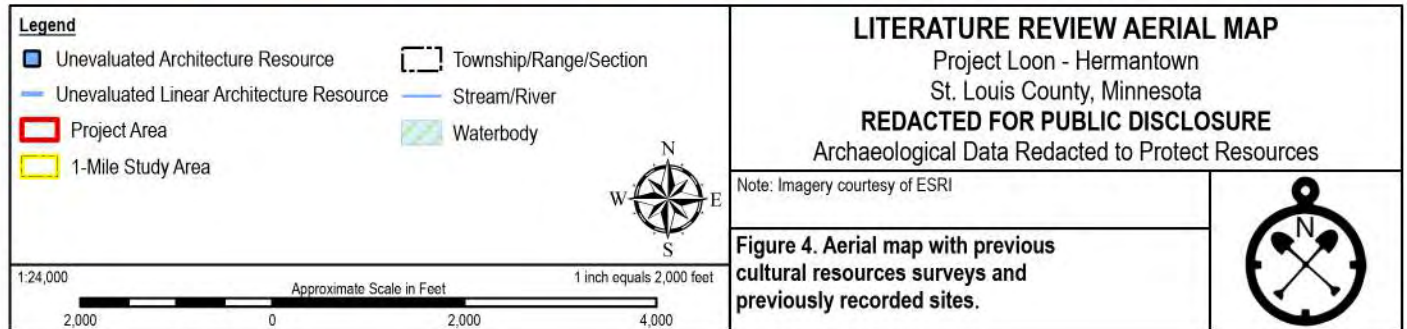
REDACTED FOR PUBLIC DISCLOSURE

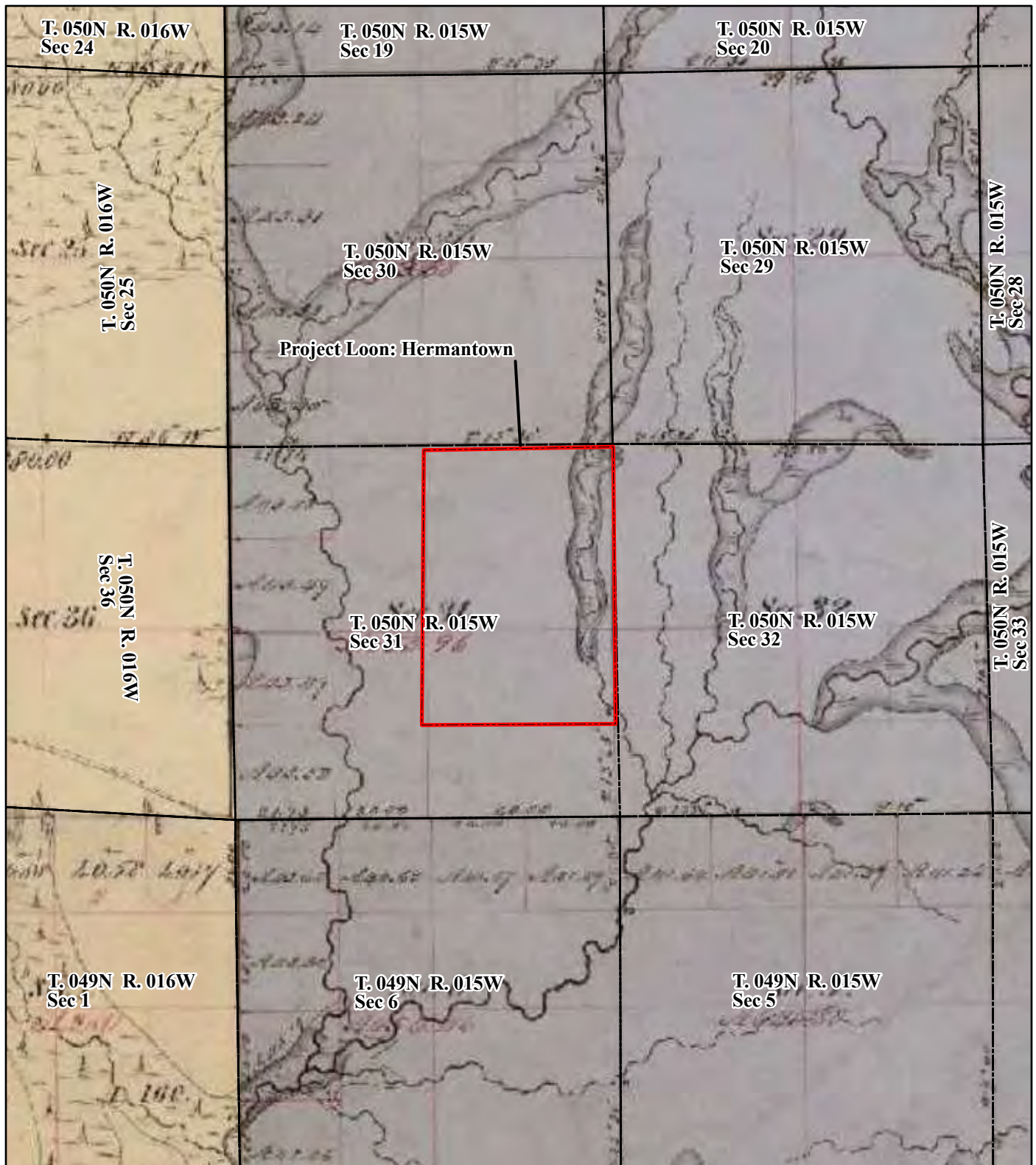
Archaeological Data Redacted to Protect Resources

Note: Imagery courtesy of ESRI

Figure 3. Topographic map with previous cultural resources surveys and previously recorded sites.







Legend

- Project Area
- Township/Range/Section



1:24,000
Approximate Scale in Feet
1 inch equals 2,000 feet
2,000 0 2,000 4,000

HISTORICAL BLM GLO PLAT MAP

Project Loon: Hermantown
St. Louis County, Minnesota

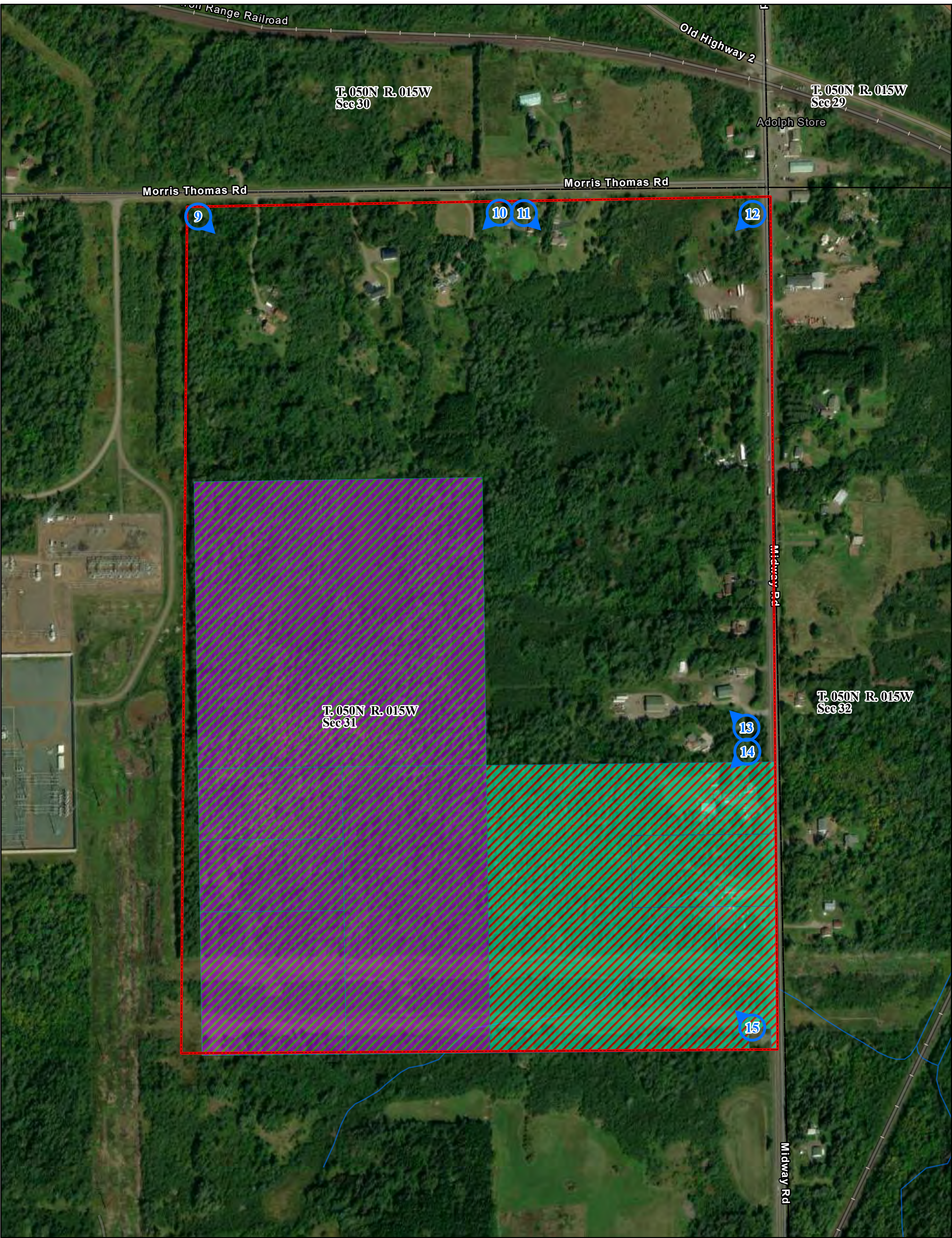
Note: Imagery courtesy of the U.S. Department of the Interior Bureau of Land Management.

Figure 5. Project location on the 1857-71 BLM GLO Plat map.



Figure 7: Project location on an aerial map showing areas of resource potential.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]



Paitrick Parcels

Umpierre Parcels

Project Area

Township/Range/Section

Stream/River

Waterbody

Photographic Orientation

N

W

E

S

417

0

417

Feet

1:5,000

1 inch equals 417 feet

FIELDWORK MAP

Project Loon: Hermantown

St. Louis County, Minnesota

Note: Aerial Imagery courtesy of ESRI

Figure 8. Project location on an aerial map showing photograph locations and orientation.

N



Figure 9: Overview facing southeast within the project area (DSCN6287).



Figure 10: Overview facing southwest within the project area (DSCN6290).



Figure 11: Overview facing southeast within the project area (DSCN6293).



Figure 12: Overview facing southwest within the project area (DSCN6297).



Figure 13: Overview facing northwest within the project area (DSCN6301).



Figure 14: Overview facing southwest within the project area (DSCN6303).



Figure 15: Overview facing northwest within the project area (DSCN6306).

***Phase I Archaeological Survey for
Project Loon—Hermantown,
St. Louis County, Minnesota
[Public Version]***



***Phase I Archaeological Survey for
Project Loon—Hermantown,
St. Louis County, Minnesota
[Public Version]***

Prepared by:
In Situ Archaeological Consulting, LLC



In Situ Project: 2024-275

Prepared for:
Kimley-Horn and Associates
Mortenson Development, Inc.

THIS REPORT HAS BEEN REDACTED FOR PUBLIC DISSEMINATION: Information relating to the nature and location of archaeological sites has been withheld from this public version of the report, as such information is considered private and confidential and not for public disclosure in accordance with Section 304 of the National Historic Preservation Act (54 U.S.C. § 307103); 36 CFR Part 800.6 (a)(5) of the Advisory Council on Historic Preservation's rules implementing Sections 106 and 110 of the Act; Section 9(a) of the Archaeological Resource Protection Act (54 U.S.C. § 100707); 43 CFR Part 10 of the Native American Graves Protection and Repatriation Act (25 U.S.C. §§ 3001-3013); Minnesota Field Archaeology Act (MS 138.31-138.42); Minnesota Historic Sites Act (MS 138.661-138.669); and Minnesota Private Cemeteries Act (MS 307.08), where applicable.

January 15, 2026

ABSTRACT

Kimley-Horn commissioned In Situ Archaeological Consulting, LLC (In Situ) to provide archaeological services in support of Project Loon—Hermantown (Project). This report presents the results of the intensive Phase I archaeological investigation conducted by In Situ for the Project.

The Project consists of the development of an approximate 283.2-acre area. Within the 283.2-acre Project area that may be subject to development, approximately 75.3 acres were subject to targeted Phase I archaeological survey for the Project. Currently, the Project is not subject to federal cultural resources review, as no federal funding, permits, or approvals are anticipated and therefore no federal nexus exists. However, this Phase I archaeological report is being prepared in support of an Alternative Urban Areawide Review (AUAR), which is a state-level environmental review conducted under Minnesota rules to evaluate potential impacts of future development scenarios.

The Project is located in Section 31 of Township (T) 50 North (N), Range (R) 15 West (W) in St. Louis County, Minnesota. The Project area is located on privately owned land within 26 parcels in the southwest corner of the city limits of Hermantown, Minnesota. The Project is located west of Midway Road and south of Morris Thomas Road West, within an area consisting of short, manicured grasses, mixed grasses, wooded areas, wetland areas, and rural infrastructure (roads, utilities, etc.). The Phase I archaeological survey included a background literature review within and surrounding the Project area along with a preliminary archaeological reconnaissance of the Project area, and a targeted Phase I archaeological survey for the proposed Project.

During the field survey, a total of 75.3 acres of the 283.2-acre Project area were subject to targeted Phase I archaeological survey for the Project. Due to the environmental conditions (e.g. not near permanent water sources or known cultural resources), the remaining 207.9 acres of the Project area have a low archaeological potential. Therefore, no Phase I archaeological survey took place within these areas, as there is a low potential for the undertaking to impact cultural resources in these areas. It is the professional recommendation of In Situ that the undertaking is not expected to affect historic properties within these areas of low archaeological potential.

Five newly recorded post-contact archaeological sites were observed and recorded during the archaeological survey of the Project (21SL1302, IS-LOON-002, IS-LOON-003, IS-LOON-004, and IS-LOON-005). All five of the newly recorded archaeological sites are recommended as *not eligible* for the NRHP. In addition, no previously identified resources are within or adjacent to the proposed Project area. Therefore, In Situ recommends a finding of *No Historic Properties Affected* within the surveyed Project area.

Although no historic properties were identified, In Situ recommends the development and implementation of an Inadvertent Discovery Plan to be in effect during all ground-disturbing construction activities associated with the Project. In addition, In Situ recommends that the Project developer continue consultation with Tribes that have expressed interest in, or have cultural affiliation with, the Project area throughout the remainder of the Project. Continued consultation is recommended to ensure that Tribal concerns are addressed during project implementation and that Tribes are notified in a timely manner of any unanticipated discoveries, particularly those of potential cultural or religious significance.

If the agencies concur with these findings and recommendations, and provided that the Inadvertent Discovery Plan is implemented and Tribal consultation continues as appropriate, In Situ recommends a determination of *No Further Archaeological Work* for the Project.

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INTRODUCTION

Kimley-Horn commissioned In Situ Archaeological Consulting, LLC (In Situ) to provide archaeological services in support of Project Loon—Hermantown (Project). This report presents the results of the intensive Phase I archaeological investigation conducted by In Situ for the Project.

The Project consists of the development of an approximate 283.2-acre area. Within the 283.2-acre Project area that may be subject to development, approximately 75.3 acres were subject to targeted Phase I archaeological survey for the Project. Currently, the Project is not subject to federal cultural resources review, as no federal funding, permits, or approvals are anticipated and therefore no federal nexus exists. However, this Phase I archaeological report is being prepared in support of an Alternative Urban Areawide Review (AUAR), which is a state-level environmental review conducted under Minnesota rules to evaluate potential impacts of future development scenarios.

The Project is located in Section 31 of Township (T) 50 North (N), Range (R) 15 West (W) in St. Louis County, Minnesota (Figure 1). The Project area is located on privately owned land within 26 parcels in the southwest corner of the city limits of Hermantown, Minnesota. The Project is located west of Midway Road and south of Morris Thomas Road West, within an area consisting of short, manicured grasses, mixed grasses, wooded areas, wetland areas, and rural infrastructure (roads, utilities, etc.) (Figure 2).

The Phase I archaeological survey included a background literature review within and surrounding the Project area along with a preliminary archaeological reconnaissance of the Project area, and a targeted Phase I archaeological survey for the proposed Project. The literature review was conducted on November 1, 2024, June 19, 2025, September 17, 2025, and September 30, 2025, and a preliminary archaeological reconnaissance was conducted on November 4, 2024 (In Situ 2025). The Phase I archaeological survey was conducted on the following dates:

- | | | | |
|-----------------|-------------------|----------------------|----------------------|
| • July 24, 2025 | • August 1, 2025 | • August 12, 2025 | • September 24, 2025 |
| • July 25, 2025 | • August 5, 2025 | • August 13, 2025 | • September 25, 2025 |
| • July 28, 2025 | • August 6, 2025 | • August 14, 2025 | |
| • July 29, 2025 | • August 7, 2025 | • August 15, 2025 | |
| • July 30, 2025 | • August 8, 2025 | • September 22, 2025 | |
| • July 31, 2025 | • August 11, 2025 | • September 23, 2025 | |

During the field survey, a total of 75.3 acres of the 283.2-acre Project area were subject to targeted Phase I archaeological survey for the Project. The archaeological survey was conducted under the direction of an In Situ Principal Investigator who meets the Secretary of the Interior's Professional Qualification Standards for Archaeology. Fieldwork was completed by the field crew consisting of archaeologists from In Situ. The targeted survey of the Project area was coordinated with the Cultural Resources Project Manager and the Tribal Historic Preservation Officer from the Fond du Lac Band of Lake Superior Chippewa. Additionally, when available, Cultural Monitors from the Fond du Lac Band of Lake Superior Chippewa were present during the targeted field survey of the Project area. Following the completion of the targeted survey, the results were shared and discussed with the Cultural Resources Project Manager and the Tribal Historic Preservation Officer from the Fond du Lac Band of Lake Superior Chippewa. Literature review data and report figures were compiled and completed by In Situ staff. All field notes and photographs are maintained on file at In Situ's office located in Eden Prairie, Minnesota.

Detailed site location information, including legal descriptions, coordinates, and contextual information from archaeological resources, has been redacted from this public version of the report in accordance with applicable cultural resource protection laws in order to protect archaeological resources. General site descriptions and environmental context are retained. In addition, the names and other identifying information of individuals involved in the Project have been redacted from the public version of the report to protect personal privacy and to reduce the risk of unauthorized access to sensitive cultural resource information. Full Project documentation, including professional qualifications, field staff, and authorship, is on file with the appropriate reviewing agencies.

ENVIRONMENTAL AND GEOMORPHOLOGICAL CONTEXT

At the time of survey, the topography of the Project area consisted of fairly flat to sloping terrain. Vegetation consisted of mixed grasses, forest vegetation, and wetland vegetation. Impacts include natural erosion and residential development (house, outbuildings, driveways and trails, buried utilities, etc.).

ECOLOGICAL SETTING

The Project area is located within the Northern Lakes and Forests (50) Level III ecoregion, and more specifically, the Toimi Drumlins (50p) Level IV ecoregion. The Toimi Drumlins region is defined as an “drumlins covered with forest, interspersed with wetland depressions” (U.S. Environmental Protection Agency 2007).

Prehistoric and historic vegetation within the region known as the Boreal Hardwood-Conifer Forest within the North Shore Highlands subsection consisted of aspen-birch forest, white pine-red pine forest, mixed hardwood-pine forest, and conifer bogs and swamps. Currently forest management and recreation are the primary land uses within the region (Minnesota Department of Natural Resources 1988; 2025)

Hundreds of wildlife species are resident or seasonal visitors to the region along with hundreds of native fish species which live in the surrounding rivers and tributaries. Some of the fauna that would have been common and available for historic and prehistoric human use in the Minnesota region include white-tail deer, black bear, elk, opossum, raccoon, cottontail rabbit, squirrel, gray fox, bobcat, mountain lion, wolf, mink, otter, beaver, muskrat, and woodchuck (Gibbon 2012).

CLIMATE

The climate of Minnesota is a continental-type climate that is marked by seasonal variations. The average annual temperatures in Minnesota range from 36 degrees Fahrenheit (°F) in the extreme north to 49°F in the southeastern corner. The average winter temperature is 17 °F and the average summer temperature is 70°F (National Climatic Data Center 2017). St. Louis County has a continental climate with warm summers and cold winters (Minnesota Department of Natural Resources 2025).

PHYSIOGRAPHY AND HYDROLOGY

The physiography of the Project area is located within the Brainerd-Automba Drumlin Area. This area is characterized by marked drumlin fields including the Pierz, the Brainerd, and the Mille Lacs Lake areas. The entire region is interrupted by outwash plains in some places, the largest being the Mississippi River valley train, which enlarges into a complex of pitted plains north of Brainerd (Wright 1972). The highest elevation in the area is about 2,301 ft. above sea level (Minnesota Department of Natural Resources 2025).

The major drainages in the surrounding region are the Mississippi River to the west, Lake Superior to the east, and water draining to the north eventually goes into Hudson Bay. There are several lakes and unnamed draws and creeks throughout the area (Minnesota Department of Natural Resources 2025). The proposed Project area has several wetlands within it. The nearest named

waterbody is the Midway River which is located approximately 0.14 miles east of the Project area, there is also an unnamed perennial stream located approximately 0.1 miles west of the Project area.

GEOLOGY

The geology of the Project area is characterized by the Duluth Complex; Troctolitic and gabbroic cumulate rocks, dating to the Middle Proterozoic. The Duluth Complex; Troctolitic and gabbroic cumulate rocks is made up of troctolitic and gabbroic cumulate rocks and “Constitute at least nine named and several unnamed intrusions” (Morey and Meints 2000).

SOILS

Ten specific soil series are present in the Project area, with the most prevalent soil series consisting of Normanna-Canosia-Hermantown complex (F137B) (Natural Resources Conservation Service 2025; UC Davis 2025). Much of the Project is located in an upland setting with minimal to no potential soil depositional processes present, while other portions are located within low-lying areas with marshland present, which may be subject to frequent flooding. Within upland areas, and/or areas with minimal to no deposition, archaeological material, ranging from as early as the Paleoindian Period to present, are typically located at the ground surface or are shallowly buried (Hudak et al. 2002; Johnson 1993; Michlovic 2025; Running 1995). The soil profiles for the soil series within the Project area revealed that there are no buried soils (UC Davis 2025). Table 1 summarizes the soils within the Project area.

Table 1: Summary of Soil Series within the Project Area.

Soil Series	Parent Material	Drainage	Slope	Landform	Extent of Area	Buried Soils
F33A: Cathro muck, depressional, dense substratum	Organic material over dense loamy till	Very poorly drained	0-1%	Swamps on interdrumlins, swamps on moraines	3.5%	N
F111B: Augustana-Hegberg complex	Loamy and/or silty material over friable loamy till over dense loamy till	Augustana: Moderately well drained Hedberg: Somewhat poorly drained	Augustana: 3-8% Hedberg: 1-3%	Moraines	0.1%	N

Table 1: Summary of Soil Series within the Project Area.

Soil Series	Parent Material	Drainage	Slope	Landform	Extent of Area	Buried Soils
F135A: Hermantown- Canosia- Giese, depressional, complex	Loamy material over dense loamy till	Hermantown: Somewhat poorly drained Canosia: Poorly drained Giese, depressional: Very poorly drained	Hermantown: 1-3% Canosia: 0- 2% Giese, depressional: 0-1%	Hermantown: Flats on moraines, rises on moraines Canosia: Depressions on moraines, flats on moraines Giese, depressional: Depressions on moraines	19.6%	N
F136A: Hermantown silt loam	Loamy material over dense loamy till	Somewhat poorly drained	1-3%	Flats on moraines, rises on moraines	1.8%	N
F137B: Normanna- Canosia- Hermantown complex	Loamy material over dense loamy till	Normanna: Moderately well drained Canosia: Poorly drained Hermantown: Somewhat poorly drained	Normanna: 3-8% Canosia: 0- 2% Hermantown: 1-3%	Normanna: Moraines Canosia: Depressions on moraines, flats on moraines Hermantown: Flats on moraines, rises on moraines	46.0%	N
F138D: Ahmeek- Normanna- Canosia complex	Coarse-loamy ablation till over dense coarse-loamy lodgment till	Ahmeek: Well drained Normanna: Moderately well drained Canosia: Poorly drained	Ahmeek: 8- 18% Normanna: 3-8% Canosia: 0- 2%	Moraines	9.2%	N
F142A: Canosia loam	Loamy till over dense loamy till	Poorly drained	0-2%	Flats on moraines	1.1%	N
F143B: Normanna- Aldenlake- Canosia complex	Normanna and Canosia: Loamy material over dense loamy till Aldenlake: Loamy material over gravelly outwash	Normanna: Moderately well drained Aldenlake: Well drained Canosia: Poorly drained	Normanna: 3-8% Aldenlake: 0- 8% Canosia: 0- 2%	Moraines	3.1%	N

Table 1: Summary of Soil Series within the Project Area.

Soil Series	Parent Material	Drainage	Slope	Landform	Extent of Area	Buried Soils
F144D: Aldenlake-Ahmeek complex	Aldenlake: Loamy material over gravelly outwash Ahmeek: Loamy material over dense loamy till	Well drained	8-18%	Moraines	10.5%	N
F151A: Tacoosh mucky peat, dense substratum	Organic material over loamy material over dense loamy till	Very poorly drained	0-1%	Swamps on interdrumlins, swamps on moraines	5.1%	N

CULTURAL CONTEXT

The purpose of a Phase I survey is to identify and locate cultural resources within and near the proposed undertaking and assess if the undertaking will have any potential impact on significant cultural resources. A component of this is to complete a cultural context in relation to the Project area and surrounding region. For the purposes of a Phase I survey, the following narrative presents a regionalized, condensed, and generalized pre-contact, contact, and post-contact cultural overviews based on multiple resources specific to Minnesota and the region to provide a context of potential archaeological and cultural resources that may be encountered within the Project area.

MINNESOTA ARCHAEOLOGICAL REGION

The Project location is situated in St. Louis County, Minnesota and within Archaeological Region 5 – Central Lakes Coniferous (Anfinson 1990; Gibbon 2012; Gibbon et al. 2002; Hobbs 2019). The Central Lakes Coniferous region contains portions of Aitkin, Beltrami, Carlton, Cass, Clearwater, Crow Wing, Hubbard, Itasca, Kanabec, Koochiching, Lake, and St. Louis counties. The topography of the Central Lakes Coniferous region consists of hilly terminal moraines through the center of the region with a variety of less rugged terrain of glacial origin covering the remaining areas of the region (i.e., ground moraines, outwash plains, and lake plains). The Mississippi River traverses much of the region, flowing through or near several large lakes as it comes closer to its source in Clearwater County. The route of the Mississippi River has changed significantly over the last 12,000 years. By the Woodland Period (1,000 BC-AD 1750), it followed what is essentially its modern-day path. The western area of the region drains into the Red River of the North, the northeast area of the region drains into Lake Superior, and the rivers in the southeast area of the region drain into the St. Croix River. The lakes within the Central Lakes Coniferous region are quite deep and are densely distributed throughout the region, however one area, the Glacial Lakes Upham-Aitkin plain, lacks this dense distribution of lakes (Anfinson 1990; Gibbon 2012; Gibbon et al. 2002; Hobbs 2019).

During the contact period (1630-1837), the Central Lakes Coniferous region was dominated by pine forests consisting of white pine, jack pine, and red pine with significant inclusions of elm, maple, basswood, ash, oak, aspen, and birch. In the southeast area of the region, peat bog vegetation is the dominant vegetation. Wild rice was a very important floral resource in the region. The major faunal resources within this region were deer, beaver, moose, and black bear. Waterfowl was seasonally available within the lakes and rivers (Anfinson 1990; Gibbon 2012; Gibbon et al. 2002; Hobbs 2019).

PRE-CONTACT (PRE-AD 1630)

Paleoindian Period (11,500–7,500 BC)

The Paleoindian Period in North America dates between approximately 11,500–7,500 BC. This is the period in which the first human populations came to North America and the last retreat of the Wisconsin glacial period. The defining characteristics of the Paleoindians were:

- the extensive use of exotic cherts,
- specialized lithic technologies,
- small and extremely mobile societies, and

- the primary subsistence on large game mammals (J. Morrow 1996; Schermer et al. 1995).

During this period, the environment in Minnesota continually changed from an “open boreal coniferous forest dominated by grasses and scattered conifer trees” (Gibbon 2012:38) to open prairie in the southwest, deciduous forest in center-southeast, and coniferous forest in the north.

Early Paleoindian Period (11,500 – 10,500 BC)

The main characteristics that distinguish the Early Paleoindian Period from the Late Paleoindian Period are the use of fluted lanceolate points and subsistence on large-extinct animals including mammoths, mastodons, and giant bison varieties (Gibbon 2012; J. Morrow 1996; Schermer et al. 1995). As of 2012, only about seventy-three points, and possibly a scraper and drill have been identified within Minnesota (Gibbon 2012).

The lithic technology of the Early Paleoindian Period is characterized by fluted lanceolate points. The fluted styles found in Minnesota include Clovis, Gainey, Folsom, and Holcombe Points (T. Morrow 2016). Fluting is the removal of a flake from the base of the projectile. The earliest known point type in North America is the Clovis, which dates in Minnesota from circa 9,350 to 8,650 BC (T. Morrow 2016). Clovis points are broad, thin, well-made lanceolate points with concave bases and basal flutes that extend one-half to one-fifth the length of the point. Folsom is the second oldest recorded lithic technology and overlaps with Clovis, dating in Minnesota from circa 8,800 to 8,200 BC (J. Morrow 1996; T. Morrow 2016; Schermer et al. 1995). Folsom are “thin, finely made, medium sized lanceolate points with a flattened to bi-concave cross section, parallel to convex sides, and broad flutes that cover at least 60 percent of each face” (T. Morrow 2016:128). Gainey points are fluted points that have a “lanceolate outline, deep and rounded basal concavities, and well-defined primary flutes” (T. Morrow 2016:124). Holcombe points are “small, thin lanceolate points with shallow concavities with broadly convex sides and high midpoint above the center” (T. Morrow 2016:132).

Late Paleoindian Period (10,500–7,500 BC)

The Late Paleoindian Period is characterized by the disappearance of fluted lanceolate styles and replaced with non-fluted lanceolate point types. Stemmed points, some heavy stone tools, and the use of Hixton quartzite from western Wisconsin are also characteristics of the Late Paleoindian period in Minnesota (Gibbon 2012). The majority of Late Paleoindian artifacts have been found as surface finds in plowed fields, which have been removed from their original context. This makes any inferences between the associations between the artifacts of this period difficult. The point types found in Minnesota from this period are Agate Basin, Alberta, Angostura, Browns Valley, Eden, Frederick, Hell Gap, Midland, Plainview, and Scottsbluff. These artifacts tend to be well made with high-quality craftsmanship (Gibbon 2012; T. Morrow 2016).

Archaic Period (10,500–500 BC)

The Archaic Period within Minnesota dates between 10,500–500 BC. Within Minnesota, the Early Archaic Period coexisted with the Late Paleoindian Period with little definable timeframe. The Archaic Period in Minnesota is characterized by the:

- expansion of a subsistence strategy that relied on a variety of modern game fauna (deer, moose, bison, rabbits, beavers, birds, and fish) and wild flora resources,
- absence of pottery manufacturing,

- appearance of a variety of notched and stemmed projectile points,
- emergence of pecked and groundstone tools, and
- appearance of native copper artifacts, and some exotic materials such as marine shell (Florin et al. 2016; Gibbon 2012; Stoltman 1997).

During this period, the climate was continuously changing toward a warm and dry climate, a change known as the Altithermal. The dry and hot weather continued for approximately 1,000 years before changing to a cooler, wetter climate that led to a more modern ecology by 3,000 BC (Florin et al. 2016). Deciduous forests dominated the southern area of Minnesota while pine forests replaced the boreal spruce forests in the north. By 8,000 BC, the tallgrass prairie had spread from west to east across the state, pushing the forests east and then receding back to its present position (Gibbon 2012).

Early Archaic Period (10,500–5,500 BC)

Within Minnesota, the Early Archaic Period is separated between the Early Plains Archaic and Early Eastern Archaic, which were contemporaneous with the Late Paleoindian Period. The Eastern Archaic describes the Archaic complexes that derived from the eastern forests and the Plains Archaic describes the Archaic Complexes that derived from the western plains. The main differences between the Early Eastern Archaic and the Early Plains Archaic are that the Eastern Archaic started earlier than the Plains Archaic and differed in foraging and hunting practices. The Early Archaic was a transitional period for cultures, less reliance upon large game mammals to more reliance upon foraging subsistence (T. Morrow 1996; Schermer et al. 1995).

The Early Eastern Archaic points are notched or stemmed styles such as Dalton, Hi-Lo, Quad, Thebes, St. Charles, Graham Cave Side Notched, and Kirk Corners Notched points. The most common diagnostic point from the Early Plains Archaic is Simonsen points (Florin et al. 2016; Gibbon 2012). These points are often associated with sparse scatters of non-diagnostic artifacts like scrapers, blades, and point blanks. As with the Paleoindian Period, it is likely that organic artifacts like wooden artifacts, cords/textiles, and bone tools have not lasted to modern times (Florin et al. 2016; Gibbon 2012).

Middle Archaic Period (7,500–3,000 BC)

The Middle Archaic Period dates approximately between 7,500–3,000 BC. The driest and warmest post-glacial period, the Altithermal, occurred during this period. Due to large climatic changes during this period, many sites may have either been buried or eroded away. The lithic technology of the Middle Archaic is characterized by a wide range of medium sized stemmed and notched projectile point types. The projectile points of the Middle Archaic tend to be smaller and poorly made compared to Early Archaic Period and Late Paleoindian Period points. This may have been due to an emphasis on using and possibly heat-treating poor quality local lithic resource material rather than using higher quality, exotic lithic materials (Florin et al. 2016; Gibbon et al. 2002; Picka 2012).

Middle Archaic points are smaller than Paleoindian points, with side notches and beveled, re-sharpened edges. These edges seem to be used for both penetration and cutting. Also, the points were used as projectile points for atlatl darts, which first appeared during the Archaic Period. The

site types from this period in Minnesota include base camps, short-term camps, kill sites, lithic scatters, burials, quarries, and workshops (Gibbon 2012).

The points of the Middle Archaic are divided into two broad categories, the Plains and the Eastern Woodlands. Projectile point types found in the Eastern Woodlands include LeCroy Bifurcated Stemmed, Fox Valley Truncated Barb, Osceola, Raddatz Side Notched, Eva I, Morrow Mountain I and II, Matanzas Side Notched, Etley, Benton Stemmed, and Elk River Stemmed. The point types found in the Plains are Simonsen, Graham Cave Side Notched, Oxbow, McKean, and Table Rock Stemmed. During this period, ground stone tool technology appears such as grooved stone axes, boatstones, bannerstones, and gorgets (Florin et al. 2016, Gibbon 2012; T. Morrow 1996; Schermer et al. 1995).

Late Archaic Period (3,000–500 BC)

The Late Archaic Period in Minnesota, dating between 3,000–500 BC, is characterized by the appearance of different sets of diagnostic points styles; presence of exotic, raw materials (e.g., native copper and marine shell); appearance of “unusual” artifacts including birdstones, gorgets, and Turkey Tail bifaces; presence of communal burial sites; lack of ceramics; and an increasingly modern Late Holocene environment (Gibbon 2012:78).

During the Late Archaic, intergroup interactions increased due to an increase in population growth. This increase in population and group interactions created similar subsistence strategies over large areas, which in turn increased each group’s territory size, and increased the number of local, distinctive artifact styles. Trade networks were also developed and established between different communities. The Altithermal ended during this period, causing increased resource stability in areas that were previously uninhabitable by humans. A more sedentary lifeway was practiced, as evident with the construction of large communal cemeteries, increases in wild rice harvesting, and the use of gardens that included sunflower, amaranth, and squash (Gibbon 2012; Schermer et al. 1995).

The point types from the Late Archaic are divided into five regional areas: Upper Mississippi River Valley, Northeast, Central Mississippi River Valley, Northern Plains, and Southeast. The Upper Mississippi River Valley consists of the Large Side Notched Cluster (Godar, Madison Side Notched, Osceola, and Raddatz Side Notched), Durst Cluster (Durst Stemmed) Late Archaic Stemmed Cluster (Karnak Stemmed), Turkey Tail Cluster (Turkey Tail), Terminal Archaic Barbed Cluster (Delhi and Buck Creek Barbed), Early Woodland Straight Stemmed Cluster (Fox Valley Stemmed, Kramer, Robbins), and Motley Expanding Stem Cluster (Motley, Atalissa, and Tipton). The Northeast consists of the Matanza Cluster (Matanzas Side Notched and Brewerton Eared Notched). The Central Mississippi River Valley consists of the Table Rock Cluster (Table Rock Stemmed) Etley Cluster (Etley), Nebo Hill Cluster (Nebo Hill Lanceolate, and Sedalia Lanceolate), and Wadlow Cluster (Wadlow). The Northern Plains consists of the McKean Cluster (McKean, Duncan, and Hanna), and the Oxbow Cluster (Oxbow). The Southeast consists of the Eva Cluster (Eva II), Benton Cluster (Benton Stemmed and Elk River Stemmed), Ledbetter Cluster (Ledbetter stemmed), and Dickson Contracting Stemmed Cluster (Gary and Little Bear Creek) (Gibbon 2012; T. Morrow 2016).

Woodland Period (1,000 BC–AD 1750)

The timeframe for the Woodland Period in Minnesota varies. In southeastern Minnesota, this period dates to between 500 BC–AD 1650. In central and northern Minnesota, the Woodland Period dates to between 1,000 BC–AD 1750. During this period, the environment stabilized and allowed for the development of greater regional variations (Gibbon 2012).

The two main characteristics of the Woodland Period in Minnesota are the appearances of pottery and earthen burial mounds (Johnson 1988). The appearance of these two cultural developments may suggest an increase in social complexity. Hunting and gathering continues within the Woodland Period with the “intensification of food resource activities initiated in the Late Archaic period” (Gibbon 2012:93). However, there is an increasing reliance on domesticated plants and wild rice, which indicates an increase in population growth and sedentism (Johnson 1988; Radford et al. 2015).

Initial Woodland Period in Central and Northern Minnesota (1,000 BC–AD 500)

The Initial Woodland Period in central and northern Minnesota dates between 1,000 BC–AD 500. This period is defined by the appearance of the first ceramic vessels. The earliest ceramics and burial mounds found in central and northern Minnesota are usually connected with either the Brainerd or the Laurel complexes. These complexes are described below.

Brainerd Complex

The Brainerd Complex is identified by Brainerd ceramics, which have net impressions or horizontal cord marking as exterior surface treatment. Brainerd ceramics have been found from north-central Minnesota, up to Lake Winnipeg and west into Montana. This complex could have indicated the earliest ceramics in central and northern Minnesota. Brainerd ceramics have open orifices, vertical rims, with conical or subconical bases, flat lips, and tempered with sand or grit. The dating for Brainerd ceramics has been a complicated matter, with the radiocarbon dating between 1,430 BC to AD 535. However, these radiocarbon dates could have been contaminated with “old carbon” from the regional water and even the clay used to make the ceramics. The lithics typically associated with the Brainerd Complex are Oxbow, Besant, Duncan/Hanna, McKean, and Pelican Lake points. Bone or antler tools have not been found in association with the Brainerd Complex. Also, hammerstone, utilized flakes, cores, small pieces of copper, and scrapers have been found with Brainerd ceramics (Arzigian 2008; Gibbon 2012).

Laurel Complex

The Laurel Complex is one of the most geographically extensive archaeological complexes in the Initial Woodland Period. It extends from western Quebec, northwestern Michigan, northwestern Wisconsin, and northern Ontario across northern Minnesota into southeastern and west-central Manitoba and east-central Saskatchewan. Laurel Complex roughly dates between 50 BC to AD 650/1000. Laurel ceramics are characterized by “the presence of relatively thick (average 6 mm, with a range of 3 to 8 mm), grit-tempered jars with conical bases, straight rims, slight to no neck constriction, smooth surfaces and stamped-tool decoration on the exterior rim, neck, and occasionally upper shoulder” (Gibbon 2012:123). Laurel ceramics are decorated with a variety of decorations including dentate stamping, incising, push-pull bands, pseudo-scallop shell stamps, bosses, and punctates. The complex is an adaptation to the northern forests and a hunting-gathering

lifeway that is focused on fish, moose, and beaver. There is also evidence of the diverse use of small and large game in the lake/forest region with bison on the prairie margin (Arzigian 2008).

The lithics typically associated with the Laurel Complex include end scrapers, large side-notched points, large corner-notched points, small side-notched points, and small-eared points and a wide range of knives, scrapers, and other chipped stone tools. There is a noticeable absence of ground stone tools in this region and period. Tools made from bone, antler, and teeth include conical bone projectile points, antler harpoons, cut beaver incisors, awls, bird-bone, tools, and ornaments from animal teeth and bone. Copper tools also appear with the Laurel Complex (Arzigian 2008; Gibbon 2012).

Terminal Woodland Period in Central and Northern Minnesota (AD 500–1750)

The Terminal Woodland Period in central and northern Minnesota dates from AD 500–1750. This period is characterized by major changes in ceramic and lithic technologies along with a major increase in the human population that had a gradually greater dependence on domesticated plants and a more sedentary lifeway. During this period, the harvesting of wild rice becomes widespread and intensive as a seasonal plant food in central and northern Minnesota (Gibbon 2012; Johnson 1988).

Early Terminal Woodland Period (AD 500–800)

The Early Terminal Woodland Period of northern and central Minnesota dates between AD 500–800. The Laurel Complex continued unchanged in northern Minnesota throughout the period. However, in central Minnesota, the St. Croix Complex appeared “from the northwestern corner of Wisconsin across eastern and central Minnesota into the Red River valley and on into adjacent areas of the Dakotas” (Gibbon 2012:181). This complex indicated a transition between Initial Woodland/Terminal Woodland. Currently, the St. Croix Complex’s most diagnostic traits are Onamia series ceramics and linear mounds (Arzigian 2008; Gibbon 2012).

Interestingly, mortuary traits found during this period consisted of linear and circular mounds, deep subsoil burial pits, flexed and disarticulated primary burials, bundled secondary burials frequent use of yellow and red ocher, associated utilitarian and ornamental grave goods dominated by bone and antler artifacts, Prairie Side Notched, and Broad side-notched projectile points, blade side scrapers made from Knife River Flint, and small mortuary vessels of St. Croix Stamped and Blackduck ceramic vessels (Arzigian 2008; Gibbon 2012).

Similar to the Early Terminal Woodland Period in southeastern Minnesota, the Early Terminal Woodland Period in central Minnesota is characterized by an increase of Native American populations, increase in the size and number of habitation sites, a trend to more sedentary lifeway, burial mounds become more abundant and widespread, small unnotched triangular arrow points replaced notched, stemmed dart points styles, ceramic vessels become thinner and more globular, and a dependence on a single plant food, which is wild rice in this region (Gibbon 2012).

Middle Terminal Woodland Period (AD 800–1300)

The Middle Terminal Woodland Period of northern and central Minnesota dates between AD 800–1300. The cultural complexes during this period have similar material culture and a subsistence-base that may have been heavily dependent on harvesting wild rice. The main cultural sequential

complex that occurs during this period is called by Gibbon (2012) the Blackduck-Kathio-Clam River Continuum. This describes the three spatially adjacent complexes that share many stylistic attributes. These complexes are the Blackduck complex, Kathio Complex, and the Clam River Complex. The Blackduck complex is found in the northern forests and prairie fringes of Minnesota near Headwaters and Rainy River region. The Kathio Complex is found along the southern boundary of the northwoods in east-central and central Minnesota. The Clam River Complex is found in the north woods of northwestern Wisconsin and the adjacent area of Minnesota (Arzigian 2008; Gibbon 2012).

The main differences between these ceramic complexes are the decorative motifs of the ceramics, where they are found, and perhaps a difference in subsistence emphasis. These ceramics are grit-tempered, cordmarked globular ceramic vessels with constricted necks, short outward flaring rims, and flat lips. The decoration on these ceramics tends to be confined to the upper area of the vessels including the interior rim, lip, and the exterior surface of the upper rim and neck. The techniques used to decorate these vessels include cordwrapped-stick stamping, comb stamping, various kinds of punctuations, and vertical brushing. The lithics that are typically associated with this period are Prairie Side-Notched, Plains Side-Notched, and unnotched and notched triangular points (Arzigian 2008; Gibbon 2012).

Late Terminal Woodland Period (AD 1300–1750)

The Late Terminal Woodland Period of northern and central Minnesota dates to between AD 1300–1750. The period extends into the historic period of Minnesota. The most important event in this period may be the abrupt appearance and gradual spread of the Psinomani Complex. Other important events include the reduction of Blackduck ceramics diffusing to the north, the spread of Oneota and Plains Village ceramic traits through central Minnesota, and the adoption of a truly Terminal Woodland lifeway (Gibbon 2012).

Psinomani Complex

The Psinomani Complex is characterized by the presence of Sandy Lake ceramics. Sandy Lake ceramics have a shell or mixed shell and grit temper. The surface treatment of the vessel exterior includes cordmarked, smooth, or stamped with grooved paddles. The decoration on Sandy Lake ceramics is rarely found. Ogechie ceramics, which are a northern Oneota ware, are present in small amounts in many Psinomani components. This complex may indicate interactions between neighboring peoples including Oneota farming communities to the south and east, and Plains Village peoples to the west. Site types found for this complex include semisedentary villages, wild rice harvesting, fish stations, and hunting and gathering sites. The mortuary practices of the Psinomani peoples include burying their dead in non-mound and mound contexts including intrusive burials, and both primary flexed and primary disarticulated burials. Currently, it is difficult to describe the lithic assemblage of the Psinomani Complex since few sites have been found. What has been found are small triangular points similar to other Terminal Woodland and Oneota occupations (Arzigian 2008; Gibbon 2012).

Historically Documented Native American Tribes

Disclaimer: The following discussion is written from a Euro-American perspective and may reflect inherent cultural and historical biases. Please note that the list of Native American tribes presented in this archaeological report is likely incomplete and may not represent the full diversity of peoples

who inhabited what is now southern Minnesota prior to the Contact Period (Post-AD 1630). The individual tribes mentioned in this section are those for whom the most substantial documentation exists following initial contact with Europeans or individuals of European descent.

Dakota

“Dakota” is a self-designated name meaning “ally.” The Dakota consists of 13 subdivisions of Siouan-speaking people (Dakota-Lakota-Nakota) that were all part of the *Oceti Sakowin*, or Seven Council Fires. This council of political divisions included the Mdewakanton, Wahpekute, Sisseton, Wahpeton, Yankton, Yanktonai, and Teton tribes. The Dakota originally lived in Wisconsin and north-central Minnesota before the Contact Period, however, they migrated to reside in the prairies and eastern plains of Minnesota, Iowa, Nebraska, and eastern South Dakota by the nineteenth century. The Dakota’s first contact with Europeans was with French traders and Jesuit missionaries in the 1650s. The Dakota were originally a migrational people relying on a hunting and gathering subsistence strategy. They hunted bison, deer, and waterfowl and fished using spears and nets. They also foraged for wild flora resources including fruit, acorns, nuts, wild rice, and maple sap. During the 19th century, the Dakota practiced horticulture but planted at irregular intervals. They planted corn, squash, beans, and tobacco. Their crop yields were small and would only last a few weeks (DeMallie 20001; Malinowski et al. 1998; Pritzker 2000). When the Dakota occupied the Wisconsin-Minnesota area, they formed small (occasionally palisaded) villages near lakes and rice swamps, living in large heavily timbered bark houses with pitched roofs. During winter, some groups would live in conical houses covered in skins, and the Sisseton group sometimes used tipis after moving to the prairies (Pritzker 2000).

The descendants of the Dakota people have continued to maintain tribal identity throughout the northern Great Plains. Modern Dakota-Lakota-Nakota communities include: the Fort Peck Reservation in Roosevelt, Sheridan, Valley Counties, Montana; the Devils Lake (formerly Fort Totten) Reservation in Benson, Eddy, Nelson, and Ramsey Counties, North Dakota; the Lake Traverse Reservation in Richland and Sargent counties, North Dakota and Cadington, Day, Grant, Marshall, and Roberts Counties, South Dakota; the Santee Sioux Reservation in Knox County, Nebraska; the Flandreau Santee Sioux Reservation in Mood County, South Dakota; the Lower Sioux Community, Redwood County, Minnesota; the Prairie Island Community, Goodhue County, Minnesota; the Upper Sioux Community in Yellow Medicine County, Minnesota; the Shakopee Mdewakanton Sioux Community in Scott County, Minnesota; and several communities in Saskatchewan, Canada (Pritzker 2000).

Ojibwe (Chippewa/Anishinaabe)

The Ojibwe, also known as the Chippewa, are an Algonquian-speaking people that inhabited areas north of Lake Huron and northeast Lake Superior in the early seventeenth century and moved to the Great Lakes and Hudson Bay area in the eighteenth century, with some groups stretching westward to the Missouri River. By the early nineteenth century, the Ojibwe had split into four general subareas. There were small groups of Ojibwe north and west of the Great Lakes who lived a hunter-fisher-gatherer lifestyle, a group of Plains Ojibwe (sometimes known as Bungi) who lived around southern Saskatchewan/Manitoba and North Dakota/Montana that lived a Great Plains lifestyle, a group of southeastern Ojibwe (sometimes known as the Mississauga) who lived in Michigan and Ontario who hunted, fished, gathered, and gardened, and finally a southwestern Ojibwe group that lived in northern Wisconsin and Minnesota, who heavily relied on wild rice as

well as hunting, fishing, gathering, and gardening (Pritzker 2000). The tribe's native and self-designated name is Anishinaabe, which means "first people" (Waldman 2006). The Ojibwe first had contact with Europeans when Frenchman Etienne Brul  explored the area in 1622. In the 17th century, the Ojibwe became heavily involved with the French fur trade, becoming allies with the French (Pritzker 2000).

The Ojibwe were primarily sedentary people, living villages of domed, conical, or elliptical wigwams made of a pole frame covered in cattail mats or birch bark with a smoke hole in the center. The larger, elliptical wigwams housed several families whereas the smaller, domed or conical wigwams were typically for one family (Pritzker 2000). Wigwams are often built on a slope with ditches dug away from them to drain rainwater. The Ojibwe have also been known to live in tipis at times (Malinowski et al. 1998). In the south, Ojibwe women planted gardens consisting of corn, squash, beans, and pumpkins, and also gathered berries, nuts, fruits and maple sap for sugar. Mainly in the winter, men hunted and trapped both large and small game as well as birds and fowl. Fishing took place year-round, and shellfish was eaten where available. Wild rice was a staple for the southern Ojibwe groups and would be gathered by knocking the grass stems with a stick, however, the northern Ojibwe groups did not have access to wild rice or maple sap (Pritzker 2000). The typical game animals the Ojibwe hunted were deer, moose, bear, beaver, lynx, mink, marten, otter, rabbit, and caribou (Malinowski et al. 1998).

There are numerous Ojibwe-owned reservations in Michigan, Minnesota, Wisconsin, Montana, and North Dakota. Federally recognized tribal entities in Michigan include: The Bay Mills Indian community, Grand Traverse Band of Ottawa and Chippewa, Keweenaw Bay Indian Community of L'Anse of Chippewa Indians, Keweenaw Bay Indian Community of Lac Vieux Desert of Chippewa Indians, Keweenaw Bay Indian Community of Ontonagon Bands of Chippewa, Sault Ste. Marie Band of Chippewa Indians, and Saginaw Chippewa Indian Tribe. In Minnesota, federally recognized tribal entities include: the Minnesota Chippewa Tribe (which includes the Bois Forte [Nett Lake] Band, Fond du Lac Band, Grand Portage Band, Leech Lake Band, Mille Lacs Band, and White Earth Band) and the Red Lake Band of Chippewa. Federally recognized tribal entities in Wisconsin include: the Lake Superior Tribe of Chippewa (which includes the Bad River Band, Lac Courte Oreilles Band, Lac du Flambeau Band, and Red Cliff Band), the St. Croix Chippewa Indians, and the Sokaogon Band of Chippewa Community of the Mole Lake Band of Chippewa Indians. The federally recognized tribal entity in Montana is the Chippewa-Cree Indians of Rocky Boy Reservation, and the Turtle Mountain Band of Chippewa Indians is federally recognized in North Dakota (Pritzker 2000).

POST-CONTACT (POST-AD 1630)

Contact Period (AD 1630–1837)

Disclaimer: The following discussion is written with a lens of Euro-American bias. Before the native population made contact with early French Explorers, European trade goods started to appear within Minnesota. Glass beads, iron knives, brass kettles, finger rings, and gun parts appear within the archaeological record, which were from early French traders. The local native tribes were also indirectly affected by Europeans by the spread of foreign disease, which decimated their populations. At one point or another, parts of Minnesota were claimed by the French, Spanish, British, and United States. Minnesota was first claimed by the French as part of New France (Blegen 1963; Folwell 1956).

The first recorded exploration in Minnesota was by French explorers Daniel Graysolon, Sieur du Lhut, Father Louis Hennepin, and Pierre Charles le Sueur. Sieur du Lhut was sent out from Quebec and Montreal to open trade with the Dakota in AD 1679, and for the next 11 years explored the triangle between the Mississippi and St. Croix rivers. Father Louis Hennepin along with Michel Accault, and Antonie Aguell were also sent out to explore in the Upper Mississippi River Valley circa AD 1679, where they discovered and named St. Anthony Falls. In 1731, Canadian-born French explorer Pierre Gaultier de Varennes, Sieur de La Verendrye set out to explore lands west of Lake Superior. In August of 1731, he sailed into Grand Portage and passed over the Canada-United States Border Lakes to establish a trading post at Lake of the Woods. At this post, trade could be conducted with the local tribes. At the conclusion of the Seven Years' War (French and Indian War), the 1763 Treaty of Paris gave all the land east of the Mississippi, which had been held by the Kingdom of France, to the Kingdom of Great Britain; this land would then be ceded to the United States of America in the 1783 Treaty of Paris after the conclusion of the Revolutionary War. In 1797, Pembina in North Dakota was established by Charles Baptiste Chaboillez of the Northwest Fur Company. Also, the Hudson Bay and American Fur Companies were positioned at Pembina as the fur trade increased and expanded. There were a few native tribes within the northwestern area of Minnesota including the Dakota and Ojibwe (Blegen 1963; Folwell 1956; Radford et al. 2015).

Post-Contact Period (Post–AD 1837)

Disclaimer: The following discussion is written with a lens of Euro-American bias. The area that currently includes all of Minnesota and western Wisconsin was considered “Indian Territory” and settlements were not allowed. Although the French, British, and Americans established trading posts in Minnesota, the first official white settlements were established after AD 1837. This was due to the signing of two treaties, one with the Ojibwe and one with the Dakota. The 1837 treaties had the Ojibwe and Dakota ceding all their lands east of the Mississippi, which included the Golden Triangle, the land between Mississippi and St. Croix Rivers. The treaties were ratified by Congress in AD 1838 and the land was open to American settlement. In 1849, Minnesota officially became a territory and on May 11, 1858, was admitted as a state into the United States. In 1862, Congress passed the Homestead Act which allowed up to 160 acres of land to be claimed provided that the person was head-of-household or person over 21 years of age, was a United States citizen or filed a declaration to become a citizen, and stayed on the land and worked the land for five years and pay any administration fees (Blegen 1963; Folwell 1956).

Railroad Development

In the mid-1800s, construction of railroads was started throughout the United States beginning with the first railroad built near Baltimore, Maryland in 1831 (Schwieder 2000). The railroad system in Minnesota began in 1862, with the construction of the St. Paul and Pacific, connecting St. Paul and St. Anthony. This resulted in the construction and expansions of major railway lines to the southwest and west, including the Chicago; St. Paul, Minneapolis and Omaha Railway; Chicago, Milwaukee & St. Paul Railway; and the Chicago & Northwestern Railway. The railroad helped to create the current settlement pattern and economic developments in Minnesota. They are an efficient, inexpensive way to transport goods and people. Also, for the first time, people could travel at any time of the year (Quivik and Martin 1988; Schwieder 2000).

St. Louis County

St. Louis County was organized in 1856, and Duluth is the county seat. The county was named after the St. Louis River which flows through the county. Before Europeans came to the area, the Ojibwa inhabited what is now St. Louis County. As early as the year 1640, French traders reached the area, and the French, English, and Euro-Americans explored this area from 1640 to 1820. The very first settlers were missionaries, including Reverend Edmund Ely, and Reverend Spencer who taught the local native people Euro-American agriculture, education, and religion in 1820. Europeans, for the most part, did not settle in the area until the La Point treaty was signed in 1854. The treaty ceded lands, which included the county, to the United States from the local Native Americans. The first post-treaty settlers came to St. Louis County to work in the lumber and mining industries and to farm the land. The city of Duluth was—and continues to be— an important hub for exports and imports. The first railroad in the county was the St. Paul and Duluth Railroad, which was completed in 1870. It stretched from St. Paul to Duluth and was essential for early industrial growth in St. Louis County. Lumbering has been one of the main industries in St. Louis County, as the land within the county contains hundreds of acres of forests. Lumber production peaked in 1905, and agriculture also became an important industry within St. Louis County. Farmland in St. Louis County is ideal for small grains, root vegetables, and grasses (Bryant 1881; Lake Vermilion 2017; St. Louis County 2017; Upham 1920; Woodbridge and Pardef 1910).

Iron mining was a very important industry in St. Louis County's history. In 1865, George Stuntz discovered iron ore near Lake Vermilion in St. Louis County. The Vermilion Iron Range opened its first mines in 1884. The Mesabi Range was then discovered in the 1880s by several members of the Lewis H. Merritt family. The Mesabi Range started production in 1892 with the opening of Mountain Iron Mine. By the 1900s these ranges helped Minnesota become the lead iron producer in the nation. However, these ranges start to run dry. In 1964, the last iron ore from the Vermilion Range was shipped out and the mines within the range were closed. Currently, the Mesabi Range is the last iron range in Minnesota to still be in producing, but not to the same degree that it once did (Bryant 1881; Lake Vermilion 2017; St. Louis County 2017; Upham 1920; Woodbridge and Pardef 1910).

RESEARCH DESIGN AND METHODOLOGY

The Phase I archaeological investigation was conducted in accordance with the SHPO Manual for Archaeological Projects in Minnesota (Anfinson 2005) and the State Archaeologist's Manual for Archaeological Projects in Minnesota (Office of the State Archaeologist 2011). For this Project, the fieldwork and reporting were completed to these standards and guidelines and the work completed was done in a reasonable and good faith effort to identify historic properties within the Project area.

LITERATURE REVIEW

The purpose of a Phase I archaeological survey is to identify and locate cultural resources within and near the proposed undertaking and assess if the undertaking will have any potential impact on significant resources. A component of this is to complete a literature review of the Project area and surrounding area to identify known cultural resources and the research helps to provide information on archaeological potential and cultural resources that may be encountered within a project area.

A literature search was conducted within a 1-mile radius around the Project area (Study Area). The task was completed using site data files and previous inventory files maintained at the Minnesota Office of the State Archaeologist (OSA) and Minnesota SHPO. Additional background research was completed by reviewing National Register of Historic Places (NRHP) data, historic maps, cemetery/burial records, atlases, current and historic aerial photographs, LiDAR imagery, soil maps, topographic and geomorphic data, and other sources that might provide information for the locations of historic-era sites, areas of prior disturbance, etc.

PRELIMINARY ARCHAEOLOGICAL RECONNAISSANCE FIELD METHODS

A preliminary reconnaissance survey consisted of a site visit by an archaeologist in order to assess the potential for cultural resources. The site visit was completed using visual inspection survey methodology. The preliminary reconnaissance survey was limited to areas where field crew could safely access strictly within public rights-of-way. The general terrain, geomorphological setting, and topographic factors were observed and considered in order to assess the absence or likelihood of any cultural resources within the Project area. Areas considered to have a low potential for containing archaeological sites consisted of previously disturbed areas, areas with a slope greater than 20 degrees, areas of poorly drained soils, and low lying-wet areas which were not considered for a Phase I archaeological survey. If areas were considered to have potential for an archaeological site, the following factors were considered: located within undisturbed land, located on a topographically significant landscape feature, proximity to a suitable former or existing water source, and/or proximity to a previously recorded archaeological site or historic structure. In addition, the gathered background research data were used with current field conditions to assess the potential within the Project area for intact archaeological sites.

Photographs of the Project area as well as observational notes on the general terrain, features within the Project area, and other pertinent information regarding the landscape of the Project area were collected. The results of the preliminary reconnaissance helped to develop a targeted survey strategy for areas not within previous disturbances.

PHASE I ARCHAEOLOGICAL INVESTIGATION

The Phase I archaeological survey for this Project was completed to guidelines of the SHPO Manual for Archaeological Projects in Minnesota (Anfinson 2005) and the State Archaeologist's Manual for Archaeological Projects in Minnesota (Anfinson 2011). Prior to the Phase I field survey for the Project, In Situ completed an archaeological potential assessment of the Project area. For the archaeological potential assessment, there are two areas within the Project area that were identified as having archaeological potential and were flagged to complete a targeted archaeological survey: 1) portions of the Project area that are within areas of higher cultural resource potential; and, 2) locations along wetlands and intermittent streams.

For the assessment of archaeological resource potential within the proposed Project area, factors consisting of the general terrain, water resources, geomorphological setting, and topographic factors are considered in order to assess the absence or likelihood of any cultural resources within the Project area. Areas identified as areas with apparent/significant disturbance, areas with excessive slope, areas of poorly drained soils, and low lying-wet areas are considered to have a low potential for containing archaeological sites. However, for an area to be considered to have potential for an archaeological site, the following factors are considered:

- Located within undisturbed land (excluding plowed agricultural fields);
- Located on a topographically significant landscape feature with well-drained soils;
- Proximity of a suitable former or existing water source (within 200 m of named waterbody and perennial streams);
- Proximity of a previously recorded archaeological site (within 100 m).

Using these parameters, In Situ identified if there are any areas of archaeological potential within the Project area. This archaeological potential generated by In Situ revealed approximately 29.5 acres of archaeological potential within the Project area. In addition to the areas of potential identified by In Situ, the Tribal Historic Preservation Office for the Fond du Lac Band of Lake Superior Chippewa requested that areas around the wetlands within the Project area be subject to survey. Therefore, a 100 ft survey buffer around wetlands was added to the survey area for the Project. This added an additional 45.8 acres of survey area to the 29.5 acres of archaeological potential, bringing the total survey area for the Project to 75.3 acres.

No Phase I archaeological survey took place within the remaining 207.9 acres of the Project area, as there is a low potential for the undertaking to impact cultural resources in these areas. It is the professional recommendation of In Situ that the undertaking is not expected to affect historic properties within these areas of low archaeological potential.

The crew was supervised by a qualified archaeologist who meets the requirements of the Secretary of the Interior's Guidelines for Professional Qualifications in Archaeology (48 FR 44739; National Park Service 1983). A sub-meter GPS unit utilizing Geographic Information System (GIS) data as well as field maps were used to collect spatial data and to ensure field personnel maintain an accurate survey grid. This ensured that the crew did not extend the survey outside the Project survey area. All field notes, maps, and photos will be maintained at the In Situ office. The survey conducted within the Project area used three methods of sampling and testing to identify and evaluate cultural resources: visual inspection, pedestrian survey, and shovel testing.

Visual Inspection

Locations where cultural resources were not expected, such as disturbed areas, areas with a slope greater than 20 degrees, and low/wet areas were walked over and visually inspected. This method was used to verify the absence or likelihood of any cultural resources within these areas. This method was also utilized to document the general terrain and the surrounding area. In addition, visual inspection took place in areas where there was poor (25 percent) ground surface visibility where shovel testing could not take place. A visual inspection walkover survey took place in areas where a systematic survey, such as pedestrian survey or shovel testing, could not be completed. Areas that were subject to visual inspection walkover used a transect interval of 15 meters (m). Visual inspection is not considered a systematic sample survey strategy and is not as thorough and/or accurate, as it is used when systematic and acceptable survey strategies cannot be completed due to project restrictions, poor field conditions, and/or when there are areas of low cultural resource potential such as sloped, wetland, and disturbed areas are present.

Pedestrian Survey

This method was used to survey landforms with slopes that are greater than 20 degrees, or landforms with slopes that are less than 20 degrees and have a surface visibility greater than 25% (e.g., plowed field). The pedestrian survey transect interval was 15 m. Transect interval spacing would be reduced to 5 m in order to delineate the area when any artifacts were discovered. The systematic pedestrian survey was limited only to areas with ample ground surface visibility. Pedestrian survey differs from visual inspection as it is a systematic sample survey method that is only used when ground surface visibility is ample enough for a more accurate and acceptable archaeological survey and assessment.

Shovel Testing

This method was used to sample subsurface contexts in areas with ground visibility of less than 25% that are not within areas of excessive slope, wetland, and significant and apparent disturbed areas. Shovel tests were 30-40 cm in circular diameter and were excavated on a grid at 15 m intervals, with additional radial shovel tests conducted at 5 m intervals if any artifacts were discovered. Shovel tests were excavated in 20 cm levels and the excavated soil was screened through a 0.25-inch mesh/hardware cloth. Where possible, shovel tests extended at least 10 cm into pre-Holocene soils/deposits or until 1 m in depth. All shovel tests were documented, and data gathered from the shovel tests included sub-meter geospatial location, shovel testing depths, soil stratigraphy, soil texture, soil structure, Munsell color, and the presence or absence of cultural materials. Shovel tests were photographed to document the typical soil profiles that were encountered during shovel testing. If possible (unless limited by impassable gravel/pavement conditions, facility/land access, and/or safety concerns/buried utilities), shovel tests were placed in areas of potential disturbance to verify and ascertain the extant level of disturbance.

The shovel test units are classified as negative, positive, sloped, wet, and disturbed. “Negative” shovel tests contained no cultural material. “Positive” shovel tests have intact soils that contained cultural material. “Sloped” shovel tests were located on excessive slopes. “Wet” shovel tests have undisturbed soils and contain a shallow water table and/or hydric soils. “Disturbed” shovel tests have evidence of previous ground disturbance due to land development.

SITE EVALUATION CRITERIA

The purpose of the archaeological investigation was to identify and record previously undocumented cultural resources located within the Project area. Sites were evaluated for their significance as defined by criteria established in Title 36 Code of Federal Regulations 60.4 (National Park Service 1997 [1990]), which states:

The quality of significance in American history, architecture, archaeology, engineering and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
- B. That are associated with the lives of persons significant in our past; or
- C. That embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. That has yielded, or may be likely to yield, information important in prehistory or history.

A site may meet one or more of the eligibility criteria listed above, but if the site is considered to not retain sufficient integrity, then it may be recommended not eligible for inclusion in the NRHP. In addition, In Situ followed the U.S. National Park Service's National Register Bulletin on Guidelines for Evaluating and Registering Archaeological Properties for the eligibility assessment of archaeological sites (National Park Service 2000).

ARTIFACT ANALYSIS AND CURATION

If any artifacts 50 years or older were recovered, they were processed in accordance with the SHPO Manual for Archaeological Projects in Minnesota (Anfinson 2005) and the State Archaeologist's Manual for Archaeological Projects in Minnesota (Anfinson 2011). If artifacts were collected, they are to be returned to the landowner. Should the landowner decline the possession of the artifacts, they will be stored at a repository that meets the Secretary of the Interior's Standards for Curation (55 FR 37630; National Park Service 1990), which for this Project will be the Minnesota Historical Society (MHS).

RESULTS

BACKGROUND RESEARCH

A literature and records search was conducted within the Study Area on November 1, 2024, June 19, 2025, September 17, 2025, and September 30, 2025 (Figures 3-5H). In conducting the literature review, the following resources detailed in Table 3 were consulted. These are resources that may provide information on the locations of potential cultural resources and other contextual information regarding the proposed Project area. Detailed site location information, including legal descriptions, coordinates, and contextual information from archaeological resources, has been redacted from this section of this public version of the report in accordance with applicable cultural resource protection laws in order to protect archaeological resources. General site descriptions and environmental context are retained.

Table 2: Resources Consulted During the Literature and Records Review.

Resource	Notable Observations within the Study Area	Within Project Area	Table/Figure	Date Reviewed
SHPO Files	Three previous cultural resource inventories/surveys; one previously recorded archaeological site; six previously recorded architectural resources	None	Tables 4, 5, and 6; Figures 3 and 4	MnSHIP: November 1, 2024, and June 19, 2025; In Person: September 17, 2025, and September 30, 2025
OSA Files				OSA Portal: November 1, 2024, and June 19, 2025; In Person: September 17, 2025, and September 30, 2025
NRHP Files	None	None	N/A	August 18, 2024, and June 19, 2025
1874 Andreas Atlas (Andreas 1874)	Forest	Forest	N/A	August 18, 2024, and June 19, 2025
1857 BLM GLO Historic Plat Map (BLM 1857)	Streams/rivers and wetlands	Streams/rivers and wetlands	Figure 5A	August 18, 2024, and June 19, 2025
1915 Map of South Part of St. Louis County, Minnesota (Coe and Harrison 1915)	Minnesota and Northern Wisconsin railroad, railroads, roads, streams/rivers, Lincoln School, School No. 4-7, School No. 1-7	Minnesota and Northern Wisconsin railroad	Figure 5C	September 30, 2025

Table 2: Resources Consulted During the Literature and Records Review.

Resource	Notable Observations within the Study Area	Within Project Area	Table/ Figure	Date Reviewed
1916 State of Minnesota Plat Book (W.W. Hixson & Co. 1916)	Duluth, Missabe and Northern railroads, parcels, roads	Peter Halverson parcel (NW NE Section 31, T50N, R15W); C.G. Johnson parcel (SW NE Section 31, T50N, R15W); A. Gulbrandson parcel (SE NE Section 31, T50N, R15W); Peter Kelly parcel (NE SE Section 31, T50N, R15W); A. Johnson parcel (E NE SE Section 31, T50N, R15W); C. Johnson parcel (W NE SE Section 31, T50N, R15W);	Figure 5D	August 18, 2024, and June 19, 2025
1939 Aerial Imagery (MHAPO 2015)	Railroads, agricultural fields, Midway River, streams/riders, roads, residences, gravel road, railroad grade scar, forests, wetlands	Agricultural fields, roads, residences, railroad grade scar, gravel road, forests, wetlands	Figure 5F	August 18, 2024, and June 19, 2025
1953 Adolph, MN 24,000 USGS Topographic Map (USGS 1953)	Duluth, Missabe and Northern railroads, Midway River, streams/riders, roads, gravel roads, gravel pits	Gravel road	Figure 5E	August 18, 2024, and June 19, 2025
1966 Trygg Historical Map (Trygg 1966)	Pine forests and streams/riders	Pine forests and streams/riders	Figure 5B	August 18, 2024, and June 19, 2025
1961 Aerial Imagery (MHAPO 2015)	Railroads, agricultural fields, Midway River, streams/riders, roads, residences, gravel road, railroad grade scar, forests, wetlands	Agricultural fields, roads, residences, railroad grade scar, gravel road, forests, wetlands	Figure 5G	August 18, 2024, and June 19, 2025
1981 Aerial Imagery (MHAPO 2015)	Railroads, substation, agricultural fields, Midway River, streams/riders, roads, residences, gravel road, railroad grade scar, transmission line easements, forests, wetlands	Agricultural fields, roads, residences, transmission line easements, forests, wetlands	Figure 5H	August 18, 2024, and June 19, 2025

Table 2: Resources Consulted During the Literature and Records Review.

Resource	Notable Observations within the Study Area	Within Project Area	Table/Figure	Date Reviewed
1993 Adolph, MN 24,000 USGS Topographic Map (USGS 1993)	Railroads, substation, Midway River, streams/rivers, roads, gravel roads, gravel pits	Gravel roads	Figures 1 and 3	August 18, 2024, and June 19, 2025
Current (2025) Aerial Imagery (Esri 2025)	Railroads, substation, Midway River, streams/rivers, roads, gravel roads, gravel pits, residences, forests, wetlands	Gravel roads, residences, transmission line easements, forests, wetlands	Figures 2, 4, and 7	June 19, 2025

The records search at SHPO and OSA revealed three previous cultural resource inventories/surveys, one previously recorded archaeological site, and six previously recorded architectural resources within the Study Area.

Previous Cultural Resource Inventories/Surveys

The records search revealed three previous cultural resource inventories/surveys completed within the Study Area between 1979 and 2023 (Table 3). The surveys were completed in support of utility projects. One of these previous inventories/surveys did result in the recordation of an archaeological site; however, these surveys and the site are not located within the Project area.

Table 3: Previous Cultural Resource Inventories/Surveys within the Study Area.

Report Number	Title	Authors	Year
SL-1979-03	An Archaeological Reconnaissance Survey of the Proposed Transmission Line #131 from Arrowhead to Gary, Duluth, St. Louis County, Minnesota	Hudak, G. Joseph and L.L. Emery	1979
SL-2022-02	Phase I Reconnaissance Survey for the HVDC Modernization Project St. Louis County, Minnesota	Larsen, Stephen and Michael Madson	2022
SL-2023-12	Addendum: Phase I Reconnaissance Survey for the HVDC Modernization Project St. Louis County, Minnesota	Larsen Stephen and Damien Reinhart	2023

Previously Recorded Archaeological Sites

The data gathered revealed one previously recorded archaeological site within the Study Area (Table 4). The previously recorded site is *unevaluated* for the NRHP and is not located within the Project area. Based on the location of the Project area, possible archaeological site types that may be encountered within the Project area include precontact artifact scatters, precontact habitation sites, post-contact artifact scatters, and post-contact farmsteads.

Table 4: Previously Recorded Archaeological Sites within the Study Area.

Site Number	Legal Location	Cultural Affiliation	Site Type	NRHP Eligibility
21SL1274	[Legal description and the mapped location of archaeological sites are redacted from the text and report figures to protect archaeological resources.]	Early Agriculture & River Settlement (1840-1870)/Northern MN Lumbering (1870-1930s)	Artifact Scatter/Foundation/Ruin	Unevaluated

Previously Recorded Architectural Resources

The data gathered revealed six previously recorded architectural resources within the Study Area (Table 5). One resource is *eligible* for the NRHP, three resources are *unevaluated* for the NRHP, and one resource is *not eligible* for the NRHP. None of these resources are located within the Project area.

Table 5: Previously Recorded Architectural Resources within the Study Area.

Site Number (NRHP #)	Site Name/Type	Address	NRHP Eligibility
SL-HER-00013	Bridge 88790	Unknown	Unevaluated
SL-HER-00041	Parrott's Auto Shop	5513 Highway 2	Not Eligible
SL-MID-00007	Bridge 88789	Unknown	Unevaluated
XX-ROD-00176	Trunk Highway 2	From the Wisconsin state line in Duluth to the North Dakota state line in East Grand Forks	Unevaluated
XX-RRD-DMR008	Duluth Missabe and Northern Railway Company/Duluth Missabe and Iron Range Railway Company: Main Line	Railroad right of way from S 27th Avenue W in Duluth to Mountain Iron	Eligible
XX-RRD-DMR015	Spirit Lake Transfer Railway Company/Duluth Missabe and Iron Range Railway Company	Railroad right of way between the DM&N Main Line at Adolph and the Oliver Bridge over the St. Louis River in Duluth	Not Eligible

Additional Records Review

After reviewing all referenced sources and records, it was found that land within the Study Area has largely been forested in the past and some areas have been cleared of natural forests to create agricultural fields. The Project area itself has been subject to moderate disturbance as the northern and eastern edges of the area have been subject to rural development (buildings, roads, utilities, etc.). The historic aerial, plat, and topographic map resources also show that the Project area had been used as agricultural fields following the clearing of forests. However, by the 1970s the Project area was no longer being used for agricultural practices, and the area was becoming forested again. The Minnesota and Northern Wisconsin railroad also intersected with the northwestern corner of the Project area until the railroad was abandoned in 1912 (Coe and Harrison 1915). The corridor can be seen in the historic aerials, but a residence was developed in the area (MHAPO 2015). It is

unlikely that any archaeological evidence remains of the railroad due to the development, and subsequent demolition, of the residence.

Archaeological Potential

The Project area is located in an area of roadways, rights-of-way, transmission line corridors, wooded/grassy areas, and wetland areas. The Project area consists of fairly flat to sloping terrain and is on a landform with topographically significant landscape features, as the area contains points of higher elevation with flood plains from suitable water sources on either side. The Project area lies between the Midway River to the southeast and an unnamed perennial stream to the west, both of which are natural suitable water sources. Sources of fresh water and landforms such as river terraces have high potential for archaeological sites (Hobbs 2019; Hudak et al. 2002). Long-term occupation sites are more likely to occur along permanent water sources, as more resources are readily available (Anderson and Smith 2003; Hobbs 2019; Hudak et al. 2002). Historic maps did not indicate any prior cultural sites within the Project area, nor are there any previously recorded sites located within the proposed Project area. In addition, there is a lack in the number of previously recorded sites within the Study Area. There are existing transmission line corridors that cut through the parcel horizontally in the south, as well as residential parcels along the northern and eastern edges of the Project area; it is likely that these portions of the Project area may have been heavily impacted by rural and sub-urban construction as well as road and utility construction. It is probable that those activities would have significantly, if not totally impacted any archaeological resources that may or may not have been present in relation to these portions of the Project area, leaving a nominal potential for the intact presence of significant archaeological remains within these areas. Also, portions of the Project area are located within low-lying areas with marshlands present, as indicated on historic maps. Low lying/marsh areas are not typically suitable for long term occupation, as the area may be subject to frequent flooding. However, there are portions of the Project area identified as areas of interest that are not developed, not within wetlands, and are located on landforms of higher elevation between two suitable water sources (Midway River to the southeast and an unnamed perennial stream to the west) (In Situ 2025).

Due to these factors, it was noted that approximately 29.5 acres of the Project area identified as areas of interest that may have a potential for cultural resources, with the remaining areas having a low potential for cultural resources. In addition to the areas of potential identified by In Situ, the Tribal Historic Preservation Office for the Fond du Lac Band of Lake Superior Chippewa requested that areas around the wetlands within the Project area be subject to survey. Therefore, a 100 ft survey buffer around wetlands was added to the survey area for the Project. This added an additional 45.8 acres of survey area to the 29.5 acres of archaeological potential, bringing the total survey area for the Project to 75.3 acres.

When referencing MnModel, which is a tool developed by the Minnesota Department of Transportation that can help identify areas of cultural resource potential that may require cultural resource surveys and assessments, the entire Project area is located within an area of unknown site potential/poorly surveyed, meaning that there is not enough data to determine a resource potential. In addition, MnModel also does not provide any data to assess the landscape suitability for site preservation for the Project area, meaning that there is not enough data to determine the landscape suitability for site preservation (Hobbs 2019; Hudak et al. 2002).

PHASE I ARCHAEOLOGICAL SURVEY RESULTS

Preliminary Archaeological Reconnaissance

On November 4, 2024, In Situ staff conducted a preliminary reconnaissance of the Project area. The Project area consists of short, manicured grasses, mixed grasses, wooded areas, wetland areas, and rural infrastructure (roads, utilities, etc.). The topography consisted of fairly flat to sloping terrain. During this visit, In Situ staff noted indications that the Project area ranged from a low to a high potential for cultural resources. The areas of higher potential are within portions of the Project area that are not developed, not within wetlands, and are located on landforms of higher elevation. The areas of lower potential have been subject to previous disturbances and development, as two transmission line corridors cross through the southern Project area and residential parcels are present along the northern and eastern edges of the Project area and other portions were within low lying areas and marshlands. Due to these factors, the portions of the Project area identified as having a higher archaeological potential were subject to a targeted Phase I archaeological survey.

Phase I Archaeological Survey

The Phase I archaeological survey for the Project consisted of a targeted survey of the proposed Project area, totaling approximately 75.3 acres (Figures 6-7). The survey was conducted on the following dates:

- | | | | |
|-----------------|-------------------|----------------------|----------------------|
| • July 24, 2025 | • August 1, 2025 | • August 12, 2025 | • September 24, 2025 |
| • July 25, 2025 | • August 5, 2025 | • August 13, 2025 | • September 25, 2025 |
| • July 28, 2025 | • August 6, 2025 | • August 14, 2025 | • November 13, 2023 |
| • July 29, 2025 | • August 7, 2025 | • August 15, 2025 | |
| • July 30, 2025 | • August 8, 2025 | • September 22, 2025 | |
| • July 31, 2025 | • August 11, 2025 | • September 23, 2025 | |

The survey area of the Project is located within an area consisting of short, manicured grasses, mixed grasses, wooded areas, wetland areas, and rural infrastructure (roads, utilities, etc.) (Figures 8-109). Ground surface visibility (GSV) within the Project area was poor to good (0-90%) throughout the survey area, with some areas of higher GSV (greater than 25%) within recently cleared areas. Pedestrian survey methodologies were used within areas of higher GSV (greater than 25%). Shovel testing was conducted in areas that had poor (less than 25%) ground surface visibility and that were not in areas that were subject to visual inspection. Visual inspection was conducted within areas of slope, wetlands, rural development, and previous disturbances that prohibited shovel testing. Existing disturbance within the Project area includes agricultural practices, construction activity, and rural development (buildings, roads, buried utilities, etc.).

Approximately 75.3 acres were subject to survey during the archaeological field survey for the Project. Of the 75.3 acres that were surveyed:

- Approximately 0.5 acres were within areas with adequate to good (greater than 25%) GSV and were subject to pedestrian survey (Figure 110A);
- Approximately 1.3 acres were determined to be within low-lying areas of low cultural resource potential and were visually inspected (Figure 110B);

- Approximately 9.2 acres were within areas of disturbance (rural development, buildings, utilities, roads, recent construction, etc.) and were visually inspected (Figures 110C-110E);
- Approximately 2.5 acres were within sloped context and were visually inspected (Figure 110F);
- Approximately 9.9 acres were within a wetland context and were visually inspected (Figure 110G);
- Approximately 51.9 acres were within areas with poor (less than 25%) GSV and were subject to shovel testing.

Shovel Testing

For this Project, a total of 951 shovel test units were conducted during this survey. Of the 951 shovel tests, 23 shovel tests were positive for cultural resources, which are associated with 21SL1302. Of the shovel tests conducted, there were 33 shovel tests that had a high-water table at the time of survey.

Soil profiles observed during shovel testing within the Project area revealed a topsoil depth that ranged between 7 to 58 cm below ground surface, with pre-Holocene glacial till at a depth ranging between 11 to 63 cm.

A typical shovel test profile within the Normanna-Canosia-Hermantown complex (F137B) soil series in upland settings within the Project area consisted of a dark brown (10YR3/3) loam soil over a dark yellowish brown (10YR3/6) sandy clay loam soil, as shown in Figure 111A. The typical glacial till encountered during shovel testing is shown in Figure 111B.

A typical hydric shovel test profile within the Normanna-Canosia-Hermantown complex (F137B) soil series in wetland-adjacent settings within the Project area consisted of a very dark grayish brown (10YR3/2) silt loam soil over a dark gray (10YR4/1) silt soil mottled with a dark yellowish (10YR4/6) silt loam soil over a dark yellowish brown (10YR3/6) sandy loam soil mottled with a grayish brown (10YR5/2) sandy loam soil, before reaching the high-water table, as shown in Figure 112.

A typical disturbed shovel test profile within the Aldenlake-Ahmeek complex (F144D) soil series within the Project area consisted of a dark reddish brown (5YR3/3) coarse gravelly fill dirt over a dark brown (7.5YR3/4) loamy sand soil, as shown in Figure 113.

Further depths for testing were deemed unnecessary due to the low potential for deep archaeological deposits, as the Project is located in a setting with glacial till and the soil profiles for the soil series within the Project area revealed that there are no buried soils (UC Davis 2025). Over the course of the survey, glacial till was encountered throughout the Project area during shovel testing. Glacial till is a sediment deposited by glaciers and is made up of a mixture of material ranging from tiny soil particles to boulders (National Park Service 2018). Northeastern Minnesota was covered by the Superior ice lobe during the Wisconsin Episode of glaciation, which began approximately 75,000 years ago and lasted until approximately 11,000 years ago. The Superior lobe contained till from the Lake Superior basin, including red sandstone and agates, giving the till its characteristic red color (Minnesota Geological Survey 2025). Glacial till represents a pre-Holocene glacial deposit, therefore, shovel tests were terminated at least 10 cm into the pre-Holocene soils/deposits (glacial till) or until 1 meter in depth, where possible.

CULTURAL RESOURCES

During the field survey, a total of 75.4 acres of the 283-acre Project area were subject to targeted Phase I archaeological survey for the Project. Five newly recorded archaeological sites were observed and recorded during the archaeological survey of the Project (21SL1302, IS-LOON-002, IS-LOON-003, IS-LOON-004, and IS-LOON-005). These sites are discussed in detail below. Detailed site location information, including legal descriptions, coordinates, and contextual information from archaeological resources, has been redacted from this section of this public version of the report in accordance with applicable cultural resource protection laws in order to protect archaeological resources. General site descriptions and environmental context are retained.

Newly Recorded Archaeological Resources

21SL1302

Site Type:	Artifact Scatter
Association:	Post-Contact; Euro-American
Site NRHP Recommendation:	Not Eligible
Management Recommendation:	No Further Work

Site 21SL1302 is a post-contact artifact scatter site within a wooded and grassy area on relatively flat terrain. Site 21SL1302 was recorded by In Situ on August 11, 2025 (Figures 114-120). The site area measures approximately 0.72 acres and was recorded using shovel testing and visual inspection methodologies. The site is located within an area with short, manicured grasses, mixed grasses, and wooded vegetation, providing poor (0%) ground surface visibility, so shovel testing and visual inspection methods were used to delineate the extent of cultural materials.

The site is comprised of 23 positive shovel tests out of 33 plotted, five of which contained bone along with other historic materials (FS 1-1, FS 1-2, FS 1-3, FS 1-4, and FS 2-1). Radial shovel tests were conducted only off the positive primary shovel tests that contained animal bone. For this site, additional radial shovel tests were not completed off primary shovel tests that resulted only in sparse assemblages (1-3 pieces of historic glass or nails) in order to minimize unnecessary impacts to the site from close interval subsurface testing and the completed shovel tests were ample enough to delineate the horizontal extents of the site.

Of the primary tests, three were positive shovel tests that contained animal bone (FS 1-1, FS 1-2, and FS 2-1), and six were positive shovel tests with sparse assemblages. Of the radial tests, two were positive shovel tests that contained animal bone (FS 1-3 and FS 1-4), twelve were positive with sparse assemblages, four were negative for cultural material, and the remaining six were located within conditions unsuitable for shovel testing (disturbed gravel, wetland conditions, and road ROW with utilities present). No features (foundations, pits, etc.) associated with the artifact scatter were identified. The site is in poor condition due to natural erosion and demolition.

A total of 87 artifacts were collected from within the site to serve as a sample of artifact variety (Figures 121-127). Artifacts were only collected from the positive shovel tests that contained animal bone. Some artifacts were documented in the field and not collected due to sparse assemblages and/or redundancy. All the collected artifacts are described below. A total of 87 artifacts were recovered from five positive shovel tests that were conducted within or near site

21SL1302 during the Phase I archaeological survey. Artifacts recovered from the shovel tests that contained animal bone are as follows:

- FS1-1 (all recovered from the A horizon, 0-24 cmbs)
 - 1-1.1: Nine shards of colorless glass
 - 1-1.2: One shard of amber glass
 - 1-1.3: One shard of melted colorless glass
 - 1-1.4: Six sherds of white glazed whiteware
 - 1-1.5: One sherd of pink glazed whiteware
 - 1-1.6: Two fragments of butchered mammal bone
- FS 1-2 (all recovered from the A horizon, 0-40 cmbs)
 - 1-2.1: Five shards of colorless glass
 - 1-2.2: Three pieces of green plastic, with one displaying the stamped letter “M”
 - 1-2.3: Two rusted round ferrous metal nails
 - 1-2.4: One black rubber washer
 - 1-2.5: Two pieces of charcoal
 - 1-2.6: One piece of unmodified animal bone
- FS 1-3 (All recovered from the A horizon, 0-36 cmbs)
 - 1-3.1: Four sherds of white glazed whiteware
 - 1-3.2: Four rusted ferrous metal nails (one appears to be a screw)
 - 1-3.3: One shard of white milk glass
 - 1-3.4: One shard of melted amber glass
 - 1-3.5: One shard of solarized (amethyst-tinted) glass, displaying the stamped letter “M”
 - 1-3.6: Two shards of colorless glass, with one displaying a double ridged lip
 - 1-3.7: Two shards of melted colorless glass
 - 1-3.8: Six small mammal bone fragments, some butchered
- FS 1-4 (All recovered from the A horizon, 0-26 cmbs)
 - 1-4.1: One shard of colorless glass
 - 1-4.2: One fragment of an orange and black striped glass marble
 - 1-4.3: Two pieces of a tarnished brass funnel-shaped ring,—possible candlestick holder
 - 1-4.4: One rusted ferrous metal wire
 - 1-4.5: Two fragments of unmodified mammal bone
- FS 2-1 (All recovered from the transition between the A and B horizon, 0-38 cmbs)
 - 2-1.1: One tarnished bronze WWI Royal Canadian Engineers Officer’s cap badge (dating to circa 1914-1918)
 - 2-1.2: One unidentified tarnished/rusted metal implement—possibly the backing to the WWI Royal Canadian Engineers Officer’s cap badge (2-1.1).
 - 2-1.3: Four fragments of unmodified mammal bone
 - 2-1.4: Three rusted ferrous metal nails, with one bent in a “U” shape
 - 2-1.5: Fourteen shards of colorless glass, with one shard showing a machine seam
 - 2-1.6: Two sherds of white glazed whiteware

Artifacts recovered from positive shovel tests were encountered from 0-40 centimeters below surface (cmbs). Radial shovel tests were conducted from each positive primary shovel test that contained animal bone in 5-meter increments in each of the cardinal directions if possible.

Site 21SL1302 is a post-contact historic scatter site that is in poor condition, with impacts from natural erosion and previous demolition. The site is not associated with any significant historical patterns, persons, or events (Criteria A and B). The site does not have any unique or outstanding characteristics or design (Criterion C) and due to the poor condition of the site and the fact that post-contact artifact scatter sites like this are common and prevalent in the region, the site is unlikely to yield information important to our understanding of the history of the region (Criterion D). Site 21SL1302 is recommended *not eligible* for inclusion on the NRHP and no further work is recommended.

IS-LOON-002

Site Type:	Isolated Find
Association:	Post-Contact; Euro-American
Site NRHP Recommendation:	Not Eligible
Management Recommendation:	No Further Work

Site IS-LOON-002 is a post-contact isolated find site within a wooded and grassy area on relatively flat terrain. Site IS-LOON-002 was recorded by In Situ on July 28, 2025 (Figures 128-131). The site area measures approximately 94.7 sq ft (8.8 sq m) and was recorded using visual inspection methodology. The site is located within an area with mixed grasses and wooded vegetation, providing poor (0%) ground surface visibility, so shovel testing and visual inspection methods were used to delineate the extent of cultural materials.

H1 is a Chevrolet truck that is fifteen feet north to south and six feet east to west.

The truck may have been manufactured in the early 1950s based on the body style. The truck appears to have been used as a dump truck. A metal plate on the bed indicates that the truck bed was manufactured by the St. Paul Hydraulic Hoist Company. The mirrors on the truck were manufactured by the Re-Trac Manufacturing Corporation (Figures 132-135).

Shovel tests were conducted in the area around the truck and were negative for cultural material, which aided in more precise delineation of the site boundaries. No features (foundations, pits, etc.) associated with the truck were identified. The site is in moderate condition due to dilapidation.

For this site, a Minnesota Archaeological Site Form was completed and submitted to the OSA. In review of the site form, the OSA found the site lacks contextual integrity and does not meet the requirements for an official site number due to the site being in secondary context and being at this site location for less than 50 years. Therefore, this site did not receive an official site number through the OSA.

Site IS-LOON-002 is a post-contact isolated find site that is in moderate condition, with impacts from natural erosion and dilapidation. The site is not associated with any significant historical patterns, persons, or events (Criteria A and B). The site does not have any unique or outstanding characteristics or design (Criterion C) and due to the fact that post-contact sites like this are

common, the site is unlikely to yield information important to our understanding of the history of the region (Criterion D). Site IS-LOON-002 is recommended not eligible for inclusion on the NRHP and no further work is recommended.

IS-LOON-003

Site Type:	Artifact Scatter
Association:	Post-Contact; Euro-American
Site NRHP Recommendation:	Not Eligible
Management Recommendation:	No Further Work

Site IS-LOON-003 is a post-contact artifact scatter site within a wooded and grassy area on relatively flat to undulating terrain. Site IS-LOON-003 was recorded by In Situ on July 28, 2025 (Figures 136-139). The site area measures approximately 0.08 acres and was recorded using shovel testing and visual inspection methodologies. The site is located within an area with mixed grasses, brush, and wooded vegetation, providing poor (0%) ground surface visibility, so shovel testing and visual inspection methods were used to delineate the extent of cultural materials. The site is located directly adjacent to an existing residence.

The site is comprised of multiple vehicles, scattered farm equipment, and debris (H1-H6) (Figures 140-143).

H1 is possibly a 1920-1930 Dodge Brothers car that may have been converted into a homemade tractor, also known as a doodlebug, during the 1930s or 1940s as a result of a shortage of tractors (The Henry Ford Museum 2025; Lambton County Museums 2020). However, the Dodge Brothers vehicle is in poor condition with significant dilapidation which makes determining if there have been any modifications difficult.

H2 is a car that may date to between 1935 and 1950, based on the body style. The car is in poor condition.

H3 is a car that may date to between 1935 and 1950, based on the body style. The car is in poor condition as it is missing its front end.

H4 is a possible 1917-1928 Fordson Model F tractor. The Fordson tractor is in poor condition but appears to have replacement parts that are significantly newer than the rest of the vehicle which appears dilapidated.

H5 is a possible 1953-1957 Allis Chalmers WD45 tractor. The possible Allis Chalmers tractor appears to be in good condition and is located in a recently cleared area, suggesting that it may be used regularly by the parcel owner.

H6 is part of a post-1920 Adams Leaning Wheel Grader No. 12, which would have been pulled behind a tractor to grade ditches, banks, and roads (J.D. Adams Company 1930).

There are also barrels and pieces of metal scattered across the area. The shovel tests surrounding the site were negative for cultural material, which aided in more precise delineation of the site

boundaries. No artifacts were collected. No features (foundations, pits, etc.) associated with the artifact scatter were identified. Overall, the site is in poor condition due to dilapidation.

For this site, a Minnesota Archaeological Site Form was completed and submitted to the OSA. In review of the site form, the OSA found the site lacks contextual integrity and does not meet the requirements for an official site number due to the site being in secondary context and being at this site location for less than 50 years. Therefore, this site did not receive an official site number through the OSA.

Site IS-LOON-003 is a post-contact historic scatter site that is in poor condition, with impacts from natural erosion and previous dilapidation. The site is not associated with any significant historical patterns, persons, or events (Criteria A and B). The site does not have any unique or outstanding characteristics or design (Criterion C) and due to the poor nature of the site and that post-contact sites like this are common, the site is unlikely to yield information important to our understanding of the history of the region (Criterion D). Site IS-LOON-003 is recommended not eligible for inclusion on the NRHP and no further work is recommended.

IS-LOON-004

Site Type:	Artifact Scatter
Association:	Post-Contact; Euro-American
Site NRHP Recommendation:	Not Eligible
Management Recommendation:	No Further Work

Site IS-LOON-004 is a post-contact artifact scatter site within a wooded and grassy area on relatively flat terrain. Site IS-LOON-004 was recorded by In Situ on July 29, 2025 (Figures 144-147). The site area measures approximately 0.01 acres and was recorded using shovel testing and visual inspection methodologies. The site is located within an area with mixed grasses and wooded vegetation, providing poor (0%) ground surface visibility, so shovel testing and visual inspection methods were used to delineate the extent of cultural materials. No features (foundations, pits, etc.) associated with the artifact scatter were identified. The site is in poor condition due to natural erosion and dilapidation. The site is located directly adjacent to an existing residence.

The site is comprised of a scatter of farm equipment and debris (Figures 148-150).

H1 is a metal and wood frame with a belt and pulley system, possibly part of a threshing machine. A belt, made of synthetic materials, is wrapped around the pulley. The frame is approximately three feet tall and six feet long.

Additionally, the scatter contains a small, potentially modern, two stroke engine with no visible maker's mark, possible parts for another belt and pulley machine, including metal frames, a potential flat belt and pulley wheel, and a large metal gear, a possible metal trailer, an orange metal cart containing possible linked metal stakes, partially destroyed wooden barrel with metal hoops.

For this site, a Minnesota Archaeological Site Form was completed and submitted to the OSA. In review of the site form, the OSA found the site lacks contextual integrity and does not meet the requirements for an official site number due to the site being in secondary context and being at this

site location for less than 50 years. Therefore, this site did not receive an official site number through the OSA.

Site IS-LOON-004 is a post-contact historic scatter site that is in poor condition, with impacts from natural erosion and dilapidation. The site is not associated with any significant historical patterns, persons, or events (Criteria A and B). The site does not have any unique or outstanding characteristics or design (Criterion C) and due to the poor condition of the site and the fact that post-contact artifact scatter sites like this are common and prevalent in the region, the site is unlikely to yield information important to our understanding of the history of the region (Criterion D). Site IS-LOON-004 is recommended not eligible for inclusion on the NRHP and no further work is recommended.

IS-LOON-005

Site Type:	Isolated Find
Association:	Post-Contact
Site NRHP Recommendation:	Not Eligible
Management Recommendation:	No Further Work

Site IS-LOON-005 is a post-contact isolated find site within a wooded and grassy area on relatively flat terrain. Site IS-LOON-005 was recorded by In Situ on July 29, 2025 (Figures 151-154). The site area measures approximately 58.5 sq ft (5.4 sq m) and was recorded using visual inspection methodology. The site is located within an area with forest vegetation, providing poor (0%) ground surface visibility, so shovel testing and visual inspection methods were used to delineate the extent of cultural materials.

H1 is a Chrysler car that is eleven feet north to south and five feet east to west.

The car may have been manufactured between 1930 and 1950 based on the body style. The front end of the car is missing, making identification of the exact model difficult (Figures 155-156). A metal plate on the front indicates that the vehicle was manufactured by Chrysler.

For this site, a Minnesota Archaeological Site Form was completed and submitted to the OSA. In review of the site form, the OSA found the site lacks contextual integrity and does not meet the requirements for an official site number due to the site being in secondary context and being at this site location for less than 50 years. Therefore, this site did not receive an official site number through the OSA.

Site IS-LOON-005 is a post-contact isolated find site that is in poor condition, with impacts from natural erosion and dilapidation. The site is not associated with any significant historical patterns, persons, or events (Criteria A and B). The site does not have any unique or outstanding characteristics or design (Criterion C) and due to the fact that post-contact sites like this are common, the site is unlikely to yield information important to our understanding of the history of the region (Criterion D). Site IS-LOON-005 is recommended *not eligible* for inclusion on the NRHP and no further work is recommended.

Notable Items

During the targeted field survey, a total of 13 rock piles were observed and recorded. Of these rock piles, each one lines up with either a field line or building feature visible on aerial imagery from 1939, 1961, and/or 1981 (Figure 157). The rock piles are also not uniform and are irregularly shaped (Figures 158-161). No shovel tests were conducted within the rock piles, but shovel tests in the area surrounding each of the rock piles were negative for cultural resources. It is presumed from in-field observations, discussions with Cultural Monitors from the Fond du Lac Band of Lake Superior Chippewa, and cross-referencing with historic literature review data that the rock piles are related to historic and modern land-clearing activities associated with previous and current homesteads and farmsteads. During meetings regarding the progress of the Project, Fond du Lac staff concurred with the findings of In Situ regarding the historical context of the rock piles. Based on these considerations, In Situ recommends that these rock piles do not meet the criteria of the NRHP, and no further archaeological work is recommended for the rock piles.

Summary of Cultural Resources

During the field survey, a total of 75.3 acres of the 283.2-acre Project area were subject to targeted Phase I archaeological survey for the Project. Due to the environmental conditions (e.g. not near permanent water sources or known cultural resources), the remaining 207.9 acres of the Project area have a low archaeological potential. Therefore, no Phase I archaeological survey took place within these areas, as there is a low potential for the undertaking to impact cultural resources in these areas. It is the professional recommendation of In Situ that the undertaking is not expected to affect historic properties within these areas of low archaeological potential.

Five newly recorded post-contact archaeological sites were observed and recorded during the archaeological survey of the Project (21SL1302, IS-LOON-002, IS-LOON-003, IS-LOON-004, and IS-LOON-005). All five of the newly recorded archaeological sites are recommended as *not eligible* for the NRHP. In addition, no previously identified resources are within or adjacent to the proposed Project area. Therefore, In Situ recommends a finding of *No Historic Properties Affected* within the surveyed Project area.

Although no historic properties were identified, In Situ recommends the development and implementation of an Inadvertent Discovery Plan to be in effect during all ground-disturbing construction activities associated with the Project. An Inadvertent Discovery Plan establishes procedures to be followed in the event that previously unidentified archaeological materials, cultural resources, or human remains are encountered during construction. The purpose of the IDP is to ensure that any unanticipated discoveries are appropriately protected, evaluated, and treated in accordance with applicable federal, state, and local regulations, and in coordination with the appropriate agencies, Tribal representatives, and qualified cultural resources professionals.

In addition, In Situ recommends that the Project developer continue consultation with Tribes that have expressed interest in, or have cultural affiliation with, the Project area throughout the remainder of the Project. Continued consultation is recommended to ensure that Tribal concerns are addressed during project implementation and that Tribes are notified in a timely manner of any unanticipated discoveries, particularly those of potential cultural or religious significance.

If the agencies concur with these findings and recommendations, and provided that the Inadvertent Discovery Plan is implemented and Tribal consultation continues as appropriate, In Situ recommends a determination of *No Further Archaeological Work* for the Project.

MANAGEMENT RECOMMENDATIONS

An intensive Phase I archaeological investigation was conducted between July and September 2025. The Phase I archaeological survey included a background literature review within and surrounding the Project area along with a preliminary archaeological reconnaissance of the Project area, and a targeted Phase I archaeological survey for the proposed Project.

During the field survey, a total of 75.3 acres of the 283.2-acre Project area were subject to targeted Phase I archaeological survey for the Project. Due to the environmental conditions (e.g. not near permanent water sources or known cultural resources), the remaining 207.9 acres of the Project area have a low archaeological potential. Therefore, no Phase I archaeological survey took place within these areas, as there is a low potential for the undertaking to impact cultural resources in these areas. It is the professional recommendation of In Situ that the undertaking is not expected to affect historic properties within these areas of low archaeological potential.

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If the agencies concur with these findings and recommendations, and provided that the Inadvertent Discovery Plan is implemented and Tribal consultation continues as appropriate, In Situ recommends a determination of *No Further Archaeological Work* for the Project.

REFERENCES CITED

- Anderson, David G. and Steven D. Smith
2003 *Archaeology, History, and Predictive Modeling: Research at Fort Polk, 1972-2002*. University of Alabama Press, Tuscaloosa, Alabama.
- Andreas, Alfred Theodore
1874 *An Illustrated Atlas of the State of Minnesota* [map]. Minnesota Historical Society. Electronic resource, <https://collection.mndigital.org/catalog/mhs:1192>, accessed June 19, 2025.
- Anfinson, Scott
1990 Archaeological Regions in Minnesota and the Woodland Period. In *The Woodland Tradition in the Western Great Lakes: Papers Presented to Elden Johnson*, edited by Guy E. Gibbon, pp. 135-166 University of Minnesota Publications in Anthropology 4, Minneapolis.
2005 *SHPO Manual for Archaeological Projects in Minnesota*. Minnesota State Historic Preservation Office. St. Paul, Minnesota.
2011 *State Archaeologist's Manual for Archaeological Projects in Minnesota*. Minnesota Office of the State Archaeologist. St. Paul, Minnesota.
- Arzigian, Constance
2008 *Minnesota Statewide Multiple Property Documentation Form of the Woodland Tradition*. Electronic Document. <http://www.dot.state.mn.us/culturalresources/docs/crunit/woodlandfulldoc.pdf>, Accessed April 29, 2017
- Blegen, Theodore C.
1963 *Minnesota: A History of the State*. University of Minnesota Press. Minneapolis.
- Bryant, Charles
1881 *History of the Upper Mississippi Valley*. Minnesota Historical Company, Minneapolis.
- Coe, E.K., and John Harrison.
1915 *Map of South Part of St. Louis County Minnesota*. Iron Range Research Center. Electronic document, <https://collection.mndigital.org/catalog/irrc:2255#?xywh=9416%2C9627%2C1914%2C1164>, accessed October 16, 2025.
- DeMallie, Raymond J.
2001 Sioux until 1850. In *Handbook of North American Indians: Plains*, Vol. 13, Part 2, edited by Raymond J. DeMallie, pp. 718–760. William C. Sturtevant, general editor. Smithsonian Institution. Washington, D.C.
- Esri
2025 *World Imagery Basemap*. [map]. ArcGIS Online. Electronic resource, <https://www.arcgis.com/home/item.html?id=10df2279f9684e4a9f6a7f08febac2a9>, accessed June 19, 2025.
- Florin, Frank, James Linbeck, and Kent Bakken
2016 *Phase I Archaeological Survey and Phase II Evaluation of Site 21CR161 and 21CR162 for TH 101 Up the Bluff CSAH 61 to TH 14, Carver County, MN*. Manuscript of file, The Office of the State Archaeologist, St. Paul, Minnesota.

Folwell, William

1956 *A History of Minnesota*, Vol. I. The Minnesota Historical Society. St. Paul.

Gibbon, Guy

2012 *Archaeology of Minnesota: The Prehistory of the Upper Mississippi River Region*. University of Minnesota Press. Minneapolis.

Gibbon, Guy E., Craig M. Johnson, and Elizabeth Hobbs

2002 *Chapter 3: Minnesota's Environmental and Native American Culture History. Mn/Model*. Electronic document. <http://www.dot.state.mn.us/mnmodel/P3FinalReport/chapter3.html#ch33>, Accessed April 29, 2017.

The Henry Ford Museum

2025 Ford Model T Runabout Converted to a Tractor, Reaping Grain, circa 1919. Electronic document, <https://www.thehenryford.org/collections-and-research/digital-collections/artifact/100212#slide=gs-189087>, accessed October 17, 2025.

Hobbs, Elizabeth

2019 *MnModel Phase 4: Project Summary and Statewide Results*. Electronic document. <https://www.dot.state.mn.us/mnmodel/>, accessed January 25, 2025.

Hudak, Joseph G., Elizabeth Hobbs, Allyson Brooks, Carol Ann Sersland, and Crystal Phillips (Editors)

2002 *MnModel Final Report Phases 1-3, 2002: A Predictive Model of Precontact Archaeological Site Location for the State of Minnesota*. Available at: https://www.dot.state.mn.us/mnmodel/P3FinalReport/final_report.html. Minnesota Department of Transportation, accessed September 6, 2022.

In Situ Archaeological Consulting, LLC (In Situ)

2025 *Phase IA Cultural Resource Literature Review and Preliminary Reconnaissance for Project Loon—Hermantown, St. Louis County, Minnesota*. In Situ Archaeological Consulting. Eden Prairie, Minnesota.

J.D. Adams Company

1930 *Adams Adjustable Leaning Wheel Graders and Other Road Equipment*. J.D. Adams Company, Indianapolis, Indiana.

Johnson, Donald L.

1993 Biomechanical Processes and the Gaia Paradigm in a Unified Pedo-Geomorphic and Pedo-Archaeologic Framework. In *Proceedings of the First International Conference on Pedo-Archaeology*, edited by J.E. Foss, M.E. Timpson, and M.W. Morris, pp.41–67. University of Tennessee Agricultural Experimental Station, Special Publication 93–03, Knoxville.

Johnson, Elden

1988 *The Prehistoric People of Minnesota*. Minnesota Historical Society Press. St. Paul.

Lake Vermilion

2017 *A Brief History of the Lake Vermilion Area*. Electronic document. <http://www.lakevermillionresorts.com/about/history>, accessed October 25, 2017.

Lambton County Museums

- 2020 The Doodlebug. Electronic document, <https://www.lambtonmuseums.ca/en/lambton-heritage-museum/the-doodlebug.aspx>, accessed October 17, 2025.

Malinowski, Sharon, Anna Sheets, Jeffery Lehman, and Melissa Walsh Doig

- 1998 *Gale Encyclopedia of Native American Tribes*. Vol. III. Gale Research, Inc. Detroit, Michigan.

Michlovic, Michael G.

- 2025 *An Archaeology of the Red River of the North*. The Digital Press at the University of North Dakota, Grand Forks, North Dakota.

Minnesota Department of Natural Resources

- 1988 Natural Vegetation of Minnesota: At the Time of the Public Land Survey, 1847-1907. Biological Report No. 1. Natural Heritage Program, Minnesota Department of Natural Resources, St. Paul, MN.
- 2025 Ecological Classification System. Minnesota Department of Natural Resources, St. Paul, MN. Available at: <http://www.dnr.state.mn.us/ecs/index.html>, accessed October 15, 2025.

Minnesota Geological Survey

- 2025 *Glacial Geology*. Electronic document, <https://cse.umn.edu/mgs/glacial-geology>, accessed November 4, 2025.

Morey, G.B. and Joyce Meints

- 2000 *Geologic Map of Minnesota - Bedrock Geology*: Electronic document. <http://www.geo.umn.edu/mgs/currentpubs.htm>, Accessed May 9, 2017. Minnesota Geological Survey, State Map Series, S-20, 3rd edition, scale 1:1,000,000.

Morrow, Julie

- 1996 *Early Paleoindian Period*. Electronic document. <http://archaeology.uiowa.edu/early-paleoindian-period-0>, Accessed April 29, 2017. The Office of the State Archaeologist.

Morrow, Toby.

- 1996 *Late Paleoindian/Early Archaic Period*. Electronic document. <http://archaeology.uiowa.edu/middle-archaic-period-0>, accessed July 8, 2016. The Office of the State Archaeologist.
- 2016 *Stone Tools of Minnesota*. Manuscript on file, The Office of the State Archeologist, St. Paul, Minnesota.

National Climatic Data Center

- 2017 *Climate of Minnesota*. Electronic document. http://www.ncdc.noaa.gov/climate/normals/clim60/states/Clim_MN_01.pdf, Accessed on May 9, 2017. Asheville, North Carolina.

National Park Service

- 1983 *Archaeology and Historic Preservation; Secretary of the Interior's Standards and Guidelines*. Federal Register Volume 48, Issue 190. U.S. Department of the Interior, Washington, D.C.
- 1990 *Curation of Federally-Owned and Administered Archeological Collections*. Federal Register Volume 55, Issue 177. U.S. Department of the Interior, Washington, D.C.

- 1997 [1990] *How to Apply the National Register Criteria for Evaluation*. National Register Bulletin 15. U.S. Department of the Interior, Washington, D.C.
- 2000 *Guidelines for Evaluating and Registering Archaeological Properties*. National Register Bulletin 36. U.S. Department of the Interior, Washington, D.C.
- 2002 “Brooks-Scanlon Corporation No. 1.” In *Steamtown Special History Study: American Steam Locomotives*. U.S. Department of the Interior, Washington, D.C. Electronic document, https://www.nps.gov/parkhistory/online_books/steamtown/shs2d.htm, accessed October 16, 2025.
- 2018 *Glacial Till and Glacial Flour*. Electronic document, <https://www.nps.gov/articles/glacialtillandglacialflour.htm>, accessed November 3, 2025.
- Natural Resources Conservation Service
- 2025 Web Soil Survey. Available at: <http://websoilsurvey.nrcs.usda.gov>, accessed October 15, 2025.
- Picka, Craig
- 2012 *Heat Treatment of Ozark Cherts: An Archaeological Experiment in the Effects of Heat Treatment on Toolstone Flaking Properties*. Master’s thesis, Department of Sociology and Anthropology, Missouri State University.
- Pritzker, Barry M.
- 2000 *A Native American Encyclopedia: History, Culture, and People*. Oxford University Press.
- Quivik, Fredric and Dale L. Martin
- 1988 *Historical Context: Historic Iron and Bridges in Minnesota, 1873-1945*. Electronic document, <http://www.dot.state.mn.us/historicbridges/bridge/misc/iron-steel-context.pdf>, accessed on April 29, 2017.
- Radford, David, LeRoy Gonsior, Jacob E. Foss, and Miranda Van Vleet
- 2015 *Minnesota State Parks and Trail Culture Resource Program Annual Report – 2014*. Manuscript on file, The Office of the State Archeologist, St. Paul, Minnesota.
- Running, Garry L.
- 1995 Archaeological Geology of the Rustad Quarry Site (32RI775): An Early Archaic Site in Southeastern North Dakota. *Geoarchaeology* 10(3): 183–205.
- Schermer, Shirley J., William Green, and James Collins
- 1995 *A Brief Cultural History of Iowa*. Electronic document. <http://archaeology.uiowa.edu/brief-cultural-history-iowa-0>, Accessed April 29, 2017. The Office of the State Archaeologist.
- Schwieder, Dorothy
- 2000 *History of Iowa*. Electronic document. <http://publications.iowa.gov/135/1/history/7-1.html>, accessed on April 29, 2017.
- St. Louis County,
- 2017 *About St. Louis Minnesota*. Electronic document, <http://www.stlouiscountymn.gov/GOVERNMENT/About-History>, accessed October 25, 2017.

Stoltman, James

- 1997 Chapter 6: The Archaic Tradition. *The Wisconsin Archaeologists*, 78(1/2): 112-139. University of Wisconsin. Madison, Wisconsin.

Trygg, J. William

- 1966 *Composite Map of United States Land Surveyors' Original Plats and Field Notes*. [map]. Sheet MN 14, Minnesota Series. Trygg Land Office, Ely, Minnesota.

Upham, Warren

- 1920 *Minnesota Geographic Names: Their origin and Historic Significance*. Minnesota Historical Company, Minneapolis.

U.S. Bureau of Land Management (BLM)

- 1857 *Historic GLO Plat Map: Township 50N, Range 15W, St. Louis County, Minnesota* [map]. General Land Office Records, U.S. Department of the Interior. Electronic resource, <https://glorerecords.blm.gov>, accessed June 19, 2025.

U.S. Environmental Protection Agency

- 2007 *Ecoregions of Minnesota, Level IV Ecoregions of Minnesota Text Descriptions, Provisional*, May 11, 2007. Available at: <ftp://ftp.epa.gov/wed/ecoregions/mn/>, accessed March 30, 2017.

U.S. Geological Survey

- 1953 *Adolph, Minn., 1:24,000-scale quadrangle*. [map] U.S. Geological Survey Historical Topographic Map Collection, TopoView interface. Electronic document, <https://ngmdb.usgs.gov/topoview>, accessed June 19, 2025.
- 1993 *Adolph, Minn., 7.5-Minute Topographic Quadrangle, 1:24,000 scale*. [map] U.S. Geological Survey Historical Topographic Map Collection, TopoView interface. Electronic document, <https://ngmdb.usgs.gov/topoview>, accessed June 19, 2025.

University of California, Davis (UC Davis)

- 2025 SoilWeb. Available at: <https://casoilresource.lawr.ucdavis.edu/gmap/>. Department of Land, Air, and Water Resources, University of California, Davis, accessed October 15, 2025.

University of Minnesota (MHAPO)

- 2015 Minnesota Historical Aerial Photographs Online. University of Minnesota, Minneapolis, MN. Available at: <https://apps.lib.umn.edu/mhapo/>, accessed June 19, 2025.

W.W. Hixson & Co.

- 1916 *Plat Book of the State of Minnesota*. W.W. Hixson & Co. Rockford, Illinois. Electronic resource, <https://www.lib.umn.edu/collections/borchert/digitized-plat-maps-and-atlases#s-44771>, accessed June 19, 2025.

Waldman, Carl

- 2006 *Encyclopedia of Native American Tribes*. Checkmark Books, an imprint of Infobase Publishing. New York.

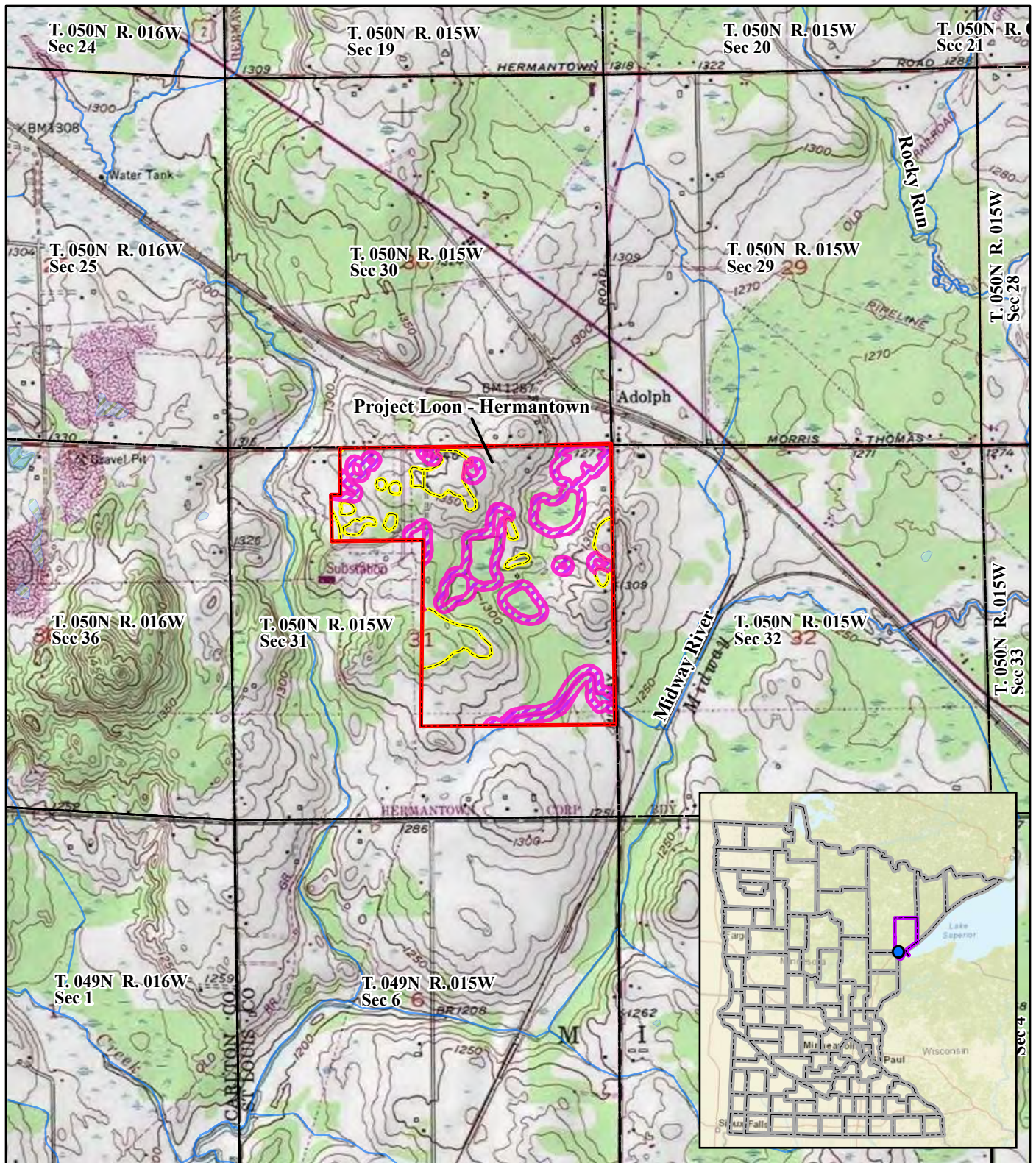
Woodbridge, Dwight and John Pardef (editors)

- 1910 *History of Duluth and St. Louis County: Past and Present*. C.F Cooper & Company, Chicago.

Wright, H. E. Jr.

1972 Physiology of Minnesota. In *Geology of Minnesota: A Centennial Volume*. pp. 561-578. Minnesota Geological Society.

FIGURES



Legend

- Project Area
- Wetland AOI Survey Area
- Resource Potential Survey Area
- Township/Range/Section
- Stream/River
- Waterbody
- Project Location
- St. Louis County
- County Boundary



1:24,000

Approximate Scale in Feet

1 inch equals 2,000 feet

2,000 0 2,000 4,000

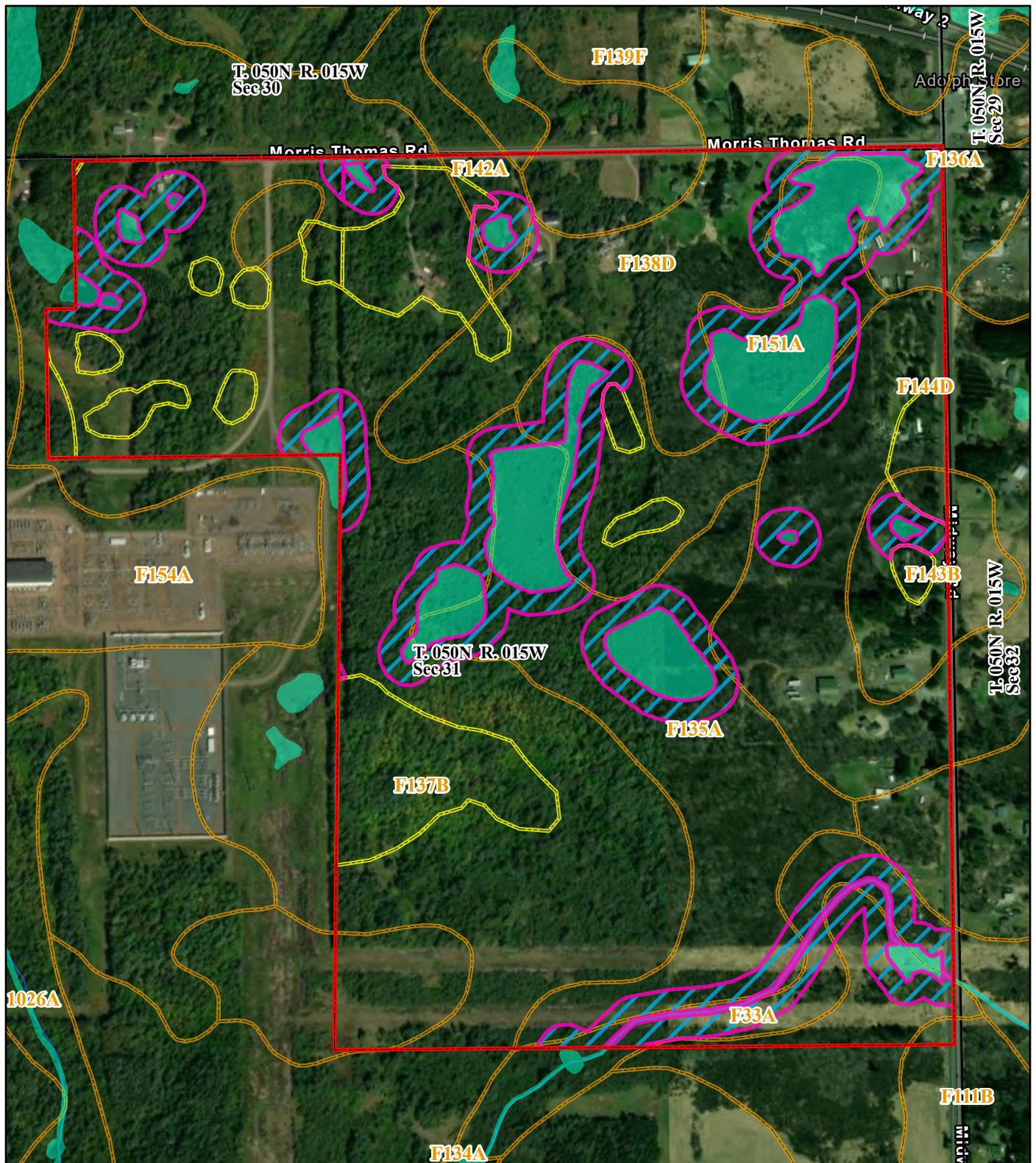
TOPOGRAPHIC MAP

Project Loon - Hermantown
St. Louis County, Minnesota

Note: Imagery courtesy of ESRI

Figure 1. Project location on the USGS 1993 Adolph, MN 7.5 minute series topographic map.





Legend

- | | |
|---|--|
| Project Area | Resource Potential Survey Area |
| Soils | Township/Range/Section |
| Wetland | — Stream/River |
| Wetland AOI Survey Area | Waterbody |



1:7,500
 Approximate Scale in Feet
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 1 inch equals 625 feet

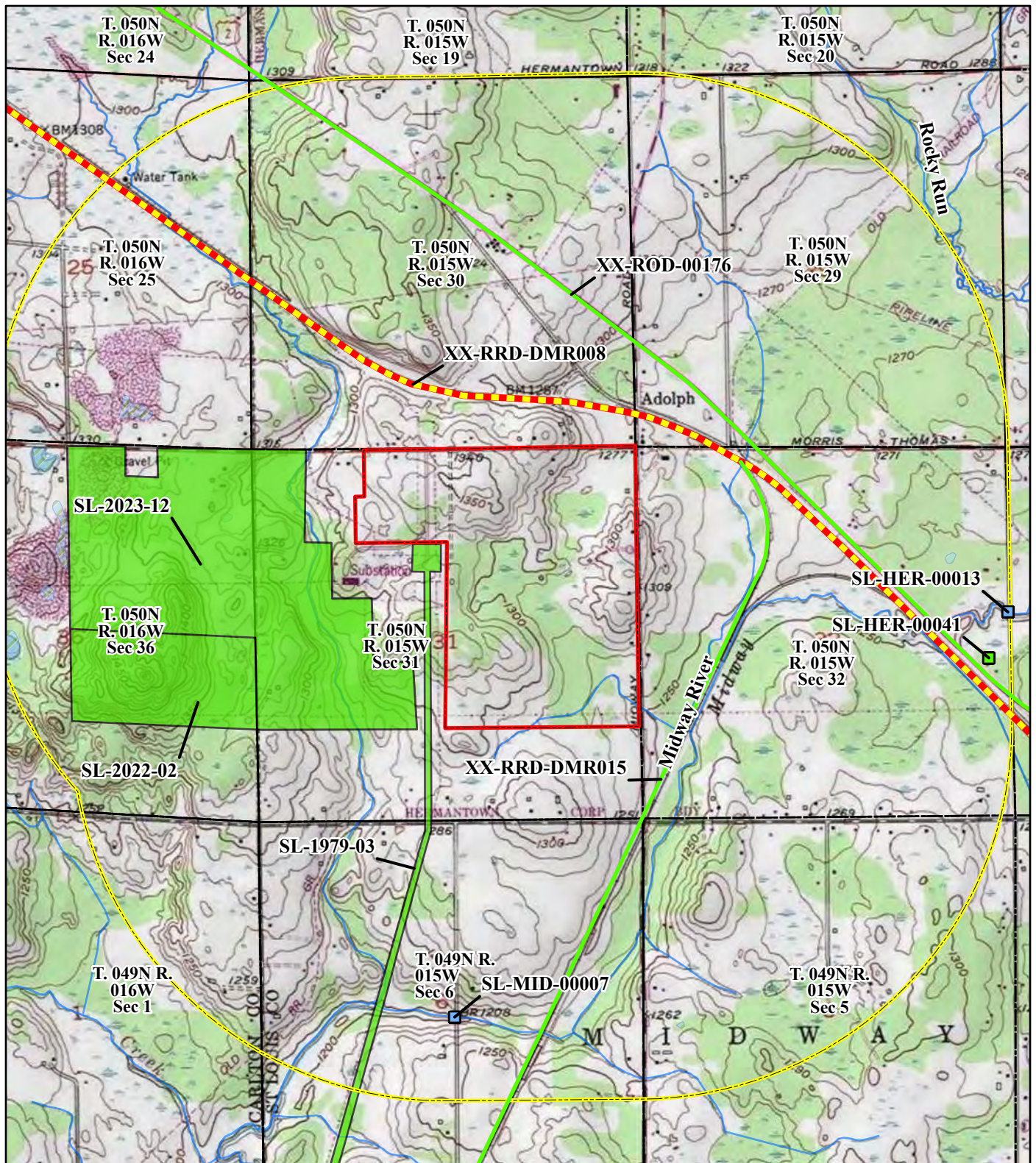
AERIAL MAP

Project Loon - Hermantown
 St. Louis County, Minnesota

Note: Imagery courtesy of ESRI

Figure 2. Project location on an aerial map.





Legend

- | | |
|--|---|
| ■ Not Eligible Architecture Resource | □ Project Area |
| ■ Unevaluated Architecture Resource | □ 1-Mile Study Area |
| — Eligible Linear Architecture Resource | □ Township/Range/Section |
| — Not Eligible Linear Architecture Resource | — Stream/River |
| ■ Previous Inventory/Survey | — Waterbody |



1:24,000

Approximate Scale in Feet

1 inch equals 2,000 feet

2,000 0 2,000 4,000

LITERATURE REVIEW TOPOGRAPHIC MAP

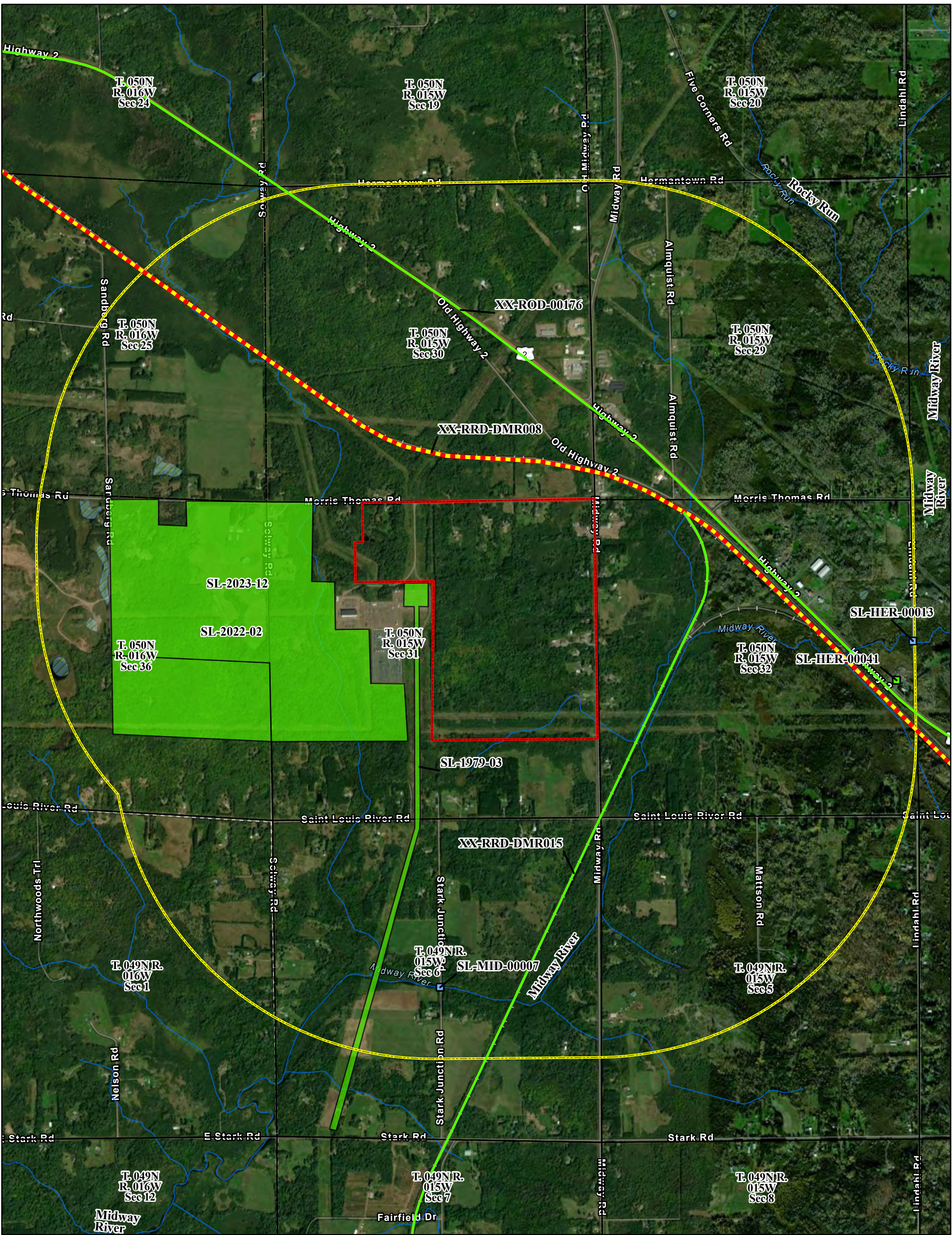
Project Loon - Hermantown
St. Louis County, Minnesota

REDACTED FOR PUBLIC DISCLOSURE
Archaeological Data Redacted to Protect Resources

Note: Imagery courtesy of ESRI

Figure 3. Topographic map with previous
cultural resources surveys and
previously recorded sites.





Not Eligible Architecture Resource

Unevaluated Architecture Resource

Eligible Linear Architecture Resource

Not Eligible Linear Architecture Resource

Previous Inventory/Survey

Project Area

1-Mile Study Area

Township/Range/Section

Stream/River

Waterbody

N

W

E

S

1,500

0

1,500

Feet

1:18,000

1 inch equals 1,500 feet

LITERATURE REVIEW

AERIAL MAP

Project Loon - Hermantown

St. Louis County, Minnesota

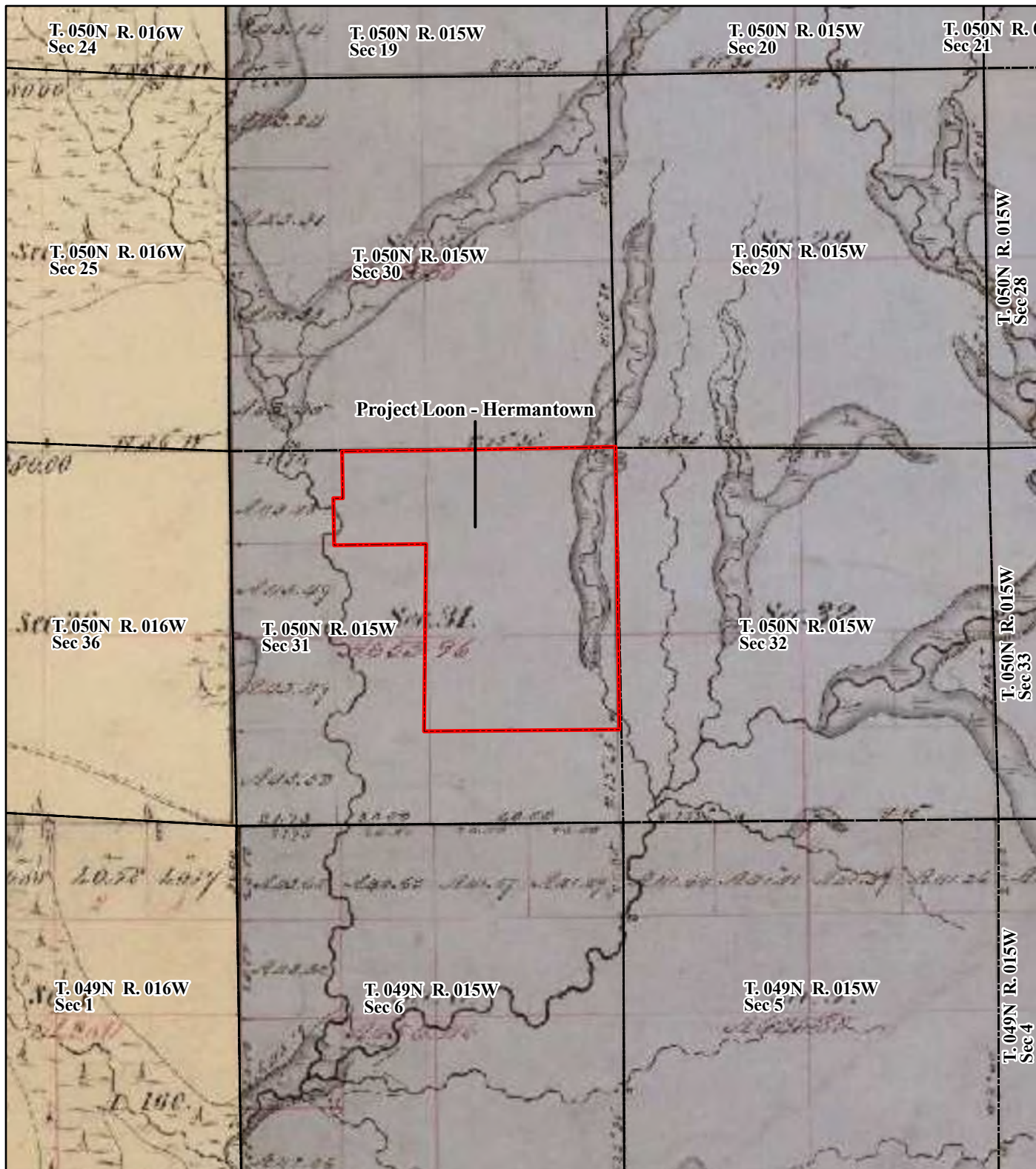
REDACTED FOR PUBLIC DISCLOSURE

Archaeological Data Redacted to

Protect Resources

Note: Aerial Imagery courtesy of ESRI

Figure 4. Aerial map with previous cultural resources surveys and previously recorded sites.



Legend

- Project Area
- Township/Range/Section



1:24,000
Approximate Scale in Feet
1 inch equals 2,000 feet
2,000 0 2,000 4,000

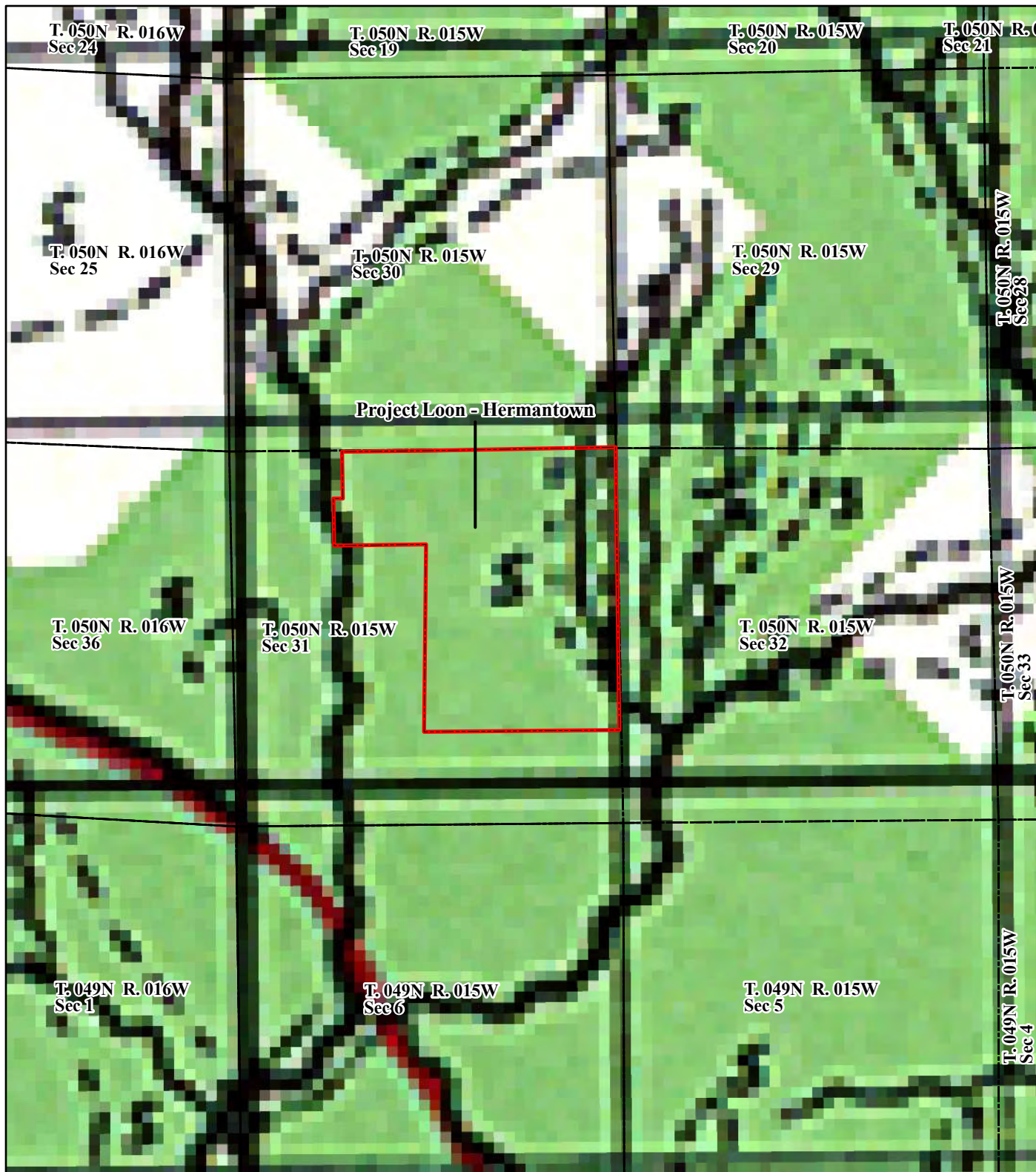
HISTORICAL BLM GLO PLAT MAP

Project Loon - Hermantown
St. Louis County, Minnesota

Note: Imagery courtesy of the U.S. Department of the Interior Bureau of Land Management.

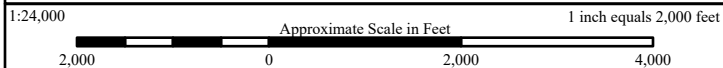
Figure 5A. Project location on the 1857 BLM GLO Plat map.





Legend

- Project Area
- Township/Range/Section



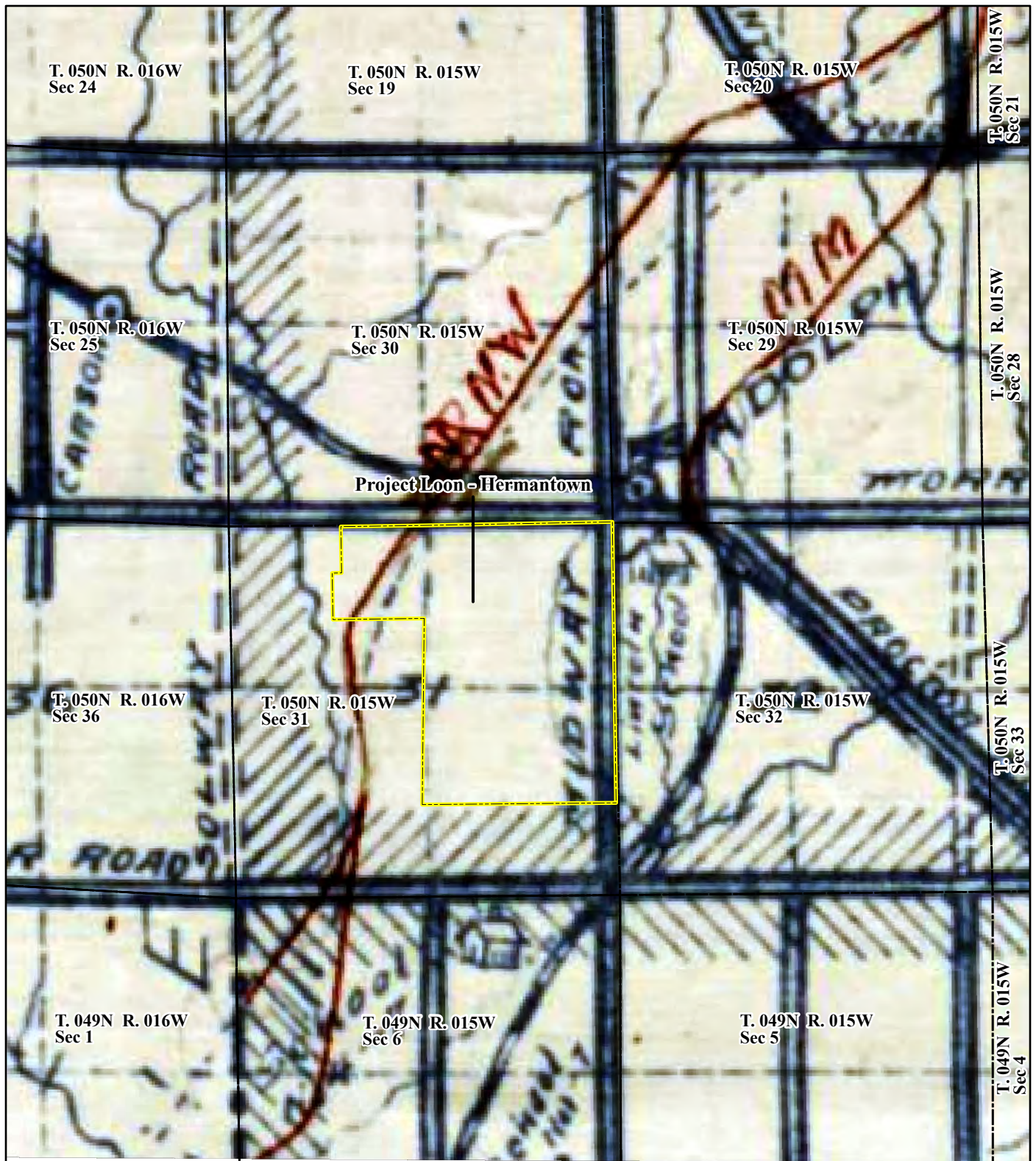
TRYGG MAP

Project Loon - Hermantown
St. Louis County, Minnesota

Note: Imagery courtesy of Trygg Historical Maps.

Figure 5B. Project location on the Historical Trygg Map published in 1966.





Legend

- Project Area
- Township/Range/Section



1:24,000

Approximate Scale in Feet

1 inch equals 2,000 feet

2,000 0 2,000 4,000

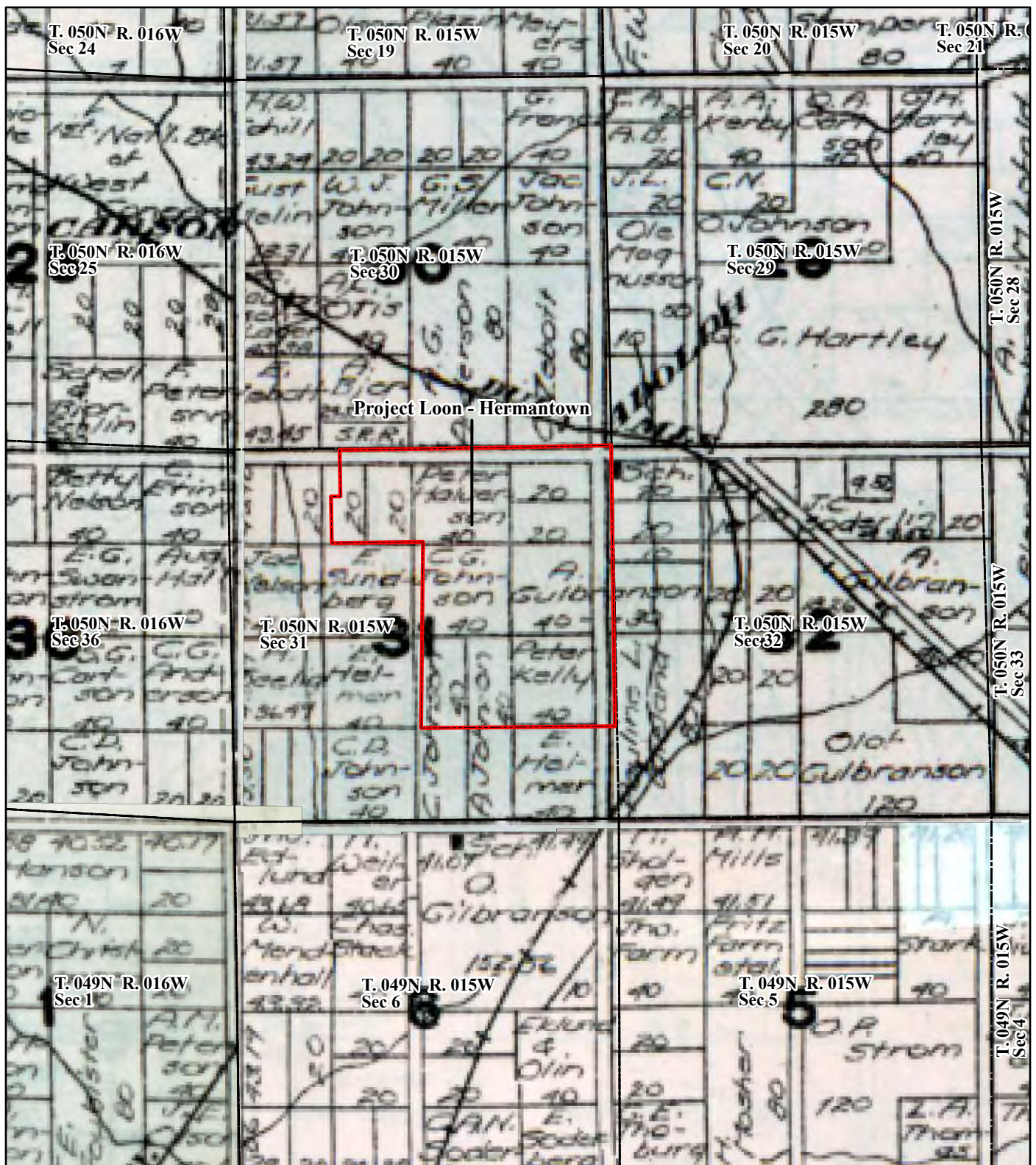
HISTORICAL TOPOGRAPHIC MAP

Project Loon - Hermantown
St. Louis County, Minnesota

Note: Imagery courtesy of the Minnesota Digital Library.

Figure 5C. Project location on a 1915 map of the south part of St. Louis county.





Legend

- ▭ Project Area
- Township/Range/Section



1:24,000
Approximate Scale in Feet
1 inch equals 2,000 feet
2,000 0 2,000 4,000

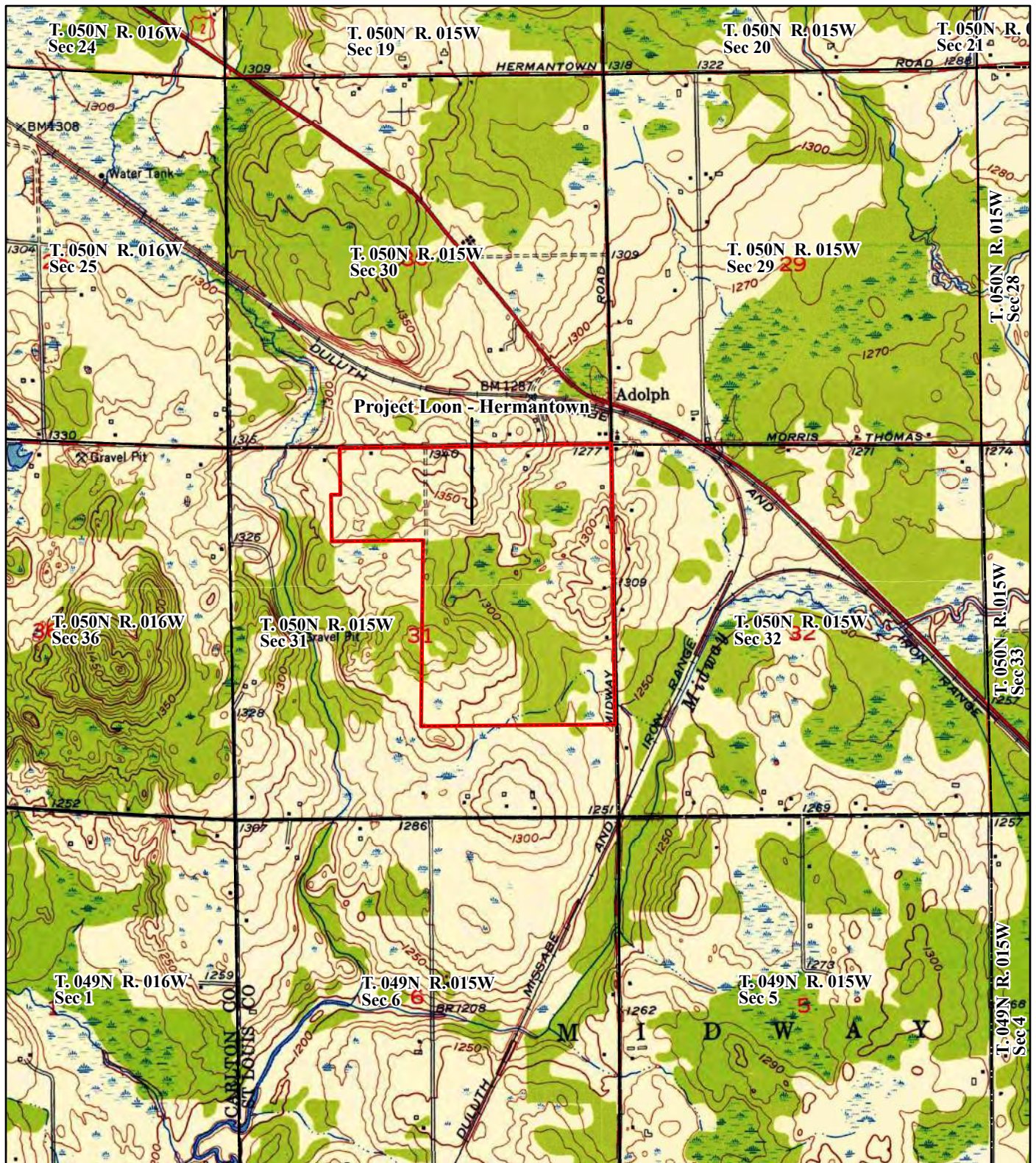
1916 PLAT MAP

Project Loon - Hermantown
St. Louis County, Minnesota

Note: Imagery courtesy of the Minnesota Digital Library.

Figure 5D. Project location on a 1916 plat map.





Legend

- Project Area
- Township/Range/Section



1:24,000
Approximate Scale in Feet
1 inch equals 2,000 feet
2,000 0 2,000 4,000

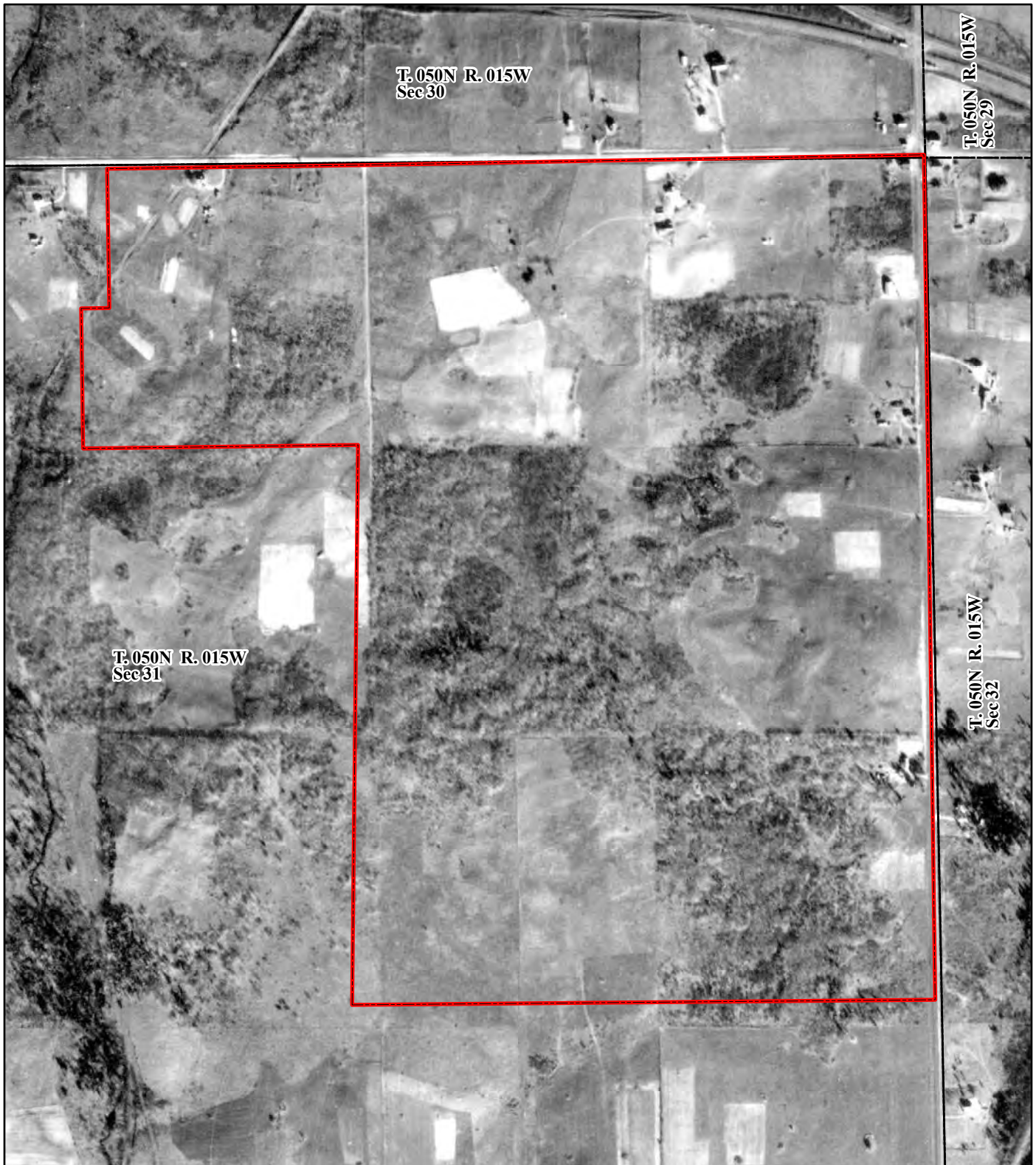
HISTORICAL TOPOGRAPHIC MAP

Project Loon - Hermantown
St. Louis County, Minnesota

Note: Imagery courtesy of the USGS.

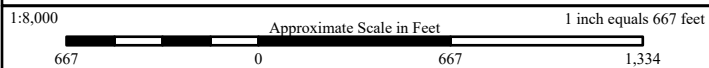
Figure 5E. Project location on the 1953
Adolph, MN 24,000 series topographic map.





Legend

-  Project Area
-  Township/Range/Section

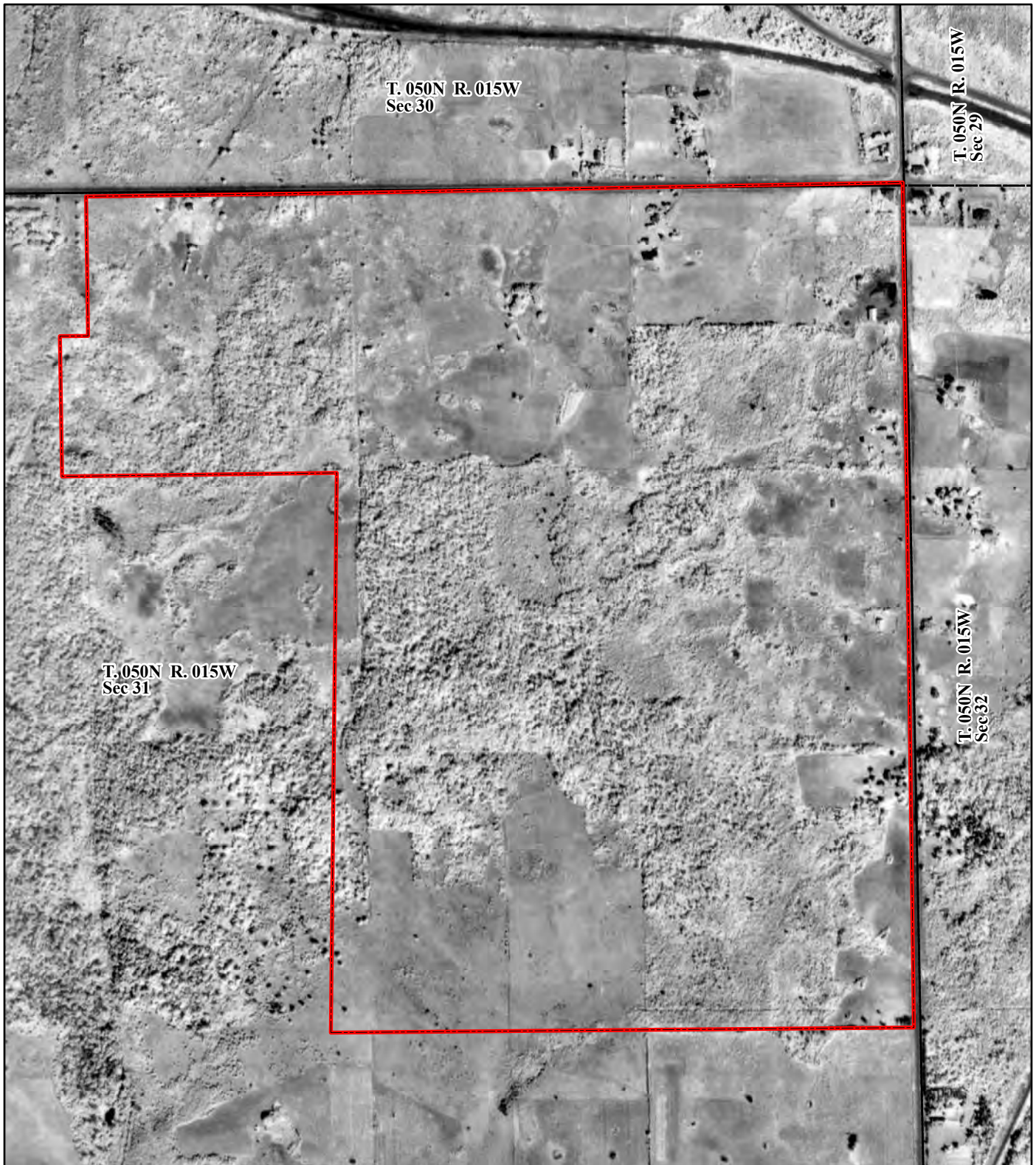


1939 AERIAL MAP
Project Loon - Hermantown
St. Louis County, Minnesota

Note: Imagery courtesy of MHAPO.

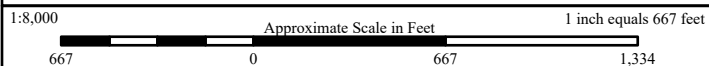
Figure 5F. Project location on 1939 aerial imagery.





Legend

-  Project Area
-  Township/Range/Section



1961 AERIAL MAP
Project Loon - Hermantown
St. Louis County, Minnesota

Note: Imagery courtesy of MHAPO.

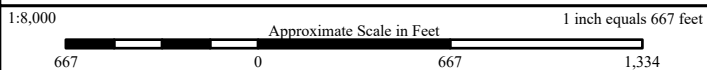
Figure 5G. Project location on 1961 aerial imagery.





Legend

- Project Area
- Township/Range/Section

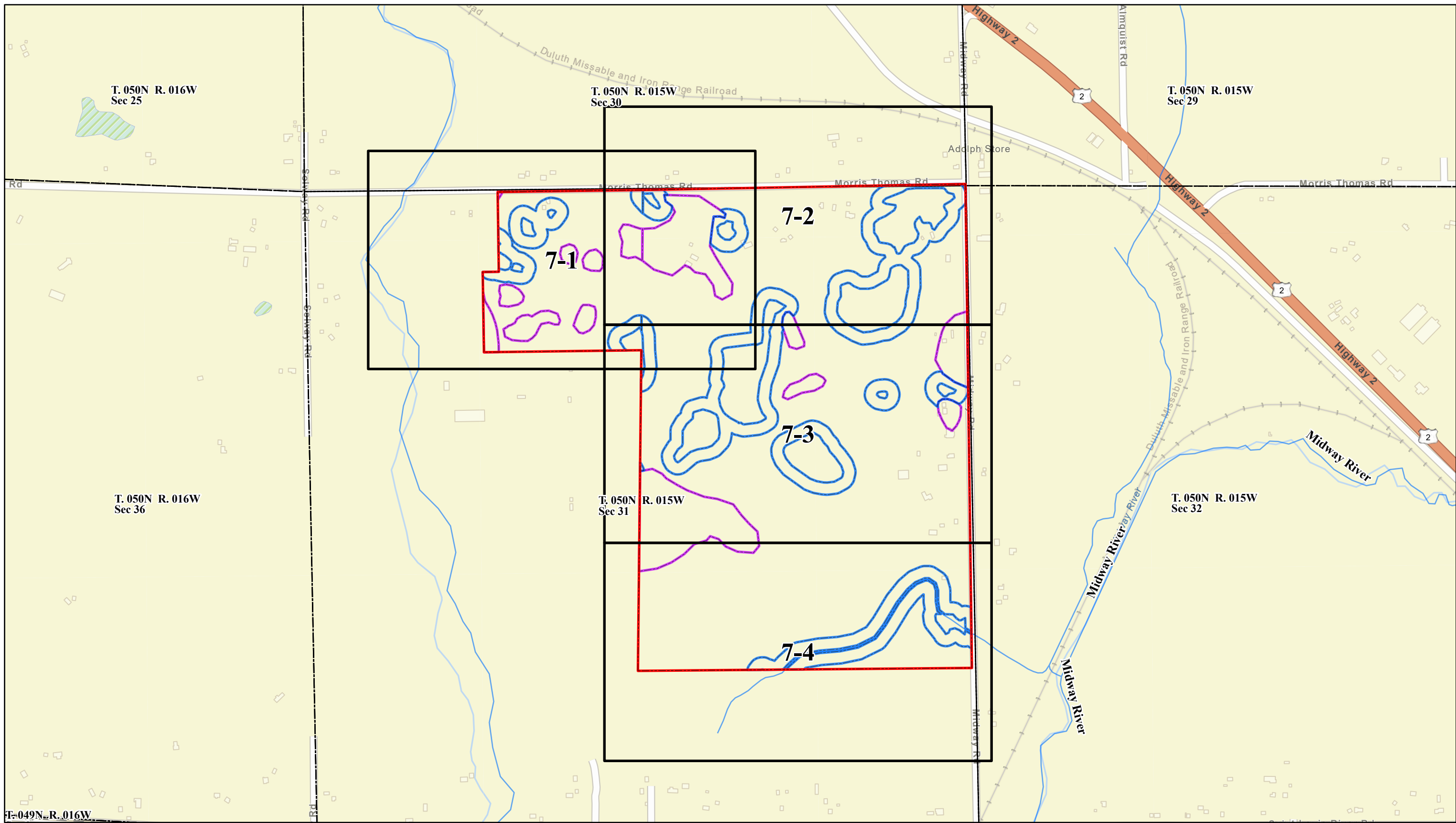


1981 AERIAL MAP
Project Loon - Hermantown
St. Louis County, Minnesota

Note: Imagery courtesy of MHAPO.

Figure 5H. Project location on 1981 aerial imagery.





Mapbook Page

Project Area

Wetland AOI Survey Area

Survey Area

Township/Range/Section

Stream/River

Waterbody

N

W

E

S

**FIELDWORK MAP
(OVERVIEW)**

Project Loon - Hermantown
St. Louis County, Minnesota

750

375

0

750

Approximate Scale in Feet

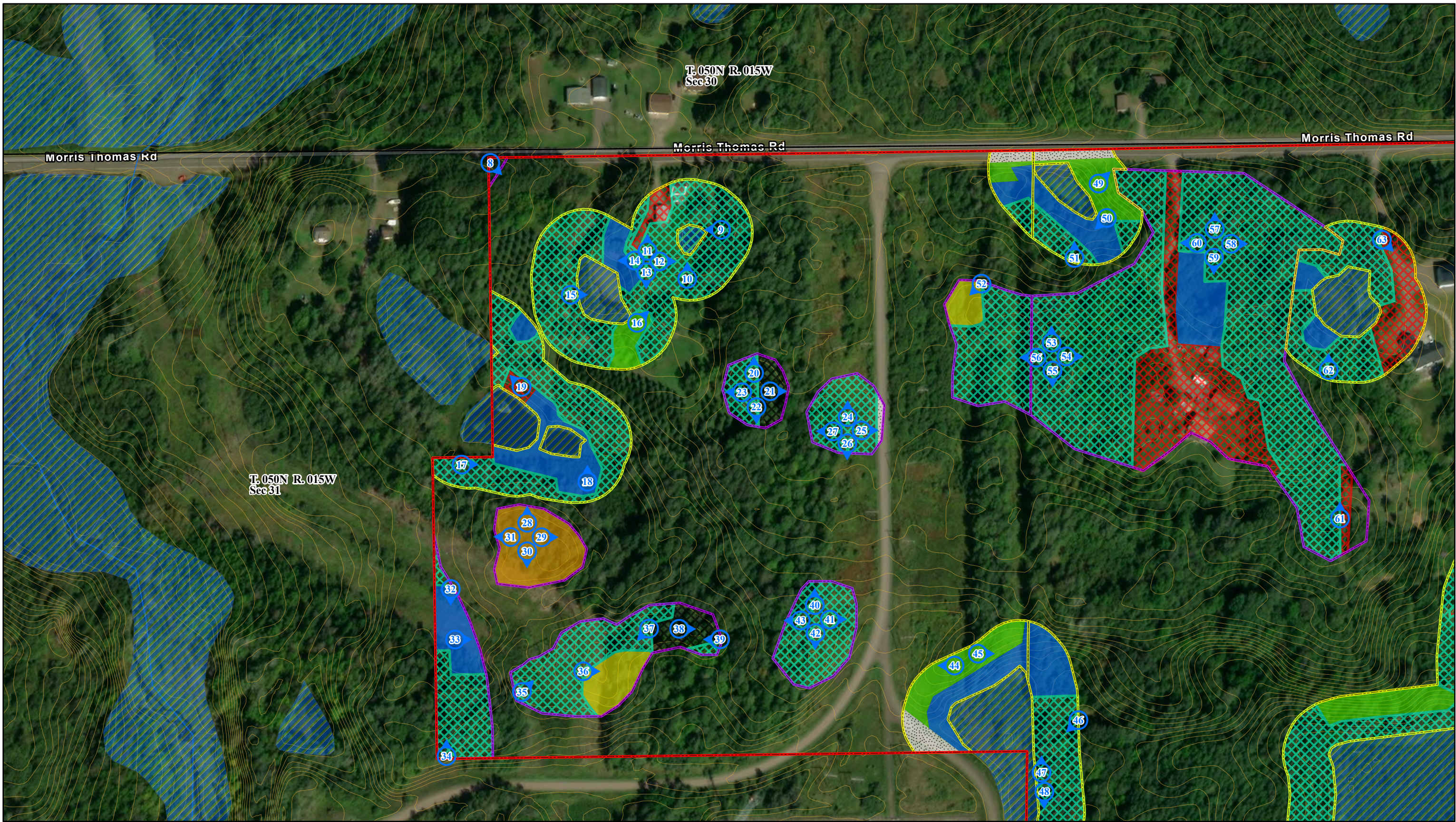
1:9,000

1 inch equals 750 feet

Note: Imagery courtesy of ESRI

Figure 6. Political map showing the mapbook layout for the fieldwork map of the project indicating the results of testing and photo orientations.

N



Legend

Photo Orientation	Road/Path	Resource Potential Survey Area
Disturbed-Construction	Sloped Conditions	Wetland
Low Potential-Low Lying Area	Wetland Conditions	Township/Range/Section
Rural Development/Private Property	Shovel Testing Area	Stream/River
Pedestrian Survey	Project Area	2-ft Contour
	Wetland AOI Survey Area	

**FIELDWORK MAP
(DETAILED)**

Project Loon - Hermantown
St. Louis County, Minnesota

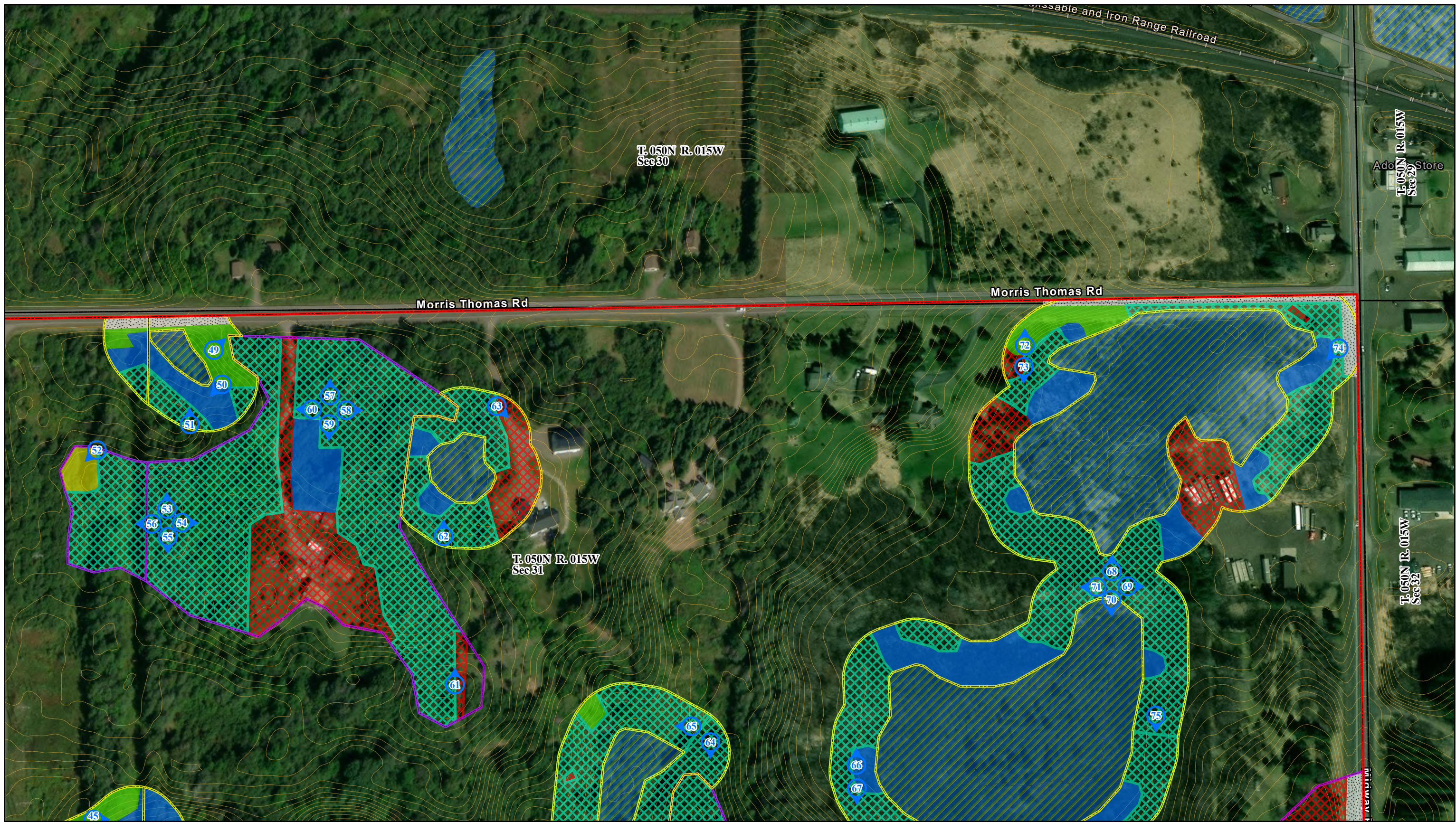
REDACTED FOR PUBLIC DISCLOSURE
Archaeological Data Redacted to
Protect Resources

200 100 0 200
Approximate Scale in Feet

1:2,400 1 inch equals 200 feet

Note: Imagery courtesy of ESRI

Figure 7-1. Fieldwork map of the project indicating the results of testing and photo orientations.



Legend				FIELDWORK MAP (DETAILED) Project Loon - Hermantown St. Louis County, Minnesota REDACTED FOR PUBLIC DISCLOSURE Archaeological Data Redacted to Protect Resources		
Photo Orientation	Road/Path				Wetland AOI Survey Area	
Disturbed-Construction	Sloped Conditions	Resource Potential Survey Area	Wetland Conditions	Wetland		Figure 7-2. Fieldwork map of the project indicating the results of testing and photo orientations.
Low Potential-Low Lying Area	Shovel Testing Area	Township/Range/Section	Project Area	2-ft Contour		
Rural Development/Private Property						
Pedestrian Survey						



Legend

Photo Orientation	Road/Path	Wetland AOI Survey Area
Disturbed-Construction	Sloped Conditions	Resource Potential Survey Area
Low Potential-Low Lying Area	Wetland Conditions	Wetland
Rural Development/Private Property	Shovel Testing Area	Township/Range/Section
Pedestrian Survey	Project Area	2-ft Contour

FIELDWORK MAP (DETAILED)

Project Loon - Hermantown
St. Louis County, Minnesota

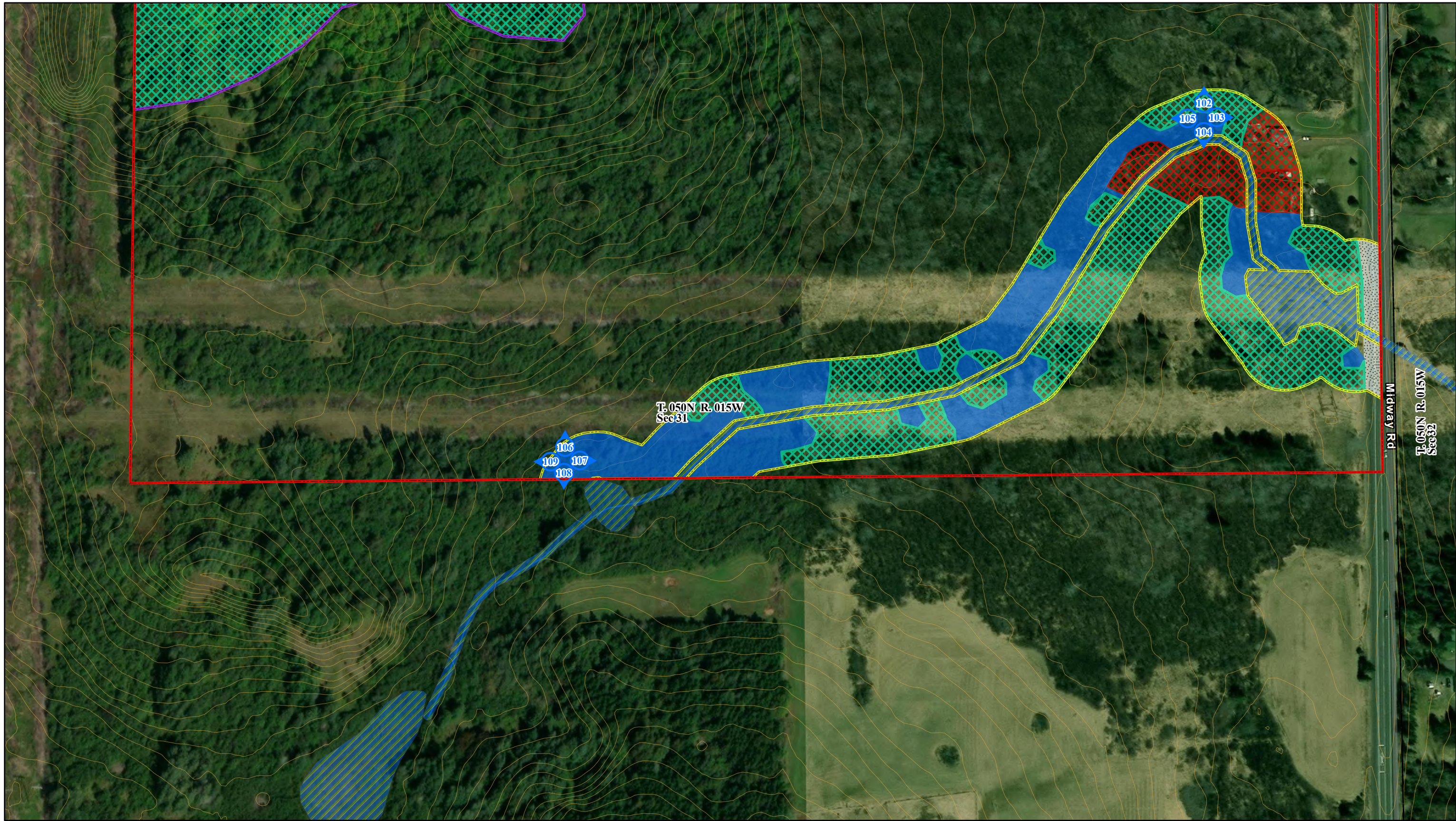
REDACTED FOR PUBLIC DISCLOSURE
Archaeological Data Redacted to Protect Resources

200 100 0 200
Approximate Scale in Feet

1:2,400 1 inch equals 200 feet

Note: Imagery courtesy of ESRI

Figure 7-3. Fieldwork map of the project indicating the results of testing and photo orientations.



Legend		
Photo Orientation	Road/Path	Resource Potential Survey Area
Disturbed-Construction	Sloped Conditions	Wetland
Low Potential-Low Lying Area	Wetland Conditions	Township/Range/Section
Rural Development/Private Property	Shovel Testing Area	Stream/River
Pedestrian Survey	Project Area	2-ft Contour
	Wetland AOI Survey Area	

FIELDWORK MAP (DETAILED)

Project Loon - Hermantown
St. Louis County, Minnesota

REDACTED FOR PUBLIC DISCLOSURE
Archaeological Data Redacted to Protect Resources

200 100 0 200

Approximate Scale in Feet

1:2,400 1 inch equals 200 feet

Note: Imagery courtesy of ESRI

Figure 7-4. Fieldwork map of the project indicating the results of testing and photo orientations.



Figure 8: View facing southeast within the survey area (shovel test area) (R0016489).



Figure 9: View facing west within the survey area (shovel test area) (R0017052).



Figure 10: View facing north within the survey area (shovel test area) (R0017044).



Figure 11: View facing north within the survey area (shovel test area/existing private farmland) (R0017014).



Figure 12: View facing east within the survey area (shovel test area) (R0017016).



Figure 13: View facing south within the survey area (shovel test area) (R0017018).



Figure 14: View facing west within the survey area (shovel test area/wetland) (R0017020).



Figure 15: View facing east within the survey area (wetland conditions) (R0017029).



Figure 16: View facing northeast within the survey area (sloped conditions/shovel test area) (IMG_0084).



Figure 17: View facing east within the survey area (shovel test area) (IMG_0074).



Figure 18: View facing north within the survey area (wetland conditions) (IMG_0069).



Figure 19: View facing northwest within the survey area (manicured lawn/private property) (R0016492).



Figure 20: View facing north within the survey area (shovel test area) (R0016538).



Figure 21: View facing east within the survey area (disturbed/construction) (R0016526).



Figure 22: View facing south within the survey area (shovel test area) (R0016542).



Figure 23: View facing west within the survey area (shovel test area) (R0016544).



Figure 24: View facing north within the survey area (shovel test area) (R0016530).



Figure 25: View facing east within the survey area (shovel test area) (R0016532).



Figure 26: View facing south within the survey area (shovel test area) (R0016534).



Figure 27: View facing west within the survey area (shovel test area) (R0016536).



Figure 28: View facing north within the survey area (low potential-low lying area) (R0016554).



Figure 29: View facing east within the survey area (low potential-low lying area) (R0016556).



Figure 30: View facing south within the survey area (low potential-low lying area) (R0016558).



Figure 31: View facing west within the survey area (low potential-low lying area) (R0016560).



Figure 32: View facing south within the survey area (wetland conditions) (R0016614).



Figure 33: View facing east within the survey area (wetland conditions) (R0016602).



Figure 34: View facing north within the survey area (shovel test area) (R0016609).



Figure 35: View facing northeast within the survey area (shovel test area) (R0016596).



Figure 36: View facing east within the survey area (pedestrian survey-construction 90% GSV) (R0016562).



Figure 37: View facing southwest within the survey area (shovel test area/pedestrian survey) (R0016579).



Figure 38: View facing east within the survey area (disturbed-construction) (R0016575).



Figure 39: View facing west within the survey area (disturbed-construction) (R0016616).



Figure 40: View facing north within the survey area (shovel test area) (R0016546).



Figure 41: View facing east within the survey area (shovel test area) (R0016548).



Figure 42: View facing south within the survey area (shovel test area) (R0016550).



Figure 43: View facing west within the survey area (shovel test area) (R0016552).



Figure 44: View facing west within the survey area (sloped conditions) (R0016857).



Figure 45: View facing east within the survey area (sloped conditions) (R0016856).



Figure 46: View facing southwest within the survey area (shovel test area) (R0016829).



Figure 47: View facing north within the survey area (shovel test area) (R0016832).



Figure 48: View facing south within the survey area (shovel test area) (R0016834).



Figure 49: View facing northeast within the survey area (sloped conditions) (R0016896).



Figure 50: View facing southwest within the survey area (wetland conditions) (R0016897).



Figure 51: View facing north within the survey area (shovel test area) (R0016898).



Figure 52: View facing southwest within the survey area (pedestrian survey-construction 90% GSV) (R0016676).



Figure 53: View facing north within the survey area (shovel test area) (R0016662).



Figure 54: View facing east within the survey area (shovel test area) (R0016664).



Figure 55: View facing south within the survey area (shovel test area) (R0016666).



Figure 56: View facing west within the survey area (shovel test area) (R0016668).



Figure 57: View facing north within the survey area (shovel test area) (R0016720).



Figure 58: View facing east within the survey area (shovel test area) (R0016722).



Figure 59: View facing south within the survey area (shovel test area) (R0016724).



Figure 60: View facing west within the survey area (shovel test area) (R0016727).



Figure 61: View facing north within the survey area (manicured lawn/private property) (R0016807).



Figure 62: View facing north within the survey area (shovel test area) (R0017100).



Figure 63: View facing east within the survey area (existing private farmland) (R0017007).



Figure 64: View facing south within the survey area (shovel test area) (R0017139).



Figure 65: View facing west within the survey area (shovel test area) (R0017140).



Figure 66: View facing north within the survey area (shovel test area/wetland) (R0016925).



Figure 67: View facing south within the survey area (shovel test area) (R0016927).



Figure 68: View facing north within the survey area (shovel test area) (R0016935).



Figure 69: View facing east within the survey area (shovel test area) (R0016936).



Figure 70: View facing south within the survey area (shovel test area) (R0016937).



Figure 71: View facing west within the survey area (shovel test area) (R0016938).



Figure 72: View facing north within the survey area (sloped conditions) (R0016973).



Figure 73: View facing south within the survey area (shovel test area) (R0016975).



Figure 74: View facing southwest within the survey area (wetland conditions) (R0016982).



Figure 75: View facing south within the survey area (shovel test area) (R0016912).



Figure 76: View facing north within the survey area (shovel test area) (R0016874).



Figure 77: View facing east within the survey area (shovel test area) (R0016875).



Figure 78: View facing south within the survey area (shovel test area) (R0016876).



Figure 79: View facing west within the survey area (shovel test area) (R0016877).



Figure 80: View facing northwest within the survey area (shovel test area) (R0018401).



Figure 81: View facing southeast within the survey area (shovel test area/private property) (R0018397).



Figure 82: View facing north within the survey area (private property) (R0018402).



Figure 83: View facing south within the survey area (private property) (R0018404).



Figure 84: View facing east within the survey area (shovel test area) (R0018386).



Figure 85: View facing west within the survey area (shovel test area) (R0018388).



Figure 86: View facing north within the survey area (shovel test area) (R0017168).



Figure 87: View facing east within the survey area (shovel test area) (R0017169).



Figure 88: View facing south within the survey area (shovel test area) (R0017170).



Figure 89: View facing west within the survey area (shovel test area) (R0017171).



Figure 90: View facing north within the survey area (shovel test area) (R0017084).



Figure 91: View facing east within the survey area (shovel test area) (R0017086).



Figure 92: View facing south within the survey area (shovel test area) (R0017088).



Figure 93: View facing west within the survey area (shovel test area) (R0017090).



Figure 94: View facing north within the survey area (low potential-low lying area) (R0016765).



Figure 95: View facing east within the survey area (low potential-low lying area) (R0016766).



Figure 96: View facing south within the survey area (shovel test area) (R0016767).



Figure 97: View facing west within the survey area (shovel test area) (R0016768).



Figure 98: View facing north within the survey area (shovel test area) (R0017208).



Figure 99: View facing east within the survey area (shovel test area) (R0017209).



Figure 100: View facing south within the survey area (shovel test area) (R0017210).



Figure 101: View facing west within the survey area (shovel test area) (R0017211).



Figure 102: View facing north within the survey area (shovel test area) (R0018314).



Figure 103: View facing east within the survey area (shovel test area/wetland) (R0018315).



Figure 104: View facing south within the survey area (wetland conditions) (R0018316).



Figure 105: View facing west within the survey area (shovel test area/wetland) (R0018317).



Figure 106: View facing north within the survey area (wetland conditions) (R0018189).



Figure 107: View facing east within the survey area (wetland conditions) (R0018190).



Figure 108: View facing south within the survey area (wetland conditions) (R0018191).



Figure 109: View facing west within the survey area (wetland conditions) (R0018192).



Figure 110A. View of typical ground surface visibility (90%) for pedestrian project within the project area (R0016570/R0016678).



Figure 110B: View of typical low-lying area with low cultural resource potential within the project area (R0016554/R0016773).



Figure 110C: View of typical rural development/private property within the project area (R0016940/R0016716).



Figure 110D: View of typical disturbed conditions (roads) within the project area (R0016813/R0016821).



Figure 110E: View of typical disturbed conditions (construction activity) within the project area (R0016567/R0016562).



Figure 110F: View of typical sloped conditions within the project area (R0016857/R0016856).



Figure 110G: View of typical wetland conditions within the project area (R0016779/R0016961).



Representative shovel test photo.



Representative soil profile photo.

Representative Shovel Test Soil Profile

Scale

0 cm

20 cm

40 cm

60 cm

80 cm

100 cm

120 cm

Soil Series: Normanna-Canosia-Hermantown-complex (F137B)

Depth to Subsoil: 37 cm

Depth to Terminus: 102 cm

Date: 07/30/2025



A: 10YR3/3 Dark brown silt loam (0-24 cm)



B: 10YR3/6 Dark yellowish brown sand loam (24-37 cm); glacial till at 36cm



C: 10YR4/4 Dark yellowish brown sand loam (37-102 cm)



Figure 111B: View of glacial till from shovel testing units (R0016757/R0016652).



Representative shovel test photo.



Representative soil profile photo.

Representative Hydric Shovel Test Soil Profile

Scale

0 cm

20 cm

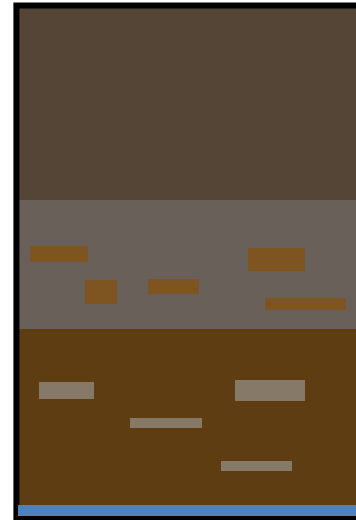
40 cm

60 cm

80 cm

100 cm

120 cm



Soil Series: Normanna-Canosia-Hermantown complex (F137B)

Depth to Subsoil: 22 cm

Depth to Terminus: 59 cm

Date: 08/05/2025



A: 10YR3/2 Very dark grayish brown silt loam (0-22 cm)



B: 60% 10YR4/1 Dark gray silt mottled with 40% 10YR4/6 Dark yellowish brown silt loam (22-37 cm)



Bw: 70% 10YR3/6 Dark yellowish brown sandy loam mottled with 30% 10YR5/2 grayish brown sandy loam; water table reached (37-59 cm)



Representative shovel test photo.



Representative soil profile photo.

Representative Disturbed Shovel Test Soil Profile

Scale

0 cm

20 cm

40 cm

60 cm

80 cm

100 cm

120 cm



Soil Series: Aldenlake-Ahmeek complex (F144D)

Depth to Subsoil: 68 cm

Depth to Terminus: 85 cm

Date: 09/25/2025



A: 5YR3/3 Dark reddish brown coarse gravely fill dirt (0-68 cm)



B: 7.5YR3/4 Dark brown loamy sand (68-85 cm)

Figure 114: Site 21SL1302 location on a topographic map.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]

Figure 115: Site 21SL1302 location on aerial imagery.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]

Figures 116-120: Site 21SL1302 overview photographs.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]



Figure 121: Artifacts collected from positive shovel test FS 1-1 within site 21SL1302 (DSCN9697).



Figure 122: Artifacts collected from positive shovel test FS 1-2 within site 21SL1302 (DSCN9698).



Figure 123: Artifacts collected from positive shovel test FS 1-3 within site 21SL1302 (DSCN9701).



Figure 124: Artifacts collected from positive shovel test FS 1-4 within site 21SL1302 (DSCN9704).



Figure 125: Artifacts collected from positive shovel test FS 2-1 within site 21SL1302 (DSCN9707).



Figure 126: WWI Era Royal Canadian Engineers Officer's cap badge recovered from FS 2-1 within site 21SL1302 - front (DSCN9708).



Figure 127: WWI Era Royal Canadian Engineers Officer's cap badge recovered from FS 2-1 within site 21SL1302 - back (DSCN9709).

Figure 128: Site IS-LOON-02 location on a topographic map.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]

Figure 129: Site IS-LOON-02 location on aerial imagery.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]

Figures 130-131: Site IS-LOON-02 overview photographs.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]



Figure 132: View of Chevrolet truck (H1) (R0016654).



Figure 133: View of mirror trademark (R0016658).



Figure 134: View of Chevrolet logo (R0016659).



Figure 135: View of manufacturing plate (R0016661).

Figure 136: Site IS-LOON-03 location on a topographic map.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]

Figure 137: Site IS-LOON-03 location on aerial imagery.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]

Figures 138-139: Site IS-LOON-03 overview photographs.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]



Figure 140: View of Dodge Brothers vehicle (H1) (R0016689).



Figure 141: View of Dodge Brothers vehicle (H1) logo (R0016700).



Figure 142: View of Adams Leaning Wheel Grader No. 12 (H6) (R0016694).



Figure 143: View of Fordson tractor (H4) (R0016698).

Figure 144: Site IS-LOON-04 location on a topographic map.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]

Figure 145: Site IS-LOON-04 location on aerial imagery.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]

Figures 146-147: Site IS-LOON-04 overview photographs.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]



Figure 148: View of farm equipment (R0016711).



Figure 149: View of metal and wood frame with a belt and pulley system (H1) (R0016712).



Figure 150: View of farm equipment (R0016713).

Figure 151: Site IS-LOON-05 location on a topographic map.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]

Figure 152: Site IS-LOON-05 location on aerial imagery.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]

Figures 153-154: Site IS-LOON-05 overview photographs.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]



Figure 155: View of Chrysler car (H1) (R0016706).



Figure 156: View of car manufacturer plate (R0016709).

Figure 157: Historical 1939 aerial map showing rock pile locations.

[This figure has been redacted from the public version of this report in accordance with applicable cultural resource protection laws in order to protect archaeological resources.]



Figure 157: Overview facing south of a rock pile within the survey area (IMG_0098).



Figure 158: Overview facing west of a rock pile within the survey area (R0016810).



Figure 159: Overview facing north of a rock pile within the survey area (R0017127).



Figure 160: Overview facing northeast of a rock pile within the survey area (R0016903).



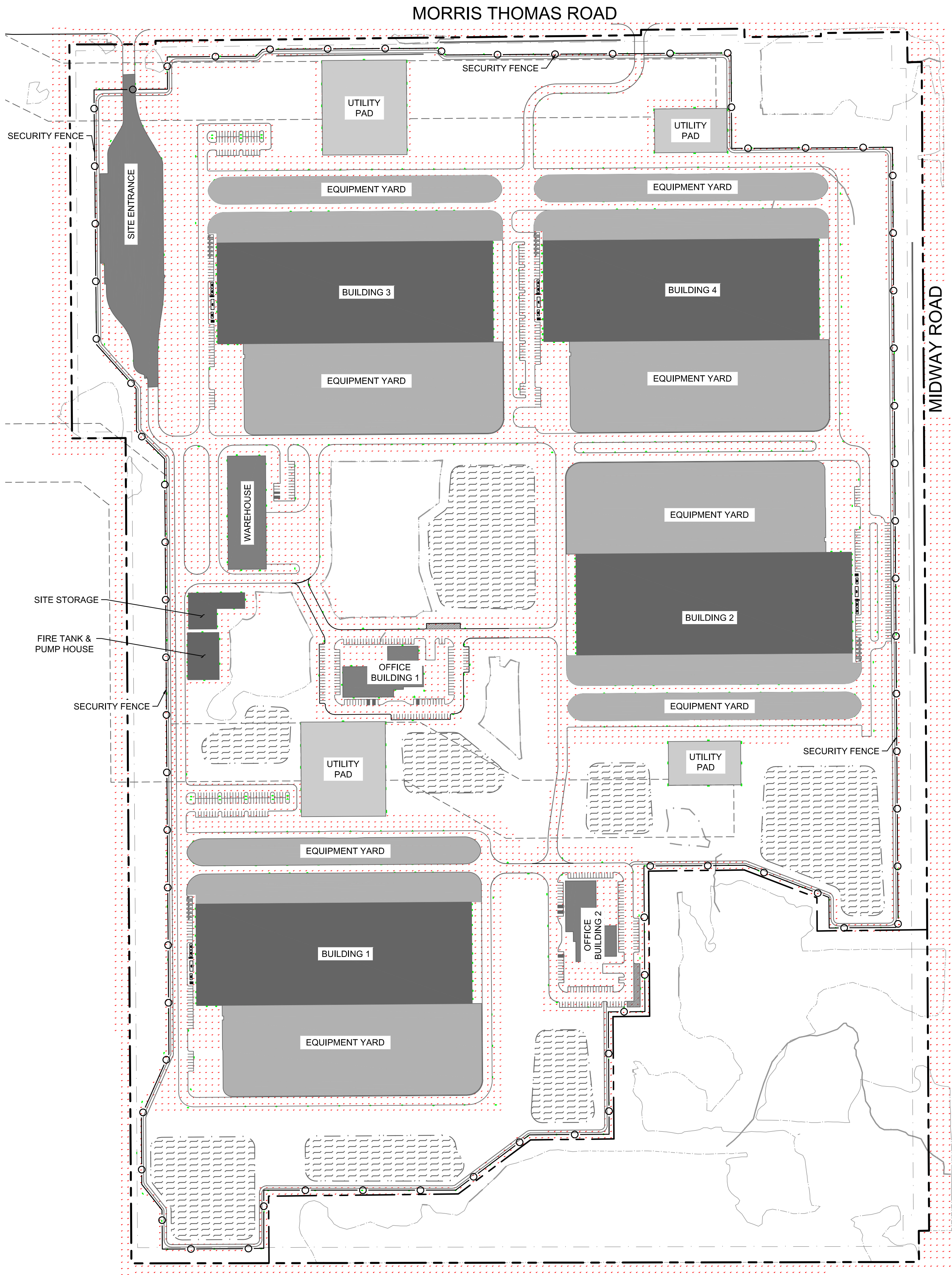
Figure 159: Overview facing north of a rock pile within the survey area (R0017127).



Figure 160: Overview facing northeast of a rock pile within the survey area (R0016903).

Appendix G: *Landscaping and Lighting Plans*

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

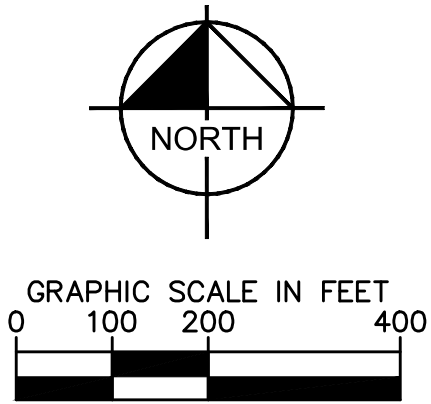


LEGEND

- PROPERTY LINE
- SETBACK LINE
- DRAINAGE AND UTILITY EASEMENT
- PROPOSED SECURITY FENCE
- PROPOSED RETAINING WALL
- PROPOSED CURB AND GUTTER
- WETLAND PRESERVATION
- STORM WATER MANAGEMENT
SEE GRADING PLAN FOR DETAILS
- PHOTOMETRIC MEASUREMENT (FC)
- LIGHTING FIXTURE

LIGHTING FIXTURE SCHEDULE										
TYPE	DESCRIPTION	MOUNTING	MANUFACTURER	MODEL	LAMP	WATTAGE	LUMENS OUTPUT	VOLTAGE	COLOR TEMP.	COMMENTS
SL1	LED SITE/AREA LIGHT, DIE CAST ALUMINUM HOUSING, ROUND TAPERED STEEL POLE WITH INTEGRAL VIBRATION DAMPENERS. TYPE 2 DISTRIBUTION, 91 LEVEL MOTION RESPONSE WITH INTEGRAL PASSIVE INFRARED SENSOR. LUMINAIRE, ARM, AND POLE TO HAVE MATCHING FINISH.	POLE	GARDCO	(1) ECF-S-32L-530-WW-G2-AR-2-4 80-BL-IMR17-MGY POLE: TRS-30H-5-DX-MGY-VDA	LED	56 W	7159 LM	480V	3000 K	
SL2	SAME AS SL1, TWO LUMINAIR HEADS MOUNTED 180 DEGREES APART.	POLE	GARDCO	(2) ECF-S-32L-1A-WW-G2-AR-3-48 0-BL-IMR17-MGY POLE: TRS-30H-5-DX-MGY-VDA	LED	212 W	25438 LM	480V	3000 K	
SL3	SAME AS SL1, TYPE 5 WIDE DISTRIBUTION	POLE	GARDCO	(1) ECF-S-32L-530-WW-G2-AR-SW-480-BL-IMR17-MGY	LED	56 W	7284 LM	480V	3000 K	
SW2	WALL SCÖNCE, DIE CAST ALUMINUM HOUSING, COMFORT TYPE 2	WALL	GARDCO	PWS-196L-450-WW-G2-2-480-BL-MGY	LED	21 W	2040 LM	480V	3000 K	
T2	LED SITE/AREA LIGHT, DIE CAST ALUMINUM HOUSING. LUMINAIRE AND ARM TO HAVE MATCHING FINISH. NOTE: HEADS TO BE MOUNTED ATOP CONCRETE SECURITY POLE.	POLE	GARDCO	(3 AT 289W) PFF-138L-700-WW-G2-SF-SP-HV U-SP2-MGY	LED	867 W	130857 LM	480V	3000 K	

PHOTOMETRIC CALCULATIONS			
CALCULATION ZONE NAME	AVERAGE (FC)	MINIMUM (FC)	MAXIMUM (FC)
NORTHERN PROPERTY LINE	0.0	0.0	0.4
EASTERN PROPERTY LINE	0.0	0.0	0.0
SOUTHERN PROPERTY LINE	0.0	0.0	0.1
WESTERN PROPERTY LINE	0.0	0.0	0.3



Know what's below.
Call before you dig.

HERMANTOWN INDUSTRIAL
PREPARED FOR
HARMONY GROUP LLC

HERMANTOWN MINNESOTA

OVERALL
PHOTOMETRIC
PLAN

KHA PROJECT
16133002
DATE
10/17/2025
SCALE AS SHOWN
DESIGNED BY JDS
DRAWN BY MCG
CHECKED BY BMW

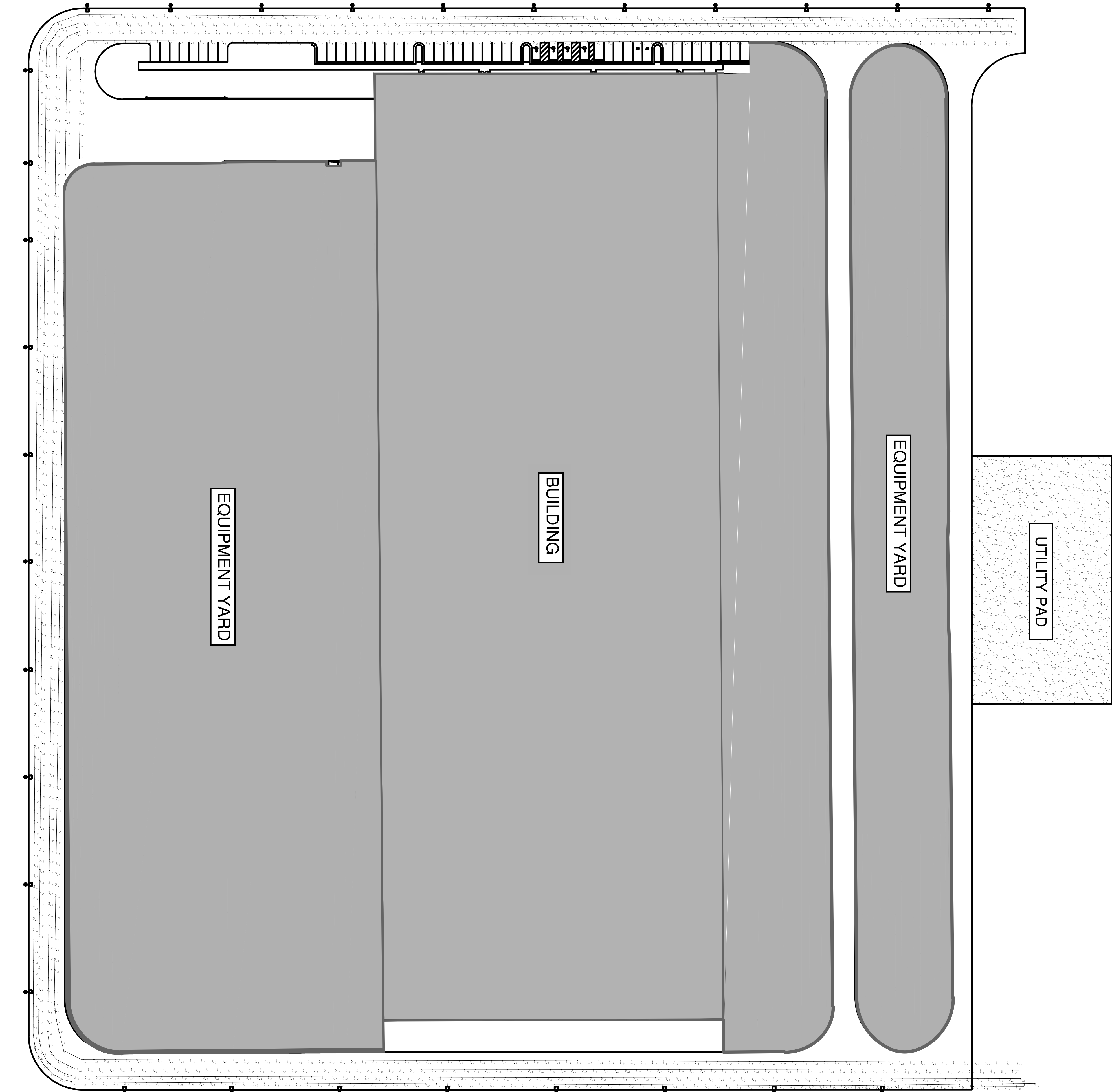
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WWW.KIMLEY-HORN.COM

SHEET NUMBER

REVISIONS
No.

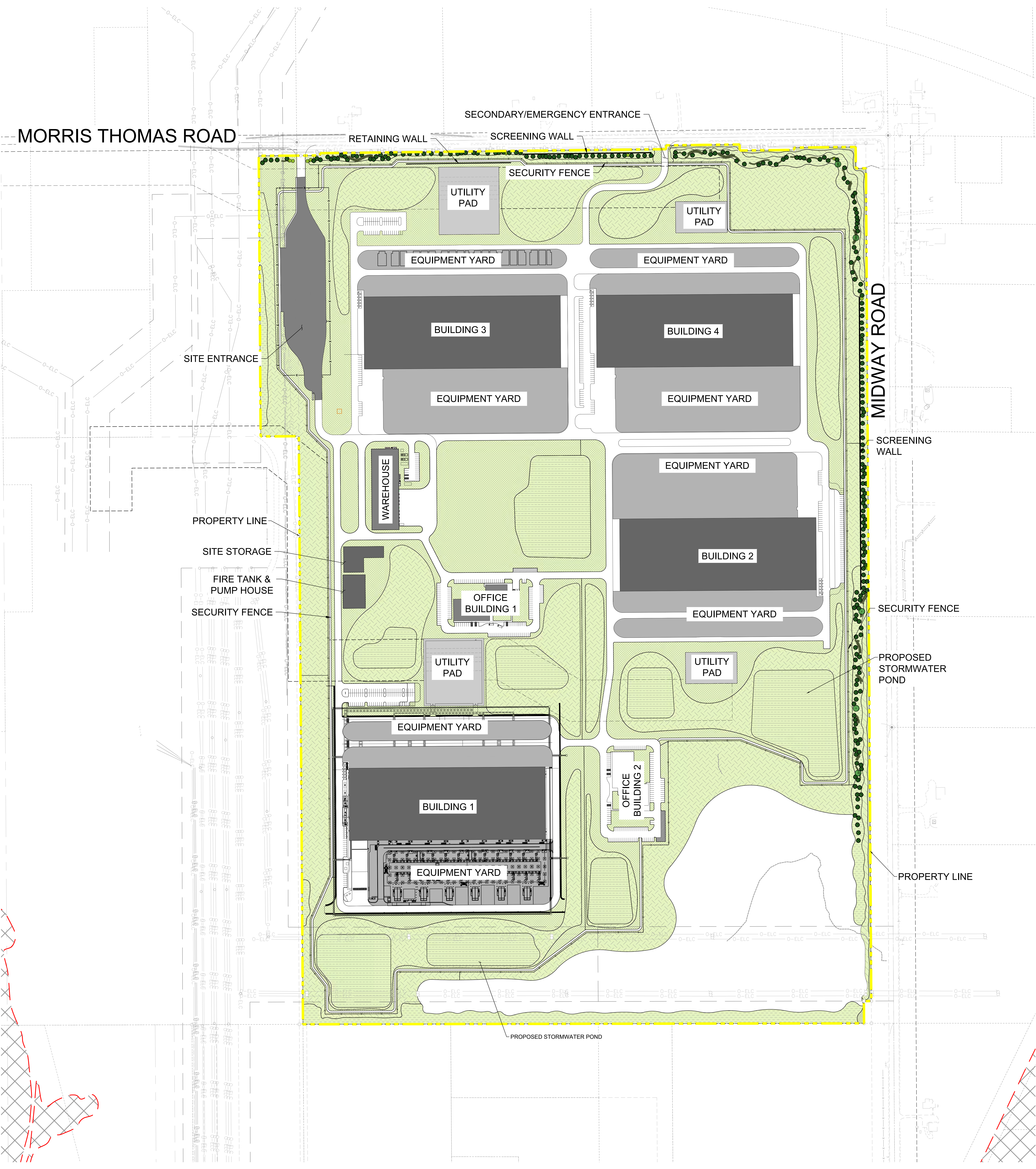
DATE
BY



Area	Average (Horizontal)	Minimum (Horizontal)	Uniformity (Ave/Min)	Uniformity (Max/Min)
Building Perimeter	n/a	1.0 @ Grade (11)	n/a	n/a
Utility Pad	2.0 @ Grade (21)	n/a	n/a	10:1
Security Fence*, Site Entrance, Roadways, Parking Lots, Walkways	1.0 @ Grade (11)	0.3 @ Grade (3)	3:1	n/a

*Fence lighting intends to ensure that there is an illumination level at the fence and not beyond

[illegible]



CONCEPT PLANT SCHEDULE			
COMMON NAME	BOTANICAL NAME	CONT	CAL
CONIFEROUS TREE			
BALSAM FIR	ABIES BALSAMEA	B & B	8' HT.
JACK PINE	PINUS BANKSIANA	B & B	8' HT.
TAMARACK	LARIX LARICINA	B & B	8' HT.
BLACK SPRUCE	PICEA MARIANA	B & B	8' HT.
RED PINE	PINUS RESINOSA	B & B	8' HT.
WHITE SPRUCE	PICEA GLAUCA	B & B	8' HT.
WHITE CEDAR	THUJA OCCIDENTALIS	B & B	8' HT.
WHITE PINE	PINUS STROBUS	B & B	8' HT.
OVERSTORY TREE			
NORTHERN PIN OAK	QUERCUS ELLIPSOIDALIS	B & B	2.5' CAL.
NORTHWOOD MAPLE	ACER RUBRUM 'NORTHWOOD'	B & B	2.5' CAL.
WHITE OAK	QUERCUS ALBA	B & B	2.5' CAL.
RED OAK	QUERCUS RUBRA	B & B	2.5' CAL.
SUGAR MAPLE	ACER SACCHARUM	B & B	2.5' CAL.
SWAMP WHITE OAK	QUERCUS BICOLOR	B & B	2.5' CAL.
UNDERSTORY / ORNAMENTAL TREE			
YELLOW BIRCH	BETULA ALLEGHANIENSIS	B & B	2" CAL.
PAPER BIRCH	BETULA Papyrifera	B & B	2" CAL.
PRAIRIE DREAMS PAPER BIRCH	BETULA Papyrifera 'VAREN'	B & B	2" CAL.
PRAIRIE ROSE CRABAPPLE	MALUS IOENSIS 'PRAIRIE ROSE'	B & B	2" CAL.
QUAKING ASPEN	POPULUS TREMULOIDES	B & B	2" CAL.
QUAKING ASPEN CLUMP	POPULUS TREMULOIDES	B & B	6' HT.
RIVER BIRCH MULTI-TRUNK	BETULA NIGRA	B & B	6' HT.
SHOWY MOUNTAIN ASH	SORBUS DECORA	B & B	2" CAL.
COMMON NAME			
DECIDUOUS SHRUBS			
BOG BIRCH	BETULA PUMILA	#7 CONT.	5' O.C.
BLACK CHOKEBERRY	ARONIA MELANOCARPA ELATA	#5 CONT.	5' O.C.
DWARF BUSH HONEYSUCKLE	DIERVILLA LONICERA	#5 CONT.	3' O.C.
JUNE BERRY / SERVICE BERRY	AMELANCHIER ALNIFOLIA	#5 CONT.	10' O.C.
PUSSY WILLOW	SALIX DISCOLOR	#5 CONT.	5' O.C.
REGENT SERVICE BERRY	AMELANCHIER ALNIFOLIA 'REGENT'	#5 CONT.	5' O.C.
LABRADOR TEA	RHODODENDRON GROENLANDICUM	#5 CONT.	5' O.C.
FLAME WILLOW	SALIX X 'FLAME'	#5 CONT.	5' O.C.

SEED MIX / SOD SCHEDULE WITHIN L.O.D.		
SYMBOL	DESCRIPTION	QTY
	TYPE 1: MNDOT MIX 36-312 WOODLAND EDGE NE	0.83 ACRES
	TYPE 2: MNDOT MIX 38-341 POLLINATOR PLOT NE	0 ACRES
	TYPE 3: MNDOT MIX 32-351 MID DIVERSITY MOIST BUFFER NE	5.56 ACRES
	TYPE 4: CUSTOM SEED MIX - NATIVE GRASSES NE	31.10 ACRES
	TYPE 6: MNDOT NB - NORTHERN BOULEVARD	36.51 ACRES
	TOTAL	74.0 ACRES
	TYPE 5: MNDOT MIX 33-361 STORMWATER NE	14.78 ACRES

NOTE:
QUANTITIES ON PLAN SUPERSEDE LIST QUANTITIES IN THE EVENT OF A DISCREPANCY.

ABBREVIATIONS:
B&B = BALLED AND BURLAPPED CAL = CALIPER HT. = HEIGHT
MIN. = MINIMUM O.C. = ON CENTER SP. = SPECIES QTY. = QUANTITY

LANDSCAPE SUMMARY

SCREENING REQUIREMENTS

REQUIRED: ALL TRASH, LOADING, AND STORAGE AREAS TO BE FULLY SCREENED FROM THE PUBLIC RIGHT-OF-WAY

PROVIDED: ALL TRASH, LOADING, AND STORAGE AREAS FULLY SCREENED FROM THE PUBLIC RIGHT-OF-WAY

BUFFER REQUIREMENTS

REQUIRED: ALL ABUTTING RESIDENTIAL PROPERTIES TO BE BUFFERED

PROVIDED: ALL ABUTTING RESIDENTIAL PROPERTIES BUFFERED

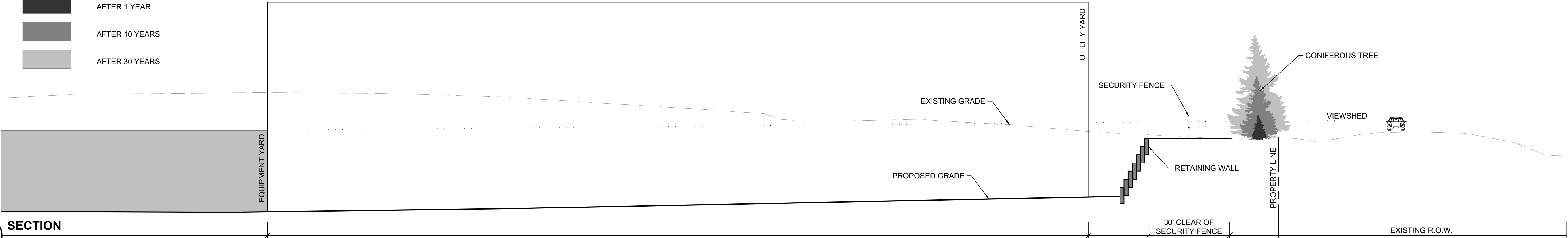
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VEGETATION GROWTH LEGEND

- AFTER 1 YEAR
- AFTER 10 YEARS
- AFTER 30 YEARS

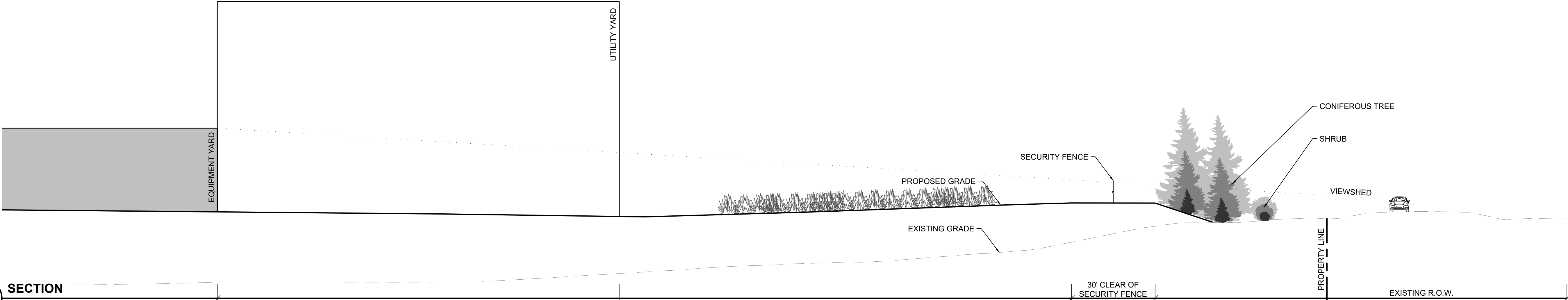
A SECTION

SCALE: 1" = 20'



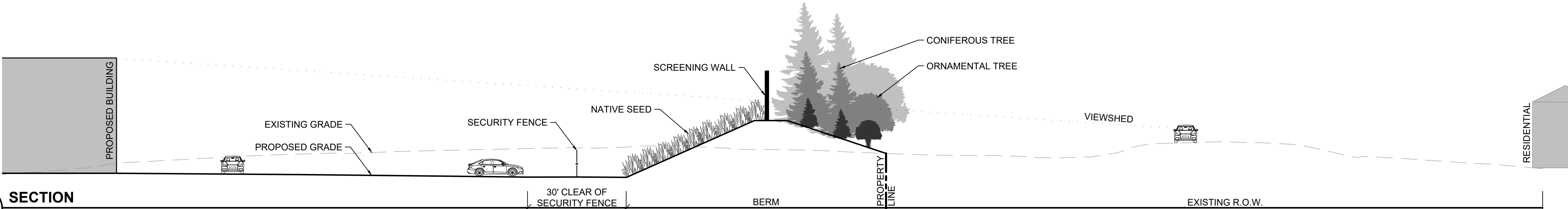
B SECTION

SCALE: 1" = 20'



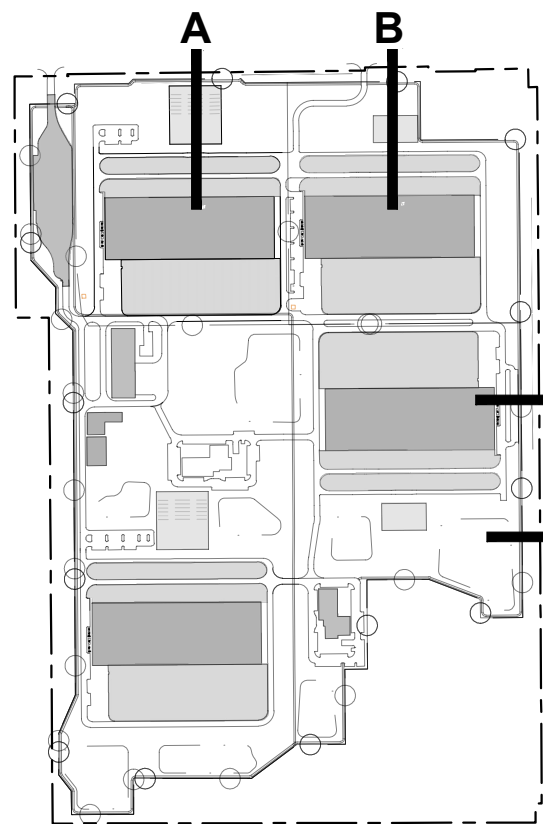
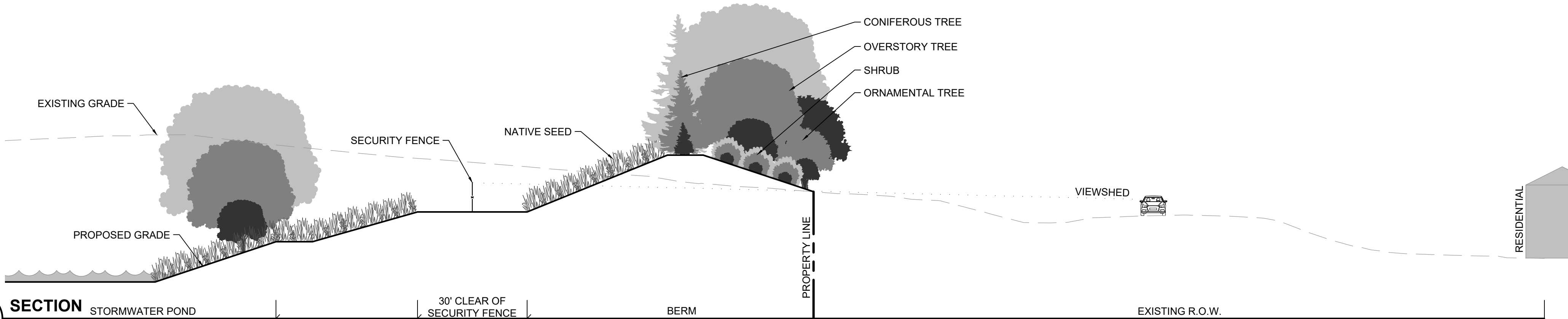
C SECTION

SCALE: 1" = 20'



D SECTION

SCALE: 1" = 20'



No.	REVISIONS	DATE	BY

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11895 SINGLETREE LANE, SUITE 225, EDEN PRAIRIE, MN 55344
PHONE: 612-315-1272
WWW.KIMLEY-HORN.COM

LEGISLATION THAT THIS PLAN SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

RYAN A. HYLLESTED, P.E.
MN LIC. NO. 53828
DATE: 08/15/2025

KHA PROJECT	161333002
DATE	08/15/2025
SCALE	AS SHOWN
DESIGNED BY	CFK
DRAWN BY	CFK
CHECKED BY	RAH

LANDSCAPE SECTIONS

HERMANTOWN INDUSTRIAL PREPARED FOR HARMONY GROUP LLC

Appendix H: *Greenhouse Gas Quantification*

Minnesota Climate Calculator: Project Summary Report

Date Prepared: 3/27/2026

The results shown below were generated using the Minnesota Climate Calculator. The emissions quantified account for the full greenhouse gas impact of a potential project throughout the construction and operational phases of the project. This includes emissions from project activities that occur on-site as well as emissions that occur upstream and downstream of the project. The results are based on user inputs and assumptions; actual project emissions may vary.

Background Information

Project Name	Existing Conditions
Project Category (primary)	Subp. 19, Residential Development
Project Category (secondary)	
Location (County)	St. Louis - partial
Construction Start Date	6/1/2026
Operational Year	2026
Operational Lifetime (Years)	1

Electricity Provider	Minnesota Power
Portion of Building Electricity Consumption to be Generated On-Site via Renewables or Supplied through the Purchase of Renewable Energy Credits (RECs)	0%
Portion of Building Natural Gas Consumption to be Supplied from Renewable Sources	0%

Building Construction Project?	No
--------------------------------	----

Construction Stage	Duration (Days)
Demolition	-
Site Preparation	-
Grading	-
Building Construction	-
Architectural Coatings	-
Paving and Landscaping	-

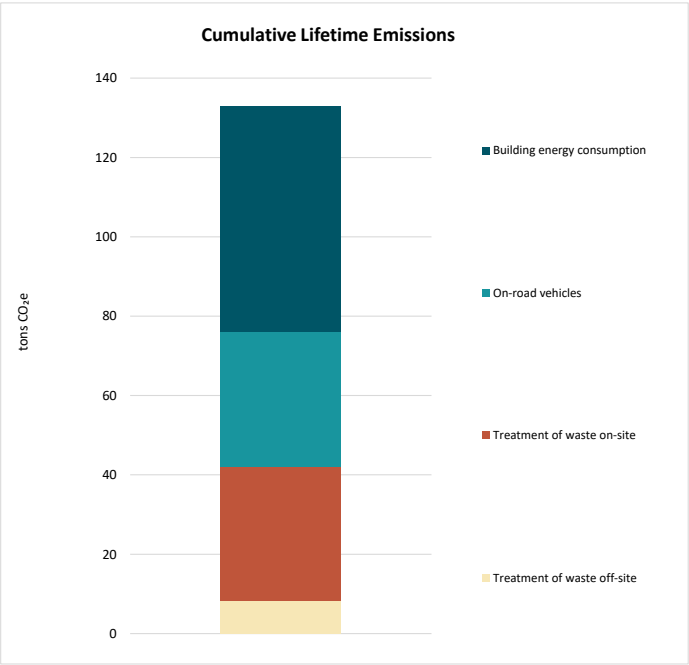
Total Project Acreage	278
Residential Building Area (sq ft)	24000
Commercial Building Area (sq ft)	0
Industrial Building Area (sq ft)	0
Institutional Building Area (sq ft)	0
Other Building Area (sq ft)	0

Summary Results

Project Lifetime	1
Unit	tons

Phase	CO ₂ e Emissions	
	Cumulative	Annualized
Construction		
Material inputs	NA	NA
Transportation of material inputs	NA	NA
Employee commuting	NA	NA
Construction equipment	NA	NA
Land use change (construction)	NA	NA
Construction waste	NA	NA
Operation		
Building energy consumption	56.92	56.92
Coal production	NA	NA
Natural gas and oil products	NA	NA
Industrial processes	NA	NA
HFC leakage	NA	NA
Land use change (operations)	NA	NA
On-road vehicles	33.90	33.90
Treatment of waste on-site	NA	NA
Treatment of wastewater on-site	NA	NA
Treatment of waste off-site	8.17	8.17
Enteric fermentation	NA	NA
Manure management	NA	NA
Total	98.99	98.99

Note: NA indicates that emissions were not quantified and/or are not applicable.



User Inputs

Note: NA indicates that emissions were not quantified and/or activity is not applicable.

Material Inputs

Material Type	Quantity	Unit	Geographical Sourcing
Aluminum	NA	Tons	Unknown
Asphalt	NA	Tons	Domestic
Brick	NA	Tons	Unknown
Concrete	NA	Tons	Domestic
Glass	NA	Tons	Unknown
Insulation (residential)	NA	Tons	Unknown
Insulation (commercial)	NA	Tons	Unknown
Steel	NA	Tons	Unknown
Wood Products	NA	Tons	Unknown

Employee Commuting

Construction Stage	Daily Average Number of Employees Commuting
Demolition	NA
Site Preparation	NA
Grading	NA
Building Construction	NA
Architectural Coatings	NA
Paving and Landscaping	NA

Transportation Mode	Percent of Employees
Single Occupancy Vehicle	NA
Carpool	NA
Motorcycle	NA
Bus	NA
Transit Rail	NA
Bike/Walk	NA

Average One-Way Commute Length (miles)	NA
--	----

Construction Equipment	Approach: NA
------------------------	--------------

Equipment Type	Fuel Type	Number of Hours per Day by Construction Stage					
		Demolition	Site Preparation	Grading	Building Construction	Architectural Coatings	Paving and Landscaping
Air Compressors	Diesel	NA	NA	NA	NA	NA	NA
Cement and Mortar Mixers	Diesel	NA	NA	NA	NA	NA	NA
Concrete/Industrial Saws	Diesel	NA	NA	NA	NA	NA	NA
Cranes	Diesel	NA	NA	NA	NA	NA	NA
Excavators	Diesel	NA	NA	NA	NA	NA	NA
Forklifts	Diesel	NA	NA	NA	NA	NA	NA
Generator Sets	Diesel	NA	NA	NA	NA	NA	NA
Graders	Diesel	NA	NA	NA	NA	NA	NA
Pavers	Diesel	NA	NA	NA	NA	NA	NA
Paving Equipment	Diesel	NA	NA	NA	NA	NA	NA
Rollers	Diesel	NA	NA	NA	NA	NA	NA
Rubber Tired Dozers	Diesel	NA	NA	NA	NA	NA	NA
Scrapers	Diesel	NA	NA	NA	NA	NA	NA
Tractors/Loaders/Backhoes	Diesel	NA	NA	NA	NA	NA	NA
Welders	Diesel	NA	NA	NA	NA	NA	NA

Fuel Type	Total Consumption	Units
Diesel	NA	Gallons
Electricity	NA	kWh
Biodiesel 100	NA	Gallons
Biodiesel 20	NA	Gallons
Renewable Diesel	NA	Gallons

Land Use Change

Land Use Type	Acres		
	Pre-Construction	Post-Construction	Post-Operation
Wetlands: peatland, non forested	NA	NA	NA
Wetlands: peatland, forested	NA	NA	NA
Wetlands: mineral soil, non forested	NA	NA	NA
Wetlands: mineral soil, forested	NA	NA	NA
Forest	NA	NA	NA
Rivers and streams	NA	NA	NA
Brush and grassland	NA	NA	NA
Cropland	NA	NA	NA
Livestock rangeland/pastureland	NA	NA	NA
Lawn/landscaping	NA	NA	NA
Green Infrastructure: Constructed wetlands, paved	NA	NA	NA
Green Infrastructure: Constructed wetlands, vegetated	NA	NA	NA
Green Infrastructure: Constructed green roofs	NA	NA	NA
Green Infrastructure: Constructed permeable pavements	NA	NA	NA
Impervious surface	NA	NA	NA
Stormwater pond (wet sedimentation basin)	NA	NA	NA

Trees	Number
Number of mature trees removed	NA
Number of new trees planted	NA

Construction Waste

Material Type	Quantity (tons)
Aluminum	NA
Asphalt	NA
Brick	NA
Concrete	NA
Glass	NA
Insulation	NA
Steel	NA
Wood Products	NA
Mixed Waste	NA

Building Energy Consumption

Approach:	Fuel Consumption
-----------	------------------

Building Type	Energy Intensity (Btu/sq ft/year)			
	Electricity	Natural Gas	Propane	Kerosene or Fuel Oil
Residential	NA	NA	NA	NA
Commercial	NA	NA	NA	NA
Industrial	NA	NA	NA	NA
Institutional	NA	NA	NA	NA
Other	NA	NA	NA	NA

Fuel Type	Fuel Consumption (units/year)	Unit
Electricity	108,000.00	kWh
Natural Gas	0.00	Cubic feet
Propane	0.00	Gallons
Kerosene or Fuel Oil	0.00	Gallons

Emissions from Coal Production

Coal Type	Incremental Production (tons/year)
Mixed Coal	NA
Anthracite Coal	NA
Bituminous Coal	NA
Subbituminous Coal	NA
Lignite Coal	NA
Coal Coke	NA

Emissions from Natural Gas and Oil Products

Fuel Type	Incremental Throughput	Unit
Natural Gas	NA	Cubic Feet/year
Renewable Natural Gas	NA	Cubic Feet/year
Propane	NA	Gallons/year
Gasoline	NA	Gallons/year
Distillate Fuel Oil No. 1	NA	Gallons/year
Distillate Fuel Oil No. 2	NA	Gallons/year
Distillate Fuel Oil No. 4	NA	Gallons/year
Residual Fuel Oil No. 5	NA	Gallons/year
Residual Fuel Oil No. 6	NA	Gallons/year
Liquified Petroleum Gas (LPG)	NA	Gallons/year
Kerosene	NA	Gallons/year
Kerosene Jet Fuel	NA	Gallons/year
Biodiesel 100	NA	Gallons/year
Biodiesel 20	NA	Gallons/year
Renewable Diesel	NA	Gallons/year

Natural Gas Assumptions

Percent Reduction in Leakage and Venting Emissions	NA
Leakage and Venting Emissions (kgCO ₂ e/MMBtu)	NA

Industrial Processes

Product Type	Quantity (tons/year)	Emission Factor (kgCO ₂ e/ton)
Cement	NA	NA
Lime	NA	NA
Limestone Use	NA	NA
Magnesium	NA	NA
Iron and Steel	NA	NA
Ammonia	NA	NA
Aluminum	NA	NA
Nitric Acid	NA	NA

HFC Leakage

Building Type	Percent of Building Area Utilized	Equipment Type	HFC
Residential	NA	Room A/C & Other residential A/C and heat pumps	NA
Commercial	NA	Other commercial A/C and heat pumps	NA
Industrial	NA	Other commercial A/C and heat pumps	NA
Institutional	NA	Walk-in refrigerators and freezers	NA
		Other commercial A/C and heat pumps	NA

On-Road Vehicles

Speed Bin (miles/hr)	Additional VMT (miles/year)
Fleet Average	54750
0-30	0
31-55	0
56-75	0

Treatment of Waste On-Site

Waste Treatment Practice	Quantity of Waste Treated (tons/year)
	NA
	NA
	NA

Treatment of Wastewater On-Site

Population Served by Treatment Plant	NA
Wastewater Treatment System Type	

Product Type	Production (MT/year)
	NA

Treatment of Waste Off-Site

Activity	Quantity	Waste Generation Rate	Unit
Number of single family households	10	7.00	lb/household/day
Number of employees (commercial)	0	10.53	lb/employee/day
Number of employees (industrial)	0	8.93	lb/employee/day
Number of employees (institutional)	0	3.55	lb/employee/day
Visitors per year (public venues)	0	1.72	lb/visitor

Waste Treatment Practice	Percent of Waste
Recycled	0%
Composted	0%
Landfilled	100%
Combusted	0%

Notes

General Notes	
Material inputs	
Transportation of material inputs	
Employee commuting	
Construction equipment	
Land use change (construction)	
Construction waste	
Building energy consumption	
Coal production	
Natural gas and oil products	
Industrial processes	
HFC leakage	
Land use change (operations)	
On-road vehicles	10 households x 15 miles a day x 365 days a year
Treatment of waste on-site	
Treatment of wastewater on-site	
Treatment of waste off-site	
Enteric fermentation	
Manure management	
Mitigation Measures and Quantified Reductions	
Adaptation Strategies	

Minnesota Climate Calculator: Project Summary Report

Date Prepared: 4/16/2026

The results shown below were generated using the Minnesota Climate Calculator. The emissions quantified account for the full greenhouse gas impact of a potential project throughout the construction and operational phases of the project. This includes emissions from project activities that occur on-site as well as emissions that occur upstream and downstream of the project. The results are based on user inputs and assumptions; actual project emissions may vary.

Background Information

Project Name	Updated Hermantown Industrial		
Project Category (primary)	Subp. 14, Industrial, commercial, institutional facilities		
Project Category (secondary)			
Location (County)	St. Louis - partial		
Construction Start Date	6/1/2027		
Operational Year	2030		
Operational Lifetime (Years)	50		

Electricity Provider	Minnesota Power		
Portion of Building Electricity Consumption to be Generated On-Site via Renewables or Supplied through the Purchase of Renewable Energy Credits (RECs)			0%
Portion of Building Natural Gas Consumption to be Supplied from Renewable Sources			0%

Building Construction Project?	Yes
--------------------------------	-----

Construction Stage	Duration (Days)
Demolition	278
Site Preparation	167
Grading	431
Building Construction	4,309
Architectural Coatings	306
Paving and Landscaping	306

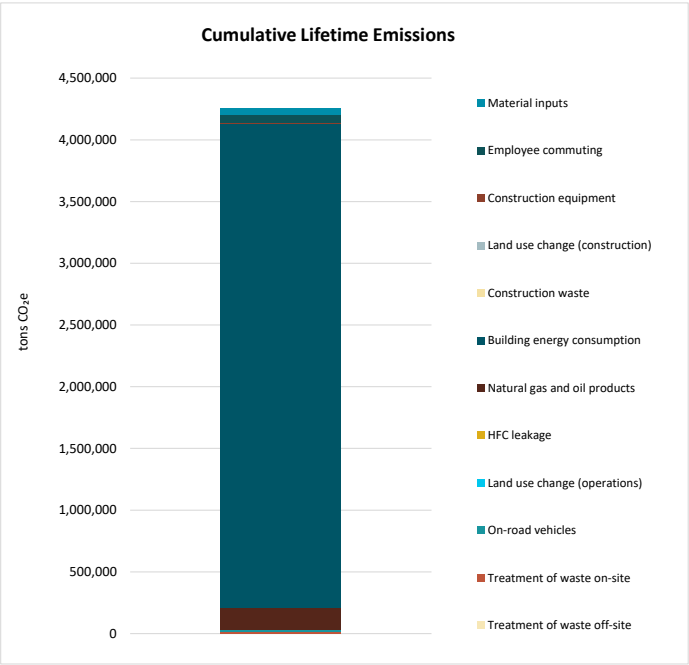
Total Project Acreage	278
Residential Building Area (sq ft)	0
Commercial Building Area (sq ft)	0
Industrial Building Area (sq ft)	1800000
Institutional Building Area (sq ft)	0
Other Building Area (sq ft)	0

Summary Results

Project Lifetime	53
Unit	tons

Phase	CO ₂ e Emissions	
	Cumulative	Annualized
Construction		
Material inputs	54,355.82	1,025.58
Transportation of material inputs	1,437.47	27.12
Employee commuting	61,179.85	1,154.34
Construction equipment	10,152.37	191.55
Land use change (construction)	66.53	1.26
Construction waste	119.16	2.25
Operation		
Building energy consumption	3,923,505.18	74,028.40
Coal production	NA	NA
Natural gas and oil products	173,102.05	3,266.08
Industrial processes	NA	NA
HFC leakage	4,331.30	81.72
Land use change (operations)	-	-
On-road vehicles	14,348.18	270.72
Treatment of waste on-site	NA	NA
Treatment of wastewater on-site	NA	NA
Treatment of waste off-site	1,456.12	27.47
Enteric fermentation	NA	NA
Manure management	NA	NA
Total	4,244,054.04	80,076.49

Note: NA indicates that emissions were not quantified and/or are not applicable.



User Inputs

Note: NA indicates that emissions were not quantified and/or activity is not applicable.

Material Inputs

Material Type	Quantity	Unit	Geographical Sourcing
Aluminum	4.00	Tons	Unknown
Asphalt	100,000.00	Tons	Domestic
Brick	0.00	Tons	Unknown
Concrete	180,000.00	Tons	Domestic
Glass	1.00	Tons	Unknown
Insulation (residential)	0.00	Tons	Unknown
Insulation (commercial)	50.00	Tons	Unknown
Steel	10,000.00	Tons	Unknown
Wood Products	0.00	Tons	Unknown

Employee Commuting

Construction Stage	Daily Average Number of Employees Commuting
Demolition	300
Site Preparation	300
Grading	900
Building Construction	1200
Architectural Coatings	0
Paving and Landscaping	200

Transportation Mode	Percent of Employees
Single Occupancy Vehicle	90%
Carpool	10%
Motorcycle	0%
Bus	0%
Transit Rail	0%
Bike/Walk	0%

Average One-Way Commute Length (miles)	13.2
--	------

Construction Equipment	Approach: Equipment Use
------------------------	-------------------------

Equipment Type	Fuel Type	Number of Hours per Day by Construction Stage					
		Demolition	Site Preparation	Grading	Building Construction	Architectural Coatings	Paving and Landscaping
Air Compressors	Diesel	0	0	0	0	6	0
Cement and Mortar Mixers	Diesel	0	0	0	0	0	0
Concrete/Industrial Saws	Diesel	8	0	0	0	0	0
Cranes	Diesel	0	0	0	7	0	0
Excavators	Diesel	24	0	16	0	0	0
Forklifts	Diesel	0	0	0	24	0	0
Generator Sets	Diesel	0	0	0	8	0	0
Graders	Diesel	0	0	8	0	0	0
Pavers	Diesel	0	0	0	0	0	16
Paving Equipment	Diesel	0	0	0	0	0	16
Rollers	Diesel	0	0	0	0	0	16
Rubber Tired Dozers	Diesel	16	24	8	0	0	0
Scrapers	Diesel	0	0	16	0	0	0
Tractors/Loaders/Backhoes	Diesel	0	32	16	21	0	0
Welders	Diesel	0	0	0	8	0	0

Fuel Type	Total Consumption	Units
Diesel	NA	Gallons
Electricity	NA	kWh
Biodiesel 100	NA	Gallons
Biodiesel 20	NA	Gallons
Renewable Diesel	NA	Gallons

Land Use Change

Land Use Type	Acres		
	Pre-Construction	Post-Construction	Post-Operation
Wetlands: peatland, non forested	0.00	0.00	0.00
Wetlands: peatland, forested	0.00	0.00	0.00
Wetlands: mineral soil, non forested	58.00	26.00	26.00
Wetlands: mineral soil, forested	0.00	0.00	0.00
Forest	132.00	37.00	37.00
Rivers and streams	0.00	0.00	0.00
Brush and grassland	0.00	0.00	0.00
Cropland	0.00	0.00	0.00
Livestock rangeland/pastureland	0.00	0.00	0.00
Lawn/landscaping	77.00	74.00	74.00
Green Infrastructure: Constructed wetlands, paved	0.00	0.00	0.00
Green Infrastructure: Constructed wetlands, vegetated	0.00	0.00	0.00
Green Infrastructure: Constructed green roofs	0.00	0.00	0.00
Green Infrastructure: Constructed permeable pavements	0.00	0.00	0.00
Impervious surface	11.00	126.00	126.00
Stormwater pond (wet sedimentation basin)	0.00	15.00	15.00

Trees	Number
Number of mature trees removed	10783
Number of new trees planted	245

Construction Waste

Material Type	Quantity (tons)
Aluminum	0.00
Asphalt	0.00
Brick	0.00
Concrete	5400.00
Glass	0.03
Insulation	5.00
Steel	0.00
Wood Products	0.00
Mixed Waste	0.00

Building Energy Consumption

Approach:	Fuel Consumption
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Building Type	Energy Intensity (Btu/sq ft/year)			
	Electricity	Natural Gas	Propane	Kerosene or Fuel Oil
Residential	NA	NA	NA	NA
Commercial	NA	NA	NA	NA
Industrial	NA	NA	NA	NA
Institutional	NA	NA	NA	NA
Other	NA	NA	NA	NA

Fuel Type	Fuel Consumption (units/year)	Unit
Electricity	4,467,600,000.00	kWh
Natural Gas	0.00	Cubic feet
Propane	0.00	Gallons
Kerosene or Fuel Oil	0.00	Gallons

Emissions from Coal Production

Coal Type	Incremental Production (tons/year)
Mixed Coal	NA
Anthracite Coal	NA
Bituminous Coal	NA
Subbituminous Coal	NA
Lignite Coal	NA
Coal Coke	NA

Emissions from Natural Gas and Oil Products

Fuel Type	Incremental Throughput	Unit
Natural Gas	0.00	Cubic Feet/year
Renewable Natural Gas	0.00	Cubic Feet/year
Propane	0.00	Gallons/year
Gasoline	0.00	Gallons/year
Distillate Fuel Oil No. 1	0.00	Gallons/year
Distillate Fuel Oil No. 2	252000.00	Gallons/year
Distillate Fuel Oil No. 4	0.00	Gallons/year
Residual Fuel Oil No. 5	0.00	Gallons/year
Residual Fuel Oil No. 6	0.00	Gallons/year
Liquified Petroleum Gas (LPG)	0.00	Gallons/year
Kerosene	0.00	Gallons/year
Kerosene Jet Fuel	0.00	Gallons/year
Biodiesel 100	0.00	Gallons/year
Biodiesel 20	0.00	Gallons/year
Renewable Diesel	0.00	Gallons/year

Natural Gas Assumptions

Percent Reduction in Leakage and Venting Emissions	50%
Leakage and Venting Emissions (kgCO ₂ e/MMBtu)	2.14

Industrial Processes

Product Type	Quantity (tons/year)	Emission Factor (kgCO ₂ e/ton)
Cement	NA	NA
Lime	NA	NA
Limestone Use	NA	NA
Magnesium	NA	NA
Iron and Steel	NA	NA
Ammonia	NA	NA
Aluminum	NA	NA
Nitric Acid	NA	NA

HFC Leakage

Building Type	Percent of Building Area Utilized	Equipment Type	HFC
Residential	100%	Room A/C & Other residential A/C and heat pumps	R-454B
Commercial	100%	Other commercial A/C and heat pumps	R-454B
Industrial	100%	Other commercial A/C and heat pumps	R-407C
Institutional	100%	Walk-in refrigerators and freezers	R-404A
		Other commercial A/C and heat pumps	R-454B

On-Road Vehicles

Speed Bin (miles/hr)	Additional VMT (miles/year)
Fleet Average	975000
0-30	0
31-55	0
56-75	0

Treatment of Waste On-Site

Waste Treatment Practice	Quantity of Waste Treated (tons/year)
	NA
	NA
	NA

Treatment of Wastewater On-Site

Population Served by Treatment Plant	NA
Wastewater Treatment System Type	

Product Type	Production (MT/year)
	NA

Treatment of Waste Off-Site

Activity	Quantity	Waste Generation Rate	Unit
Number of single family households	0	7.00	lb/household/day
Number of employees (commercial)	0	10.53	lb/employee/day
Number of employees (industrial)	130	8.93	lb/employee/day
Number of employees (institutional)	0	3.55	lb/employee/day
Visitors per year (public venues)	0	1.72	lb/visitor

Waste Treatment Practice	Percent of Waste
Recycled	92%
Composted	1%
Landfilled	7%
Combusted	0%

Notes

General Notes	
Material inputs	
Transportation of material inputs	
Employee commuting	Assumes 130 full time employees, average of 30 miles per day, 250 working days in the year
Construction equipment	
Land use change (construction)	
Construction waste	
Building energy consumption	Electricity consumption ranges from 2,233,800,000 - 4,467,600,000 kWh annually. This spreadsheet attachment is showing the upper limit assumed.
Coal production	
Natural gas and oil products	Specific generator quantities included and consumptions are high level estimates for the purposes of this AUAR to study the "worst case" scenario. For the purposes of quantifying diesel for the back up generators in this AUAR, up to 4 x 2.75 MW generators are assumed per building (up to 4 buildings total).
Industrial processes	
HFC leakage	
Land use change (operations)	
On-road vehicles	
Treatment of waste on-site	
Treatment of wastewater on-site	
Treatment of waste off-site	
Enteric fermentation	
Manure management	
Mitigation Measures and Quantified Reductions	
Adaptation Strategies	

Mitigation Measures (Step 5a)

Use the filters in the table below to identify potential mitigation measures to reduce GHG emissions from the proposed project. Use the column on the far left to select measures you plan to implement. Measures marked as 'Yes' in column F are available for quantification in the Quantified Reductions tab. Click the 'Select Applicable Quantifiable Measures' button to select quantifiable mitigation measures that are deemed applicable based on entered user inputs. Select the 'Generate PDF' button once you've made your desired selections to export the list.

Select Applicable Quantifiable Measures

Select All Unhidden Measures

Reset all Selected Measures

Generate PDF

Go to Quantified Reductions

Go to Charts

Select	Emissions Source	Phase	ID	Quantifiable?	Measure Title	Measure Description
Yes	Material inputs	Construction	M-1A-01	No	Use Sustainable Building Materials	Ensure sustainable building materials comprise at least 20% of total construction materials by volume weight. Sustainable building materials have a less carbon-intensive production process compared to their non-sustainable counterparts. This strategy could include the use of Environmental Product Declarations in bid decisions to ensure the most sustainable materials are procured. This strategy is general to any building material. See 1A-2 through 1A-6 for measures specific to wood, pavement, and cement.
Yes	Material inputs	Construction	M-1A-03	No	Sustainable Pavements	Use lower-impact materials specially designed for roadway surfaces without compromising the pavement's ability to meet its engineering purposes. For example, warm-mix asphalt (WMA) production methods use temperatures that are 30 to 120 degrees Fahrenheit lower than those of traditional hot-mix asphalt. Because less energy is needed to heat the asphalt mix, less fuel is needed to produce WMA. Fuel consumption during WMA manufacturing is typically reduced by 20%. Sustainable pavements can also result in extended pavement life thereby reducing the need for energy-intensive maintenance.
Yes	Material inputs	Construction	M-1A-04	No	Purchase Cement from Manufacturers using Low-Carbon Mix Design for Calcination	Purchase cement from manufacturers that use low-carbon mix design. Using a low-carbon mix design in addition to renewable power sources and carbon capture can significantly reduce emissions from calcination. The seven most impactful low-carbon mix alternatives, listed from smallest to largest carbon footprint, are 1) granulated blast furnace slag; 2) limestone calcined clay cement; 3) fly ash; 4) Portland limestone cement; 5) biochar; 6) early-stage carbon curing; and 7) recycled concrete aggregate.
Yes	Material inputs	Construction	M-1A-05	No	Purchase Cement from Efficient Cement Manufacturers	Purchase cement from manufacturers that have implemented measures to improve their production efficiency. Efficiency measures for cement manufacturing can reduce the demand for fuel by addressing the production process itself (such as switching from inefficient wet kilns to dry ones) or through technical and mechanical improvements (such as preventive maintenance to repair kiln leaks).
Yes	Material inputs	Construction	M-1A-06	No	Purchase Cement from Manufacturers Using Alternative Fuels	Purchase cement from manufacturers that use alternative fuels in their production method. Indirect emissions from burning fossil fuels to heat the kiln can be reduced by switching to alternative fuels, including natural gas, biomass, and waste-derived fuels such as tires, sewage sludge, and municipal solid wastes.
Yes	Material inputs	Construction	M-1A-07	No	Require Environmentally Responsible Purchasing	Implement an environmentally responsible purchasing plan. Examples of environmentally responsible purchases include but are not limited to: purchasing products made from recycled materials or with sustainable packaging; purchasing post-consumer recycled paper, paper towels, and stationery; purchasing and stocking communal kitchens with reusable dishes and utensils; choosing sustainable cleaning supplies; purchasing products from restaurants, farms, or ranches that source materials or goods from locations that use soil conservation practices; and leasing equipment from manufacturers who will recycle the components at their end of life.
Yes	Material inputs	Construction	M-1A-08	No	Use Recycled Asphalt Pavement	Use recycled concrete aggregate (RCA) or recycled asphalt pavement (RAP) in place of traditional asphalt. RCA and RAP help reduce energy consumption and thus GHGs of a project by displacing the volume of new asphalt.
Yes	Transportation of material inputs	Construction	M-1B-01	No	Use Local Building Materials	Ensure locally sourced or recycled construction materials comprise at least 20% of total construction materials by volume weight. Choosing locally made and distributed products reduces the distance required to transport the products from the distribution or manufacturing center to the project, thus reducing GHG emissions associated with transportation.
Yes	Transportation of material inputs	Construction	M-1B-03	No	Limit Delivery Windows	Limit deliveries of materials and equipment to the site to off-peak traffic congestion hours. This will avoid congested vehicle travel, which generates more emissions per mile than travel at free-flow speeds.
Yes	Transportation of material inputs	Construction	M-1B-04	No	Evaluate Efficient Delivery Options	Evaluate the feasibility of using freight locomotives and other more efficient modes of transportation to deliver construction equipment and vehicles instead of on-road haul trucks. More efficient modes of transportation will reduce delivery emissions and may reduce transportation costs.
Yes	Employee commuting	Construction	M-1C-01	No	Use Local Construction Contractors	Maximize use of local construction contractors. Contracting construction work with a local company reduces vehicle miles traveled associated with construction employee commute distances and, therefore, reduces emissions from vehicle fuel combustion. Local hire provisions may cover the entire workforce, or a percentage of the workforce based on the project size or employment type.

Yes	Construction equipment	Construction	M-1D-01	Yes	Use Renewable Diesel	Use renewable diesel in construction equipment and vehicles in lieu of similar vehicles powered by gasoline or diesel fuel. Tailpipe GHG emissions from renewable diesel are identical to tailpipe GHG emissions from conventional diesel; thus, the GHG benefits of renewable diesel come from the fact that it is produced from biomass.
Yes	Construction equipment	Construction	M-1D-02	Yes	Use Electric or Hybrid Powered Equipment	Use electric- or hybrid-powered construction equipment over conventional diesel-fueled counterparts. Replacing diesel-powered equipment with electric or hybrid-electric equipment reduces fossil fuel combustion and thus GHG emissions. However, all-electric equipment results in GHG emissions from the electricity used to charge the equipment. The indirect GHG emissions increase from electricity must be calculated in addition to the GHG emissions reduction from displaced fossil fuel combustion to estimate the total net GHG emissions reduction achieved by this measure if using all electric equipment.
Yes	Construction equipment	Construction	M-1D-03	No	Limit Heavy-Duty Diesel Vehicle Idling	Minimize idling time by requiring that equipment be shut down after five minutes when not in use. Provide clear signage that posts this requirement for workers at the entrances to the site and provide a plan for the enforcement of this requirement. Reducing idling time will reduce emissions from fuel combustion.
Yes	Construction equipment	Construction	M-1D-04	No	Maintain All Equipment in Proper Condition	Maintain all construction equipment in proper working condition and perform all preventative maintenance. Required maintenance includes compliance with all manufacturer's recommendations, proper upkeep and replacement of filters and mufflers, and maintenance of all engine and emissions systems in proper operating condition. Maintenance schedules should be detailed in an Air Quality Control Plan prior to commencement of construction.
Yes	Construction equipment	Construction	M-1D-05	No	Implement a Tire Inflation Program	Implement a tire inflation program on jobsites to confirm that equipment tires are correctly inflated. Check tire inflation when equipment arrives on site and every two weeks for equipment that remains on site. Check vehicles used for hauling materials off site weekly for correct tire inflation. Procedures for the tire inflation program should be documented in an Air Quality Management Plan prior to commencement of construction.
Yes	Construction equipment	Construction	M-1D-06	No	Use Conveyors Instead of Trucks	Move material onsite using electric conveyors instead of diesel trucks. While electric conveyors result in GHG emissions from the electricity used to charge the equipment, these indirect emissions are likely much less than emissions from diesel combustion. The indirect GHG emissions increase from electricity must be calculated in addition to the GHG emissions reduction from displaced fossil fuel combustion to estimate the total net GHG emissions reduction achieved by this measure.
Yes	Construction equipment	Construction	M-1D-08	No	Evaluate Potential for On-Site Electrical Service	Confirm all feasible avenues have been explored for providing an electrical service drop to the construction site for temporary construction power. When generators must be used, use alternative fuels, such as propane, or solar power, to power generators to the maximum extent feasible.
Yes	Construction equipment	Construction	M-1D-09	No	Use High Efficiency Lighting	Reduce electricity use in temporary construction offices by using high efficiency lighting and requiring that heating and cooling units be Energy Star compliant. Require that all contractors develop and implement procedures for turning off computers, lights, air conditioners, heaters, and other equipment each day at close of business.
Yes	Construction equipment	Construction	M-1D-10	No	Develop a Water Efficiency Plan for Dust Control	Develop a plan to efficiently use water for adequate dust control since substantial amounts of energy can be consumed during the pumping or transporting of water.
Yes	Land use change	Construction	M-1E-01	Yes	Create New Open Space with Native Vegetation and Habitat	Convert previously developed areas to vegetated open spaces. By creating new vegetated areas from previously settled land, the project would sequester carbon dioxide that would not have been captured without the land conversion. Trees and other vegetation also incorporate carbon into their biomass during their growth phase (stored carbon). Prior to establishing new vegetation, conduct information gathering to assess the site history, soil type, hydrology, topography, and wildlife populations to determine appropriate native vegetation that will be well adapted to the local environment. Establish project goals, including GHG emission reduction and restoration native pollinator and/or native habitat. Other important goals may include expanding contiguous habitat and wildlife corridors for threatened or endangered species or increasing biodiversity. Create a detailed planting and management plan that describes actions for site preparation, planting, habitat enhancement, water management, and invasive species control. Maximize long-term establishment success by conducting regular monitoring. This may involve tracking plant growth, soil conditions, and wildlife movement. Utilize the monitoring data to perform regular maintenance. Adjust the management plan as needed to keep the site healthy and ensure attainment of project goal(s).
Yes	Land use change	Construction	M-1E-02	Yes	Expand Urban Tree Planting	Require tree planting in urban areas. Planting trees sequesters carbon dioxide while the trees are actively growing, thereby reducing GHGs. The amount of carbon dioxide sequestered depends on the type of tree and the duration of the active growing period. Urban trees may also provide shade, which can reduce the urban heat island effect and building cooling demands. Buildings that use less electricity for air conditioning reduce energy consumption and associated indirect GHG emission. The selection of tree type is critical to minimize the use of additional water. Trees that have high water demands that are met through GHG-intensive water (such as water transported over long distances) can impact the amount of GHG reductions achieved by this measure.
Yes	Land use change	Construction	M-1E-05	No	Wetland Restoration	Restore wetlands to improve their function and ability to sequester GHG emissions. For example, rewet drained wetlands, remove non-native plants, exclude livestock, and plant native wetland species. Because wetlands can also represent a GHG source, ensure the restored wetland and selected restoration strategies will effectively reduce GHG emissions.

Yes	Land use change	Construction	M-1E-06	Yes	Afforestation	Plant trees on previously deforested land.
Yes	Construction waste	Construction	M-1F-02	No	Recycle Waste Paint	Recycle waste paint during construction. Recycling waste paint reduces GHG emissions from raw material sourcing and paint production. If the process of recycling waste paint is less carbon-intensive than the processes required to harvest and produce new paint, recycling results in a net reduction in GHG emissions.
Yes	Construction waste	Construction	M-1F-03	No	Recycle Demolished Construction Material	Recycle general construction waste. Recycling demolished construction material reduces GHGs by displacing new construction materials, thereby reducing the need for new raw material acquisition and manufacturing. If the process of recycling construction materials is less carbon-intensive than the processes required to harvest and produce new construction materials, recycling results in a net reduction in GHG emissions. Using local recycled construction material would also reduce emissions associated with the transportation of new construction materials, which are typically manufactured farther away from a project site. Finally, recycling avoids sending materials to landfills. Wood-based materials decompose in landfills and contribute to methane emissions.
Yes	Building energy consumption	Operation	M-2A-01	No	Require Energy Efficient Appliances	Install ENERGY STAR-certified appliances that exceed the energy efficiency of conventional appliances. By committing to more efficient appliances, the building's energy use is reduced, thereby reducing GHG emissions.
Yes	Building energy consumption	Operation	M-2A-08	No	Install Cool Roofs and/or Cool Walls	Install cool roofs and/or walls in place of dark roofs and/or conventional walls. Cool roofs have been designed to reflect more sunlight and absorb less heat than a standard roof, keeping buildings cooler in the summertime and thus reducing air-conditioning loads. Complementary to cool roofs, cool walls achieve a similar result through using more reflective paints or materials. This reduces the electricity needed to provide cooling but can potentially increase the energy needed to provide winter heating, thereby reducing associated GHG emissions depending on the project parameters (e.g., climate, level of implementation, carbon intensity of local electricity provider). However, the winter heating penalty may be small with lower levels of winter sunlight due to shorter daylight hours and more overcast skies.
Yes	Building energy consumption	Operation	M-2A-09	No	Install Green Roofs in Place of Dark Roofs	Install green roofs in place of dark roofs. Green roofs consist of a layer of vegetation on top of buildings, which provides natural insulation and climate control benefits. This reduces the electricity and natural gas needed to provide cooling and heating, thereby reducing associated GHG emissions.
Yes	Building energy consumption	Operation	M-2A-10	No	Install Cool Pavements	Install cool pavement in place of dark pavement. Cool pavement helps to lower ambient outdoor air temperatures when compared to dark-colored, heat-absorbent pavement such as asphalt. This reduces the electricity needed to provide cooling, thereby reducing associated GHG emissions, depending on the project parameters (e.g., climate, carbon intensity of local utility).
Yes	Building energy consumption	Operation	M-2A-13	No	Maximize Solar Shading	Maximize building shade during the summer months. Shading is a passive and inexpensive way to reduce summer heat loads, and thus the need for air conditioning. Examples include vegetation with seasonal variation and envelope elements that reflect natural light.
Yes	Building energy consumption	Operation	M-2A-14	No	Optimize Natural Ventilation	Maximize natural building ventilation in new construction. Façade design allows natural ventilation at night to cool the building and reduce peak daytime temperatures in summer. This in turn reduces the need for air conditioning, which reduces building electricity consumption and associated emissions.
Yes	Building energy consumption	Operation	M-2A-15	No	Obtain Third-party HVAC Commissioning and Verification of Energy Savings	Require third-party review of heating ventilation and air conditioning (HVAC) systems to ensure proper installation and construction of energy reduction features. HVAC commissioning and third-party verification of energy savings may be obtained for thermal efficiency components including HVAC systems, insulation, windows, and water heating.
Yes	Building energy consumption	Operation	M-2A-18	No	Procure Electricity from Lower Carbon Intensity Power Supply	Procure electricity with a lower carbon intensity than the primary product offered by the local provider (often an investor-owned utility). This would displace the electricity demand that would ordinarily be supplied by the local electricity provider's energy mix. Electricity provided by local electricity providers has varying carbon intensities based on the portfolio of energy sources. Procurement of electricity of a lower carbon intensity would displace the emissions that would have been produced had the electricity been supplied by the default energy mix and thus results in a reduction in GHG emissions. Green power supply options include utility green power products, community choice aggregation, shared renewables (e.g., community solar), and power purchase agreements.
Yes	Building energy consumption	Operation	M-2A-19	No	Require All-Electric Development	Install all-electric appliances and end uses. Using electric instead of natural gas-powered appliances and end uses replaces a more emissions-intensive fossil fuel source of energy with a less emissions-intensive source of energy, electricity from the grid that is increasingly transitioning to renewable sources.
Yes	Building energy consumption	Operation	M-2A-24	No	Encourage Residential Participation in Existing Demand Response Program(s)	Market and promote the local utility's manual (i.e., behavioral) demand response program(s) to encourage participation from residents in the project area. During demand response events, program users shift or conserve electricity, thereby reducing the associated indirect GHG emissions. Methods of engaging customers in demand response efforts include offering time-based rates, such as time-of-use pricing, critical peak pricing, variable peak pricing, real-time pricing, and critical peak rebates. Users are encouraged to respond to time-based rates or other forms of financial incentives with smart phone app, email, phone call, and/or text notifications.

Yes	Building energy consumption	Operation	M-2A-26	No	Provide Battery Storage	Strategically deploy battery storage. While energy storage has no direct emissions effect, when deployed strategically, energy storage can make the grid more flexible, unlocking renewable energy and reducing GHG emissions. When deployed non-strategically, owners of energy storage assets are more likely to charge their facilities during off-peak periods when power prices are lower, in order to supply power during more expensive peak hours. Off-peak generation times such as nighttime hours are more likely to be dominated by conventional power sources, which, except for nuclear and hydropower, are likely to be more emissions intensive.
Yes	Natural gas and petroleum systems	Operation	M-2C-01	Yes	Conduct Regular Maintenance	Implement a preventative maintenance schedule to replace worn-out components like gaskets, seals, and packing on valves and fittings. Regularly tighten all connections on pipelines, tanks, and equipment. Proper maintenance can avoid leaks, which in turn reduces fugitive emissions.
Yes	Natural gas and petroleum systems	Operation	M-2C-02	Yes	Ensure Proper Systemwide Management	Develop a plan to properly and efficiently maintain systemwide performance. For example, ensure proper pressure management, optimize maintenance schedules with preventative maintenance procedures, and implement procedures for proper valve operation and isolation.
Yes	HFC leakage	Operation	M-2E-01	Yes	Use Alternative Refrigerants Instead of High-GWP Refrigerants	Replace high-global warming potential (GWP) refrigerants with lower-GWP refrigerants (e.g., natural refrigerants such as carbon dioxide, ammonia, and hydrocarbons, or next generation low-GWP synthetic refrigerants like hydrofluoroolefin-1234yf) in refrigeration and air conditioning equipment. When emitted into the atmosphere, high-GWP refrigerants (e.g., hydrofluorocarbons) absorb significantly more heat than carbon dioxide on a mass basis, resulting in larger global warming effects. Shifting to lower-GWP refrigerants reduces the potency of refrigerant leaks, decreasing GHG emissions.
Yes	HFC leakage	Operation	M-2E-05	No	Reduce Service Leak Emissions	Improve refrigerant servicing technologies and practices to reduce refrigerant emissions during equipment servicing. It is estimated that recovering refrigerants can reduce emissions in servicing by up to 95 percent. Equipment should only be serviced by qualified technicians certified under Section 608 of the Clean Air Act. Implementing more widespread and thorough refrigerant recovery practices while servicing refrigeration and A/C systems must go beyond regulatory requirements.
Yes	HFC leakage	Operation	M-2E-06	No	Reduce Operational Leak Emissions	Deploy leak detection technology and preventative maintenance measures to quickly identify and resolve operational leaks, which in turn will reduce GHG emissions.
Yes	HFC leakage	Operation	M-2E-07	No	Reduce Disposal Emissions	Properly recover refrigerants prior to the disposal of refrigeration and air conditioning equipment. U.S. Environmental Protection Agency-certified refrigerant recovery equipment must be used, meaning that a least 90 percent of the refrigerant must be recovered if the compressor is operating, and at least 80 percent must be recovered otherwise.
Yes	Land use change	Operation	M-2F-01	No	Implement Management Practices to Improve the Health and Function of Natural and Working Lands	Implement management strategies aimed at improving the overall health and functionality of natural and working lands as a mechanism for increasing carbon sequestration and reducing GHG emissions. Management practices may include those that change ecosystem carbon exchange rates (e.g., cultivated land soil conservation, use of biochar) and those that involve land cover changes. If land conversion is deemed appropriate, refer to Measure M-1E-1 for recommended implementation and management strategies.
Yes	Land use change	Operation	M-2F-02	No	Wildfire Resilience and Management	Implement fuel treatments in forested areas to minimize the likelihood of severe or catastrophic wildfire behavior, thereby minimizing pyrogenic carbon emissions during a wildfire event. Fuel treatments have the short-term effect of releasing more carbon emissions as understory, ladder fuels, and forest fuel loads are burned. However, in the long term, treated stands produce fewer emissions compared to untreated stands because treated stands produce low to moderate fire severity that does not disturb the carbon stock in the overstory canopy. Untreated stands are far more likely to experience severe behavior that ignites the canopy and releases the stored carbon in the overstory.
Yes	On-road vehicles	Operation	M-2G-08	No	Limit Residential Parking Supply	Reduce the total parking supply available at a residential project or site. Limiting the amount of parking available creates scarcity and adds additional time and inconvenience to trips made by private auto, thus disincentivizing driving as a mode of travel. Reducing the convenience of driving results in a shift to other modes and decreased vehicle miles traveled and thus a reduction in GHG emissions.
Yes	On-road vehicles	Operation	M-2G-35	No	Provide Electric Vehicle Charging Infrastructure	Install onsite electric vehicle chargers at buildings with designated parking areas (e.g., commercial, educational, retail, multifamily). This will enable drivers of plug-in hybrid electric vehicles to drive a larger share of miles in electric mode, as opposed to gasoline-powered mode, thereby displacing GHG emissions from gasoline consumption with a lesser amount of indirect emissions from electricity.
Yes	On-road vehicles	Operation	M-2G-36	No	Use Cleaner-Fuel Vehicles	Use cleaner-fuel vehicles in lieu of similar vehicles powered by gasoline or diesel fuel. Cleaner-fuel vehicles may include electric vehicles, natural gas and propane vehicles, and vehicles powered by biofuels such as composite diesel (blend of renewable diesel, biodiesel, and conventional fossil diesel), ethanol, and renewable natural gas. The full GHG emissions impact of cleaner fuels depends on the emissions from the vehicle's tailpipe as well as the emissions associated with production of the fuel (sometimes termed "upstream" emissions). For example, tailpipe GHG emissions from renewable natural gas are identical to tailpipe GHG emissions from conventional natural gas; the GHG benefits of renewable natural gas come from the fact that it is produced from biomass. Similarly, battery electric vehicles have zero tailpipe emissions, but properly accounting for their GHG impacts requires quantifying the emissions associated with the electricity generation needed to charge the vehicle's batteries.

Yes	Treatment of waste off-site	Operation	M-2J-01	Yes	Institute or Extend Recycling Services	Institute or extend recycling services to reduce the volume of landfilled waste. Decomposition of certain types of landfilled waste produces methane. Increasing waste diversion from landfills therefore reduces GHG emissions. The recycling process generates some emissions, but also reduces upstream emissions from the manufacturing and production of new raw materials and goods.
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Adaptation Strategies (Step 6)

Use the checkboxes below to identify adaptation strategies relevant to selected climate trends and project characteristics. The list of adaptation strategies will filter to show strategies that align with both the climate trends and project characteristics selected. Ensure Macros are enabled for filters to work (see the User Guide tab for instructions on enabling macros). Use the column on the far left to select strategies you plan to implement as part of your proposed project. Select Generate PDF button once you've made your desired selections.

Step 1: Select Climate Trends

- ☒ Heavier, more damaging rain
- ☒ Average annual precipitation increasing
- ☒ Average annual temperature increasing
- ☒ Increasing risk of extreme heat and heatwaves
- ☒ Early thawing (cold weather warming)
- ☒ Increasing risk of drought

Reset Climate Trends

Reset Project Characteristics

Select All Unhidden Strategies

Reset all Selected Strategies

Step 2: Select Project Characteristics

- ☒ Hazardous waste
- ☒ Agriculture
- ☒ Livestock
- ☒ Critical infrastructure
- ☒ Waste management
- ☒ New or upgraded buildings
- ☒ Subsurface infrastructure
- ☒ Water management
- ☒ Construction
- ☒ Increased impervious surface
- ☒ New, expanded, or rebuilt transportation route

Generate PDF

Selection	ID	Adaptation Strategies	Additional Information
Yes	S-1A-02	Conduct ongoing and pre-event stormwater infrastructure maintenance.	Clean out the storm drains and culverts; Ensure that all maintenance equipment are readily available and working for extreme events (e.g., generators).
Yes	S-1A-10	Ensure there is adequate redundancy and/or backup energy resources available to maintain necessary operations during extreme precipitation events.	Implement renewable energy and smart grid technology to optimize energy distribution and reduce outages; Develop off-grid sources for redundant power supply; Install easy hookups for temporary power; Install backup generators; Diversify energy sources such as by installing renewable energy; Install battery storage; Incorporate multiple power supplies; Implement a microgrid with integrated energy storage systems; Join a community energy project to pool resources; Utilize a combined heat and power (CHP) system; Ensure these systems are designed to be resilient during a projected extreme flood event.
Yes	S-1A-17	When siting and orienting a facility or asset, consider flood risk from increased precipitation and extreme precipitation events.	Avoid development in erosion zones and floodplains; Select a site at higher elevation.
Yes	S-1B-01	Ensure hazardous materials are stored in temperature-controlled environments to accommodate for high temperatures and heatwaves.	Insulate storage areas; Install temperature monitoring systems with alarms to alert staff; Conduct regular inspections and maintenance of storage facilities.
Yes	S-1B-02	Consider alternative pavement surfaces and materials that are more heat-resistant to reduce heat impacts and surface temperatures.	Use light-colored asphalt pavement to reduce heat absorption and reflect radiation; Use materials for railway tracks and stations that are resistant to higher heat to prevent buckling and kinks; Install permeable surfaces especially for low-traffic areas such as roadside parking (along curbs) and parking lots.
Yes	S-1B-04	Regularly monitor the condition of roadways and conduct maintenance to address wear and tear from high temperatures and heatwaves.	Implement regular maintenance schedules to address increased wear and tear; As needed, increase the use and frequency of preventative maintenance treatments (e.g., seal coats, crack seals); Install pavement sensors for extreme heat and road failure.
Yes	S-1B-05	Retain mature trees as part of design and during construction.	Inventory trees; mark boundaries around trees to avoid compaction and damage to trunks and roots.
Yes	S-1B-06	Use cooling technologies to reduce surface temperatures during periods of high temperatures and/or heatwaves.	Use reflective coating; Use high-reflectivity hardscape; Decrease impervious surfaces and/or install permeable surfaces; Incorporate green infrastructure (e.g., green roofs); Maintain and/or expand urban tree canopy.
Yes	S-1B-08	Use building construction materials that maintain indoor temperatures and/or are resilient to increasing temperatures during high heat conditions and heatwaves.	Update building insulation for higher heat thresholds; Use reflective roofing materials; Install energy efficient windows (e.g., double-glazed windows); Install green roofs and/or green walls; Use light-colored building materials (e.g., cool roofing and siding materials); Optimize natural ventilation.
Yes	S-1B-14	Ensure there is adequate redundancy and/or backup energy resources available to maintain necessary operations during increased cooling demand and/or an extreme heat event.	Implement renewable energy and smart grid technology to optimize energy distribution and reduce outages; Develop off-grid sources for redundant power supply; Install easy hookups for temporary power; Install backup generators; Diversify energy sources such as by installing renewable energy; Install battery storage; Incorporate multiple power supplies; Implement a microgrid with integrated energy storage systems; Join a community energy project to pool resources; Utilize a combined heat and power (CHP) system.
Yes	S-1B-16	Upgrade the electrical systems to handle increased cooling demand especially from extreme heat events.	Consider renewable energy and smart grid technology to optimize energy distribution and reduce outages.
Yes	S-1B-17	Provide cooling systems for critical infrastructure or equipment sensitive to overheating during periods of high temperatures and/or heatwaves.	Install back up air conditioning units; Use battery-powered equipment which is less prone to overheating than gas-powered machinery.
Yes	S-1B-19	Increase the frequency of maintenance checks to ensure construction equipment is functioning optimally in high temperatures and during heatwaves.	Regularly check fluid levels, tire pressure, and hydraulic systems.
Yes	S-1D-08	Install water-saving technologies indoors to account for drought conditions.	Use water-efficient household appliances (e.g., low-flow toilets, showerheads, and front-loading washers); Install water meters.

Appendix I:
*Transportation
Impact
Studies*

TRAFFIC IMPACT ANALYSIS

HERMANTOWN INDUSTRIAL

HERMANTOWN, MINNESOTA

REPORT CERTIFICATION

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



Jacob Rojer, P.E., PTOE
License No. 56767

3-27-2026
Date

Approved _____
St. Louis County Traffic Engineer

Date

Approved _____
MnDOT Traffic Engineer

Date

Approved _____
Hermantown City Engineer

Date

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APPENDIX

- A. EXHIBITS
- B. TURNING MOVEMENT COUNTS
- C. SIMTRAFFIC ANALYSIS RESULTS
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INTRODUCTION

Kimley-Horn was retained to prepare a Traffic Impact Analysis (TIA) for the proposed Hermantown Industrial development located in Hermantown, Minnesota. The site is located at the southwest corner of Morris Thomas Road & Midway Road. An aerial view of the study location and surrounding roadway network is presented in **Exhibit 1** in **Appendix A**.

As part of this study, the existing roadway network was analyzed to determine the current operations at the study intersections. In order to assess the impact of the development scenarios on the area roadway network, site-generated trips were established and added to the background traffic volumes. Background traffic volumes included the other major development projects in the vicinity. Future traffic conditions were evaluated for the potential Opening Year of the proposed development (2030) and a long-term “Design Year” (2045). Background conditions were analyzed for each study year, along with the “build” conditions of the two development scenarios. Additionally, an Existing (2025) conditions traffic analysis was conducted.

This report presents and documents data collection, summarizes the evaluation of existing and projected future traffic conditions on the surrounding roadways, and identifies recommendations to address the potential impact of site-generated traffic on the adjacent roadway network.

STUDY AREA

The development site is located at the southwest corner of Morris Thomas Road & Midway Road in Hermantown, MN. The site is largely undeveloped with the exception of an electrical substation and sparse residential and commercial buildings along the edges of the site.

EXISTING ROADWAY CHARACTERISTICS

The existing roadway network near the site includes multiple County State Aid Highways (CSAHs), a US Highway, and some minor local roads. The following provides a description of the roadways near the study area:

Midway Road (CSAH 13) is a north-south two-lane St. Louis County roadway located along the eastern boundary of the AUAR study area. The annual average daily traffic (AADT) according to the MnDOT Traffic Mapping Application is 7,111 vehicle per day south of St. Louis River Road, as of 2024. Midway Road is classified as a Minor Arterial and the posted speed limit is 55 miles per hour (mph) near the project site.

United States Highway 2 (US 2) is an east-west two-lane United States highway located northeast of the AUAR area. The MnDOT Traffic Mapping Application reports an AADT of 5,466 vpd west of St. Louis River Road, as of 2025. US Highway 2 is classified as a Principal Arterial, and the posted speed limit is 60 mph near the project site.

Morris Thomas Road (CSAH 56) is an east-west two-lane St. Louis County roadway that forms the northern boundary of the AUAR area. The MnDOT Traffic Mapping Application reports an AADT of 1,195 vehicles per day west of Midway Road, as of 2024. Morris Thomas Road is classified as a Major Collector, and the posted speed limit is 55 mph.

Saint Louis River Road (CSAH 19) east of Midway Road or **County Road 696** west of Midway Road is an east-west two-lane road located south of the AUAR area. The MnDOT Traffic Mapping Application reports an AADT of 508 vpd in 2024. Saint Louis River Road is classified as a minor collector east of Midway Road and a local road west of Midway Road, with a posted speed limit is 55 mph.

Old Highway 2 is an east-west unpaved local road located northeast of the AUAR area. The MnDOT Traffic Mapping Application reported an AADT of 760 vpd in 2019 though is likely much lower than this because the connection to US 2 has since been removed.

The existing geometry and intersection control for the intersections in the study area that will be included in this analysis are shown in **Exhibit 2**.

PLANNED ROADWAY IMPROVEMENTS

St. Louis County is currently in the planning stages of looking at concepts for future roadway improvements along Midway Road to provide grade separation from the rail lines. With the unknown nature of the potential future improvements, no background roadway modifications are assumed for this analysis. Any traffic analysis conducted after roadway improvement plans have been determined should include consideration of the planned improvements.

RAILROAD CROSSING CONDITIONS

There are two railroad crossings within the study area. The north railroad crossing is located on Midway Road, approximately 430' north of Morris Thomas Road. The south railroad crossing is located at the intersection of Midway Road & St. Louis River Road. Both railroad crossings include crossing signals with arms (the south crossing has crossing signals with arms at all four intersection approaches). The north crossing is located approximately 1,000' south of the Midway Road & US Highway 2 intersection.

A count of the trains crossing passing through each of the two railroad crossings was conducted to determine the scale of the impact that the railroad crossings pose to the traffic in the study area. The north railroad crossing saw 12 trains pass-through in the 24-hour period from 12:00 PM on April 9 to 12:00 PM on April 10. The south railroad crossing saw 9 trains pass-through during the same period. The count of the railroad crossings indicated that the flow of trains through both crossings is generally consistent throughout the day without distinct peaks or lulls. However, it should be noted that per the Minnesota Railer Viewer Application, the two crossing locations can have up to 30 trains per day.

Railroad crossings at the crossing point north of Morris Thomas Road were found to typically take 3-5 minutes. Of the 12 observed railroad crossings, the longest crossing took just under 10 minutes, and the shortest crossing took 2 minutes and 15 seconds. Overall, crossings exhibited an average duration of 4 minutes and 10 seconds and a median duration of 3 minutes and 38 seconds.

MnDOT provided railroad crossing data for June-October 2025 for the Morris Thomas Road crossing. The data showed a total of 2,732 crossings during the 5-month/152-day period. This equates to 18 crossings per day. Using the crossings timestamp data, the calculated median crossing duration was 4 minutes and 17 seconds and the 95th percentile crossing duration was 7 minutes 37 seconds.

The number of 5-minute and 10-minute railroad crossing events are shown below in **Table 1**. In the 5-month span, 649 crossings were at least 5 minutes in duration (24% of total), and 50 crossings were at least 10 minutes in duration (2% of total). The number of 10-minute crossing events annually is projected to be 120 (about one per 3 days). Only one 10-minute crossing event occurred during the AM peak hour between June and October 2025.

Table 1: Number of Railroad Crossing Events by Duration

Event Type	Crossing Count Data (June - October 2025)		Projected Annual Events
	Number of Events	Percent of Total Events	
5+ Minute Crossing	649	24%	1,558
10+ Minute Crossing	50	2%	120
<i>Total Crossings</i>	<i>2,732</i>	<i>100%</i>	<i>6,557</i>

As is typical, vehicles may experience delays of a few minutes during crossings and long queues are likely to form at these times. It was observed that queues at the north railroad crossing for vehicles traveling southbound on Midway Road reach the US Highway 2 intersection at times, causing queues to form in the westbound left-turn lane, eastbound right-turn lane, and southbound through lane. Queues from the east and westbound turning movements were not observed to block their respective through lanes at any time with adequate remaining queue storage. A future conditions queue analysis for the railroad crossing was conducted as part of this report (see the *Railroad Crossing Queue Analysis* section below).

VOLUME DEVELOPMENT

Kimley-Horn conducted a review of the study area including existing land uses in the surrounding area, the adjacent street system, current traffic volumes and operating conditions, lane configurations and traffic controls at nearby intersections, and other key roadway characteristics. This section of the report details information on the existing conditions.

EXISTING TRAFFIC VOLUMES

Turning Movement Counts (TMCs) were collected at five (5) study intersections in April 2025, with the PM peak (4:00 PM to 6:00PM) collected on Wednesday, April 9, and the AM peak (7:00 AM to 9:00 AM) collected on Thursday, April 10. The five study intersections are as follows:

- US Highway 2 & Midway Road
- Midway Road & Morris Thomas Road
- Midway Road & St. Louis River Road
- US Highway 2 & Morris Thomas Road
- US Highway 2 & St. Louis River Road

The TMC data indicates that peak hour traffic volumes occur within the study area from 7:15 to 8:15 AM and 4:15 to 5:15 PM on a typical weekday. Full turning movement count data is included in **Appendix A**. The Existing (2025) traffic volumes are shown in **Exhibit 3**.

FUTURE BACKGROUND GROWTH

To account for background growth caused by change in local and regional travel patterns and future developments, a background growth rate was utilized. Historical Annual Average Daily Traffic (AADT) data was compiled with MnDOT's ESAL worksheet and used to calculate historical growth rates along each roadway, which are adjusted for local demographic patterns. The Existing AADT for each roadway and the demographically adjusted growth rates are given in **Table 2**.

Table 2: Demographically Adjusted Growth Rates

Roadway Name	Location on Roadway	Existing AADT	Growth Rate
US Highway 2	East of Midway Road	6,200	0.5%
	West of Midway Road	3,000	0.5%
Midway Road	South of St Louis River Road	7,000	1.1%
Morris Thomas Road	West of Midway Road	1,200	0.6%
	East of US Highway 2	1,800	0.5%
St Louis River Road	East of Midway Road	1,900	0.6%
Average Growth Rate			0.6%

Based on a review of historical AADT trends, the study area roadways are generally projected to see slow growth. The average demographically adjusted growth rate was found to be about 0.6% annual growth. Population projections from the Duluth Superior Metropolitan Interstate Council show that the city of Hermantown is projected to grow from 10,128 in 2021 to 10,672 in 2050, or about 0.2% annual growth. This projection confirms that the area is generally expected to see slow growth and a 0.6% annual growth rate is likely to provide a conservative estimate regarding the level of growth.

FUTURE BACKGROUND DEVELOPMENT

There are no known background developments in the project vicinity. A 0.6% annual background growth provides a conservative estimate for all background traffic growth due to local and regional developments.

FUTURE BACKGROUND TRAFFIC PROJECTIONS

The No-Build traffic volumes for the potential Opening Year (2030) were calculated by growing the Existing (2025) traffic volumes (**Exhibit 3**) by a 0.6% annual growth rate for 5 years. The resultant Potential Opening Year (2030) No-Build traffic volumes are shown in **Exhibit 4**.

The Design Year (2045) No-Build traffic volumes were calculated by growing the Existing (2025) traffic volumes (**Exhibit 3**) by a 0.6% annual growth rate for 20 years. The resultant Design Year (2045) No-Build traffic volumes are shown in **Exhibit 5**.

PROPOSED DEVELOPMENT

The proposed Hermantown Industrial development is within the AUAR development scenario intensity. Site characteristics and estimated trip generation and distribution are described below.

DEVELOPMENT CHARACTERISTICS AND SITE ACCESS

Access to the proposed development would be located along Morris Thomas Road about 0.4 miles west of Midway Road, near the northwest corner of the development site. This access point is anticipated to serve all traffic associated with the proposed development site.

TRIP GENERATION

Site specific trip generation estimates were provided by the developer. The estimates are based on trip generation data collected at similar sites across the country.

The anticipated trip generation for the Hermantown Industrial development at full buildout is shown below in **Table 3**. The development is expected to generate 1,920 daily trips, including 290 trips during the AM peak hour (260 entering and 30 exiting) and 290 during the PM peak hour (30 entering and 260 exiting).

Table 2: Proposed Development Trip Generation

Land Use Description	Daily	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Hermantown Industrial	1,920	260	30	290	30	260	290

DIRECTIONAL DISTRIBUTION

The estimated distribution of site-generated traffic on the surrounding roadway network was developed based on a review of area demographics, roadway volumes, and origin-destination data from Replica, a publicly available dataset which utilizes Census data, land use regulations, aggregate mobile data, transaction data, and real estate transaction data to model transportation patterns. Based on the origin-destination data and consideration of the existing traffic patterns and roadway characteristics, the following global distribution was developed:

- 40% to/from southeast on US Highway 2
- 15% to/from north on Midway Road
- 15% to/from south on Midway Road
- 15% to/from east on Morris Thomas Road
- 10% to/from west on Morris Thomas Road
- 5% to/from northwest on US Highway 2

The anticipated site trip distribution for the proposed development is shown in **Exhibit 6**. The site traffic assignment, representing traffic volumes associated with the proposed development at the study intersections, is a function of the estimated trip generation (**Table 2**) as well as the directional distribution listed above. The site trip assignment for Potential Opening Year (2030) Build conditions is shown in **Exhibit 7**. Full Buildout of the development site was included in the 2030 Build conditions.

FUTURE BUILD TRAFFIC PROJECTIONS

The Build traffic volumes for the potential Opening Year (2030) were calculated by adding the total development site trips (**Exhibit 7**) to the Potential Opening Year (2030) No-Build traffic volumes (**Exhibit 4**). The Potential Opening Year (2030) Build traffic volumes are shown in **Exhibit 8**.

The Design Year (2045) Build traffic volumes were calculated by adding the total development site trips (**Exhibit 7**) to the Design Year (2045) No-Build traffic volumes (**Exhibit 5**). The Design Year (2045) Build traffic volumes are shown in **Exhibit 9**.

CAPACITY ANALYSIS

Analysis of the future background conditions was carried out to determine the baseline operating conditions for the potential Opening Year (2030) and the analyzed Design Year (2045) of the proposed development. A review of future traffic growth and planned geometric changes for the study roadways was conducted for the analysis.

ANALYSIS METHODOLOGY

Synchro/SimTraffic 12th edition capacity analysis software was used to evaluate the operating conditions at the study intersections. The capacity of an intersection quantifies its ability to accommodate traffic volumes and is expressed in terms of level of service (LOS), measured in average delay per vehicle. LOS grades range from A to F, with LOS A as the highest (best traffic flow and least delay), LOS E as saturated or at-capacity conditions, and LOS F as the lowest (oversaturated conditions).

The LOS grades shown below, which are provided in the Transportation Research Board's Highway Capacity Manual (HCM), quantify and categorize the driver's discomfort, frustration, fuel consumption, and travel times experienced as a result of intersection control and the resulting traffic queuing. A detailed description of each LOS rating can be found in **Table 4**.

Table 3: Level of Service Grading Descriptions

Level of Service	Description (<i>Highway Capacity Manual</i> , 7 th Edition)
A	Minimal control delay; traffic operates at primarily free-flow conditions; unimpeded movement within traffic stream.
B	Minor control delay at signalized intersections; traffic operates at a fairly unimpeded level with slightly restricted movement within traffic stream.
C	Moderate control delay; movement within traffic stream more restricted than at LOS B; formation of queues contributes to lower average travel speeds.
D	Considerable control delay that may be substantially increased by small increases in flow; average travel speeds continue to decrease.
E	High control delay; average travel speed no more than 33 percent of free flow speed.
F	Extremely high control delay; extensive queuing and high volumes create exceedingly restricted traffic flow.

The range of control delay for each rating (as detailed in the HCM) is shown in **Table 5**.

Table 4: Level of Service Grading Criteria

Level of Service ¹	Average Control Delay (s/veh) at:	
	Unsignalized Intersections	Signalized Intersections
A	0 – 10	0 – 10
B	> 10 – 15	> 10 – 20
C	> 15 – 25	> 20 – 35
D	> 25 – 35	> 35 – 55
E	> 35 – 50	> 55 – 80
F ²	> 50	> 80

¹Highway Capacity Manual, 7th Edition

²All movements with a Volume to Capacity (v/c) ratio greater than 1 receive a rating of LOS F.

At side-street stop-controlled intersections, overall delay is not reported, and the worst side street delay is reported in its place. The overall delay at side-street stop-controlled intersections can misrepresent the operating conditions at the intersection since vehicles at free approaches often experience zero delay.

EXISTING (2025) CONDITIONS CAPACITY ANALYSIS

Existing (2025) conditions capacity analysis was conducted to develop an understanding of the baseline operating conditions currently present at the study intersections. Existing geometry and intersection control are shown in **Exhibit 2**, while the Existing (2025) traffic volumes are shown in **Exhibit 3**.

Capacity analysis was conducted in Synchro 12/SimTraffic. The results of Existing (2025) conditions capacity analysis are summarized below in **Table 6**.

Based on the analysis results, all movements at the study intersections currently operate at LOS C or better and all study intersections operate at an overall LOS A or B during the AM and PM peak hours.

The 95th percentile queueing results were reviewed, and all queues are maintained within their provided storage bays with no significant queueing issues anticipated. The SimTraffic analysis reports can be found in **Appendix C**.

Table 5: Existing Year (2025) Level of Service

Intersection	Control	Approach	Operations by Movement							
			AM Peak Hour				PM Peak Hour			
			Left	Through	Right	Overall	Left	Through	Right	Overall
Midway Road & US Highway 2	Signal	EB	C (24.5)	B (18.1)	A (4.3)	B (13.2)	C (22.9)	B (18.2)	A (6.7)	B (12.1)
		WB	C (21.2)	A (9.7)	A (4.9)		C (20.1)	B (13.3)	A (5.4)	
		NB	B (11.6)	B (17.9)	A (4.6)		B (12.2)	B (14.9)	A (4.4)	
		SB	B (11.5)	A (8.3)	A (4.9)		B (11.8)	B (10.7)	A (4.5)	
Midway Road & Morris Thomas Road	Side Street Stop	EB	A (5.1)	-	A (2.2)	A (5.1)	A (6.9)	-	A (3.8)	A (6.9)
		WB	-	-	-		-	-	-	
		NB	A (1.3)	A (2.7)	-		A (3.7)	A (2.4)	-	
		SB	-	A (3.3)	A (2.7)		-	A (4.8)	A (3.6)	
Midway Road & St Louis River Road	Side Street Stop	EB	A (6.8)	B (10.1)	A (1.8)	B (10.1)	A (6)	A (9.6)	A (1.7)	A (9.6)
		WB	-	A (2.6)	A (2.1)		A (8.7)	A (6)	A (0.9)	
		NB	A (0)	A (0.2)	A (0)		A (1.2)	A (0.2)	A (0)	
		SB	A (0.6)	A (0.6)	A (0)		A (1.7)	A (0.6)	A (0)	
US Highway 2 & Morris Thomas Road	Side Street Stop	EB	A (6.9)	A (6.5)	-	A (6.9)	A (7.5)	A (6.4)	-	A (7.5)
		WB	-	A (1.7)	A (0.1)		-	A (3.1)	A (3)	
		NB	-	-	-		-	-	-	
		SB	A (6.6)	-	A (1.5)		A (6.1)	-	A (2.5)	
St Louis River Road & US Highway 2	Side Street Stop	EB	-	A (0.7)	A (0.1)	A (4.9)	-	A (0.4)	A (0)	A (3.7)
		WB	A (1.2)	A (0.2)	-		A (1.5)	A (0.4)	-	
		NB	A (4.9)	-	A (2.2)		A (3.7)	-	A (1.9)	
		SB	-	-	-		-	-	-	

Note: The Overall LOS at side street stop-controlled intersections is reported as the worst movement.

POTENTIAL OPENING YEAR (2030) NO-BUILD CAPACITY ANALYSIS

A Potential Opening Year (2030) No-Build Condition analysis was completed to develop an understanding of the baseline operating conditions for the study area in the potential opening year of the proposed development. No geometric changes were assumed in the analysis. The Potential Opening Year (2030) No-Build traffic volumes are shown in **Exhibit 4**. Results of the Potential Opening Year (2030) No-Build conditions capacity analysis are provided in **Table 7**.

Under Potential Opening Year (2030) No-Build conditions, all intersections are expected to continue operating at LOS A or B and all individual movements are anticipated to operate at LOS C or better.

The 95th percentile queueing results were reviewed, and all queues are expected to remain within the provided storage bays with no significant queueing issues anticipated. The SimTraffic analysis reports are provided in **Appendix C**.

Table 6: Potential Opening Year (2030) No-Build Level of Service

Intersection	Control	Approach	Operations by Movement							
			AM Peak Hour				PM Peak Hour			
			Left	Through	Right	Overall	Left	Through	Right	Overall
Midway Road & US Highway 2	Signal	EB	C (26.9)	C (20.7)	A (4.5)	B (14.1)	C (26.8)	C (20.6)	A (6.1)	B (13.8)
		WB	C (22.5)	B (13.2)	A (5.9)		C (25.7)	B (14.7)	A (5.6)	
		NB	B (11.6)	B (18.1)	A (4.8)		B (12.8)	B (16.8)	A (4.5)	
		SB	B (12.2)	A (8.5)	A (4.6)		B (12.9)	B (12.5)	A (4.8)	
Midway Road & Morris Thomas Road	Side Street Stop	EB	A (5.2)	-	A (2.8)	A (5.2)	A (6.4)	-	A (3.5)	A (6.4)
		WB	-	-	-		-	-	-	
		NB	A (2)	A (2.7)	-		A (4.3)	A (2.6)	-	
		SB	-	A (3.1)	A (2.8)		-	A (5.1)	A (4)	
Midway Road & St Louis River Road	Side Street Stop	EB	A (5.6)	B (10.5)	A (1.7)	B (10.5)	A (6.9)	B (10.9)	A (1.6)	B (10.9)
		WB	-	A (2.6)	A (1.8)		A (5.6)	A (5.7)	A (1.4)	
		NB	A (0.5)	A (0.2)	A (0)		A (2.9)	A (0.2)	A (0)	
		SB	A (1.4)	A (0.6)	A (0)		A (1.1)	A (0.6)	A (0)	
US Highway 2 & Morris Thomas Road	Side Street Stop	EB	A (7.3)	A (6.7)	-	A (7.3)	A (7.7)	A (6.8)	-	A (7.7)
		WB	-	A (1.8)	A (1.6)		-	A (3.4)	A (1.5)	
		NB	-	-	-		-	-	-	
		SB	A (5.1)	-	A (1.3)		A (5.1)	-	A (2.5)	
St Louis River Road & US Highway 2	Side Street Stop	EB	-	A (0.6)	A (0)	A (4.2)	-	A (0.5)	A (0)	A (5.4)
		WB	A (1.6)	A (0.1)	-		A (1)	A (0.3)	-	
		NB	A (4.2)	-	A (2.5)		A (5.4)	-	A (1.5)	
		SB	-	-	-		-	-	-	

Note: The Overall LOS at side street stop-controlled intersections is reported as the worst movement.

POTENTIAL OPENING YEAR (2030) BUILD CONDITIONS CAPACITY ANALYSIS

The Potential Opening Year (2030) Build conditions capacity analysis was conducted to determine the traffic impacts of the proposed Build development on the operations of the adjacent roadway network in the potential opening year of the proposed development. Existing (2025) intersection control, geometry, and signal timings were assumed for the analysis. Potential Opening Year (2030) Build traffic volumes are shown in **Exhibit 8**. The results of the Potential Opening Year (2030) Build analysis are shown below in **Table 8**.

Based on the results of the Potential Opening Year (2030) Build conditions analysis, all intersections and movements are anticipated to operate at LOS C or better.

SimTraffic queueing results were reviewed and all 95th percentile queues are anticipated to remain within their respective storage bays. SimTraffic reports are included in **Appendix C**.

Table 7: Potential Opening Year (2030) Build Level of Service

Intersection	Control	Approach	Operations by Movement							
			AM Peak Hour				PM Peak Hour			
			Left	Through	Right	Overall	Left	Through	Right	Overall
Midway Road & US Highway 2	Signal	EB	C (33.9)	C (29.7)	A (6.6)	B (19.1)	C (33)	C (22.9)	A (6.6)	B (13.7)
		WB	C (29.4)	B (11.3)	A (6)		C (25.2)	B (14.1)	A (6)	
		NB	B (15)	C (23)	A (5.7)		B (14.3)	B (17.7)	A (5.5)	
		SB	B (17.6)	B (12.8)	A (4.6)		B (13.3)	B (13)	A (4.4)	
Midway Road & Morris Thomas Road	Side Street Stop	EB	B (10.1)	A (0.4)	A (4.7)	B (10.1)	C (16.8)	-	B (13.6)	C (16.8)
		WB	-	-	-		-	-	-	
		NB	A (5.5)	A (5.3)	-		A (4.3)	A (3.6)	-	
		SB	-	A (5.7)	A (3.3)		-	A (5.9)	A (4.1)	
Midway Road & St Louis River Road	Side Street Stop	EB	A (6)	B (10.4)	A (1.9)	B (10.4)	A (8.5)	B (11.8)	A (1.1)	B (11.8)
		WB	-	A (3)	A (1.9)		A (6.3)	A (6.2)	A (2.8)	
		NB	A (1.8)	A (0.3)	A (0)		A (1.8)	A (0.3)	A (0)	
		SB	A (1.2)	A (0.6)	A (0)		A (1.7)	A (1.2)	A (0)	
US Highway 2 & Morris Thomas Road	Side Street Stop	EB	A (7.9)	A (7.2)	-	A (7.9)	B (10.8)	A (9.8)	-	B (10.8)
		WB	-	A (2.7)	A (2.2)		-	A (3.5)	A (3.1)	
		NB	-	-	-		-	-	-	
		SB	A (5.6)	-	A (2.1)		A (8.1)	-	A (2.6)	
St Louis River Road & US Highway 2	Side Street Stop	EB	-	A (0.8)	A (0)	A (8.6)	-	A (0.7)	A (0)	A (7.3)
		WB	A (1.8)	A (0.5)	-		A (1.8)	A (0.5)	-	
		NB	A (8.6)	-	A (2.8)		A (7.3)	-	A (2.8)	
		SB	-	-	-		-	-	-	
Morris Thomas Road & Industrial Access	Side Street Stop	EB	-	A (1.1)	A (0.1)	A (9.5)	-	A (1.7)	A (0)	A (6.5)
		WB	A (2.5)	A (2.8)	-		A (0.5)	A (0.5)	-	
		NB	A (9.5)	-	A (2.9)		A (6.5)	-	A (4.5)	
		SB	-	-	-		-	-	-	

Note: The Overall LOS in side street stop-controlled intersections is reported as the worst movement.

DESIGN YEAR (2045) NO-BUILD CAPACITY ANALYSIS

The Design Year (2045) No-Build Condition analysis was completed to develop an understanding of the baseline operating conditions for the study area in the long-term without the addition of proposed development traffic. Existing (2025) intersection control, geometry and signal timings were utilized in the analysis. The Design Year (2045) No-Build Traffic Volumes are shown in **Exhibit 6**. Results of the Design Year (2045) No-Build capacity analysis are included below in **Table 9**.

All movements at the study intersections are expected to operate at LOS C or better during the AM and PM peak hours. All study intersections are anticipated to continue operating at an overall LOS A or B. Overall, the increases in delay due to background growth are minimal and operations are expected to remain acceptable through the Design Year (2045) with no modifications to the study area intersections.

The 95th percentile queueing results were reviewed and all 95th percentile queues are expected to be maintained within their provided storage bays. The SimTraffic reports are included in **Appendix C**.

Table 8: Design Year (2045) No-Build Level of Service

Intersection	Control	Approach	Operations by Movement							
			AM Peak Hour				PM Peak Hour			
			Left	Through	Right	Overall	Left	Through	Right	Overall
Midway Road & US Highway 2	Signal	EB	C (25.6)	C (21.2)	A (4.8)	B (15)	C (28.2)	C (22.2)	A (6.7)	B (14.8)
		WB	C (24.7)	B (13.5)	A (6.3)		C (26.7)	B (15.1)	A (6)	
		NB	B (11.1)	B (19.7)	A (4.8)		B (14.6)	B (18.7)	A (4.7)	
		SB	B (14.1)	A (9.4)	A (4.1)		B (14.7)	B (12.7)	A (4.4)	
Midway Road & Morris Thomas Road	Side Street Stop	EB	A (6.2)	-	A (3.3)	A (6.2)	A (8.7)	-	A (4.4)	A (8.7)
		WB	-	-	-		-	-	-	
		NB	A (2.5)	A (2.9)	-		A (5.4)	A (3)	-	
		SB	-	A (3.4)	A (2.8)		-	A (5.6)	A (4.1)	
Midway Road & St Louis River Road	Side Street Stop	EB	A (6.6)	B (10.8)	A (2.4)	B (10.8)	A (6.5)	B (11.2)	A (2)	B (11.2)
		WB	-	A (2.2)	A (1)		A (5.4)	A (6.3)	A (2.6)	
		NB	A (0.7)	A (0.2)	A (0)		A (1)	A (0.2)	A (0)	
		SB	A (1.9)	A (0.6)	A (0)		A (1.2)	A (0.7)	A (0.1)	
US Highway 2 & Morris Thomas Road	Side Street Stop	EB	A (7.7)	A (6.7)	-	A (7.7)	A (8)	A (6.6)	-	A (8)
		WB	-	A (2)	A (1.7)		-	A (3.3)	A (1.6)	
		NB	-	-	-		-	-	-	
		SB	A (5.7)	-	A (1.8)		A (5.2)	-	A (2.9)	
St Louis River Road & US Highway 2	Side Street Stop	EB	-	A (0.7)	A (0)	A (5.6)	-	A (0.5)	A (0)	A (4.4)
		WB	A (1.9)	A (0.3)	-		A (1.5)	A (0.4)	-	
		NB	A (5.6)	-	A (3)		A (4.4)	-	A (1.9)	
		SB	-	-	-		-	-	-	

Note: The Overall LOS in side street stop-controlled intersections is reported as the worst movement.

DESIGN YEAR (2045) BUILD CONDITIONS CAPACITY ANALYSIS

Capacity analysis was conducted for the Design Year (2045) Build conditions to determine the long-term effects of the proposed development. Existing (2025) intersection control, geometry, and signal timings were used for the analysis. The Design Year (2045) Build volumes are shown in **Exhibit 9**. Capacity analysis results for the Design Year (2045) Build conditions are provided in **Table 10**.

Results of the Design Year (2045) Build conditions analysis show that with the addition of long term background growth, delays are generally anticipated to see a minor increase compared to the Potential Opening Year (2030) Build conditions. All study intersections are anticipated to operate at LOS C or better and all individual movements are anticipated to operate at LOS D or better during the AM and PM peak hours. SimTraffic queueing results were reviewed, and all 95th percentile queues are anticipated to remain within their provided storage bays and no significant queueing issues are expected. SimTraffic reports are included in **Appendix C**.

Table 9: Design Year (2045) Build Level of Service

Intersection	Control	Approach	Operations by Movement							
			AM Peak Hour				PM Peak Hour			
			Left	Through	Right	Overall	Left	Through	Right	Overall
Midway Road & US Highway 2	Signal	EB	D (40.5)	C (32.1)	A (7.3)	C (22.1)	C (27.5)	C (25)	A (8)	B (15.4)
		WB	C (31.1)	B (12.3)	A (7.4)		C (26.7)	B (15.6)	A (7.1)	
		NB	B (19.8)	C (27.2)	A (5.9)		B (16.5)	B (19.1)	A (5.7)	
		SB	C (23.8)	B (15.2)	A (3.5)		B (15.6)	B (14.5)	A (4.8)	
Midway Road & Morris Thomas Road	Side Street Stop	EB	B (10.2)	-	A (5.6)	B (10.2)	C (21.2)	-	C (15.8)	C (21.2)
		WB	-	-	-		-	-	-	
		NB	A (6.5)	A (5.9)	-		A (5.7)	A (3.9)	-	
		SB	-	A (5.7)	A (3.7)		-	A (6.6)	A (4.6)	
Midway Road & St Louis River Road	Side Street Stop	EB	A (6.3)	B (11.3)	A (2.2)	B (11.3)	A (7.9)	B (12.1)	A (1.5)	B (12.1)
		WB	-	A (3.1)	A (1.5)		A (6.4)	A (6.9)	A (4.6)	
		NB	A (0.9)	A (0.4)	A (0)		A (1.2)	A (0.3)	A (0)	
		SB	A (2.4)	A (0.6)	A (0)		A (1.6)	A (1)	A (0)	
US Highway 2 & Morris Thomas Road	Side Street Stop	EB	A (8.6)	A (7.6)	-	A (8.6)	B (11)	A (9.6)	-	B (11)
		WB	-	A (3)	A (2.8)		-	A (3.6)	A (2.2)	
		NB	-	-	-		-	-	-	
		SB	A (5.5)	-	A (2.4)		A (6.9)	-	A (2.9)	
St Louis River Road & US Highway 2	Side Street Stop	EB	-	A (0.9)	A (0)	A (5.2)	-	A (0.7)	A (0)	A (7)
		WB	A (2.8)	A (0.8)	-		A (2)	A (0.5)	-	
		NB	A (5.2)	-	A (3)		A (7)	-	A (3.1)	
		SB	-	-	-		-	-	-	
Morris Thomas Road & Industrial Access	Side Street Stop	EB	-	A (1.2)	A (0.2)	A (6)	-	A (1.6)	A (0)	A (5.8)
		WB	A (2.6)	A (2.8)	-		A (0.3)	A (0.5)	-	
		NB	A (6)	-	A (2.8)		A (5.8)	-	A (4.4)	
		SB	-	-	-		-	-	-	

Note: The Overall LOS in side street stop-controlled intersections is reported as the worst movement.

DESIGN YEAR (2045) MITIGATED BUILD CONDITIONS CAPACITY ANALYSIS

It is anticipated that site traffic may be given designated routes to the site to avoid undesirable queueing from train crossings near the US Highway 2 & Midway Road intersection. In particular, all traffic traveling to the site from US Highway 2 south of St. Louis River Road would be instructed to turn take a left onto St. Louis River Road and then a right onto Midway Road, approaching Morris Thomas Road from the south. This would reduce the westbound left turn queueing during train events which could otherwise cause operational issues for through traffic along US Highway 2. The traffic volumes associated with this scenario are shown in **Exhibit 10**.

A capacity analysis was conducted on the Design Year (2045) Mitigated Build conditions to determine the impact of the rerouted site traffic on the roadway network with the proposed mitigation plan in place. Results are shown below in **Table 11**. All study intersections are anticipated to operate at LOS A or B and all individual movements at LOS D or better.

Table 10: Design Year (2045) Mitigated Build Level of Service

Intersection	Control	Approach	Operations by Movement							
			AM Peak Hour				PM Peak Hour			
			Left	Through	Right	Overall	Left	Through	Right	Overall
Midway Road & US Highway 2	Signal	EB	D (36.8)	C (25.6)	A (5.4)	B (17.2)	C (29.4)	C (24.5)	A (9.1)	B (14.9)
		WB	C (27.5)	B (11.1)	A (6.7)		C (27)	B (16.1)	A (6.3)	
		NB	B (15)	C (22.2)	A (5.8)		B (15.2)	B (19.2)	A (6.7)	
		SB	B (16.9)	B (10.9)	A (3.9)		B (13.9)	B (13.3)	A (4.9)	
Midway Road & Morris Thomas Road	Signal	EB	C (24.2)	-	A (2.8)	A (7.7)	B (13.2)	A (1.1)	A (5.2)	B (10.2)
		WB	-	-	-		-	-	-	
		NB	A (7.5)	A (6.2)	-		B (10.5)	A (7.5)	-	
		SB	-	A (7)	A (3.9)		-	B (12.1)	A (6.3)	
Midway Road & St Louis River Road	Side Street Stop	EB	A (6.6)	B (11.1)	A (2.8)	B (11.1)	A (8)	B (11.8)	A (1.4)	B (11.8)
		WB	-	A (3.5)	A (4.1)		A (6.9)	A (6.3)	A (2.8)	
		NB	A (0.8)	A (0.5)	A (0)		A (1.7)	A (0.3)	A (0)	
		SB	A (1.8)	A (0.8)	A (0)		A (1.8)	A (1.3)	A (0)	
US Highway 2 & Morris Thomas Road	Side Street Stop	EB	A (7.4)	A (7.2)	-	A (7.4)	B (11)	B (10.3)	-	B (11)
		WB	-	A (2.1)	A (0.5)		-	A (3.5)	A (2.5)	
		NB	-	-	-		-	-	-	
		SB	A (5.3)	-	A (2)		A (7.4)	-	A (3.2)	
St Louis River Road & US Highway 2	Side Street Stop	EB	-	A (0.9)	A (0.1)	B (10.4)	-	A (0.7)	A (0)	A (7)
		WB	A (2.8)	A (0.5)	-		A (1.5)	A (0.4)	-	
		NB	B (10.4)	-	A (3)		A (7)	-	A (3.2)	
		SB	-	-	-		-	-	-	
Morris Thomas Road & Industrial Access	Side Street Stop	EB	-	A (1)	A (0.1)	B (14.5)	-	A (1.6)	A (0)	A (6.5)
		WB	A (2.6)	A (1.4)	-		A (0.9)	A (0.7)	-	
		NB	B (14.5)	-	A (2.6)		A (6.5)	-	A (4.5)	
		SB	-	-	-		-	-	-	

TURN LANE WARRANT ANALYSIS

The need for turn lanes in the study area were evaluated using the methodologies laid out in the National Cooperative Highway Research Program's *Report 457* on the need for major-road turn lanes at side-street stop-controlled intersections. Turn lane warrants were conducted at the proposed Industrial Access point along Morris Thomas Road as well as for the intersection of Midway Road & Morris Thomas Road. Turn Lane Warrant sheets are shown in **Appendix D**.

Under the Potential Opening Year (2030) Build conditions, northbound-left and southbound-right turn lanes are both warranted at the intersection of Midway Road & Morris Thomas Road. These lanes are recommended to be constructed along with the proposed development. The results of the turn lane warrant analysis indicated that neither an eastbound right turn lane nor a westbound left turn lane are warranted at the site access point along Morris Thomas Road. However, St. Louis County will require a left turn lane at the proposed site access point along Morris Thomas Road for due to safety concerns associated with the high number of left turns at the intersection during peak periods.

The intersection of US Highway 2 & St. Louis River Road currently has a bypass lane in place of a left turn bay for the westbound approach. The MnDOT Access Management Manual recommends bypass lanes only in instances when left turn lanes are warranted but construction of a left turn lane is impractical. MnDOT guidelines state that a bypass can be considered instead of a left turn lane when a 2-lane highway has an AADT of more than 6,500 vehicles per day and the cross street has an AADT between 100 and 400 vehicles. As of 2025, the AADT on St. Louis River Road is about 500 which exceeds these guidelines and with the development of the AUAR parcels that AADT will increase.

Because the proposed development site adds westbound left turns the US Highway 2 & St. Louis River Road intersection, a left turn lane should be installed at the intersection to conform with the latest guidance from MnDOT. NCHRP guidelines confirm that a left turn lane is warranted under the Potential Opening Year (2030) Build conditions and that a westbound left turn lane should be installed at this intersection.

RAILROAD CROSSING ANALYSIS

Railroad crossing queues were analyzed using SimTraffic to determine if the provided storage bays along US Route 2 are sufficient for the queues which will occur during railroad crossing events. Railroad crossing analysis was focused on the Existing (2025) conditions and the Potential Opening Year (2030) Build conditions because St. Louis County is exploring alternatives to remove the at-grade railroad crossing in the long term.

As discussed in the *Railroad Crossing Conditions* section above, the majority of railroad crossing events take between 3 and 5 minutes, with the longest event observed taking 10 minutes. To be conservative, analysis was conducted on 10-minute train crossing events to estimate worst case scenario queueing which could occur during under typical traffic conditions.

EXISTING (2025) RAILROAD CROSSING QUEUEING

Analysis was conducted on the Existing (2025) railroad crossing conditions to determine the baseline level of queueing that occurs as a result of 10-minute train crossing events. The analysis indicates that southbound railroad crossing queues during the AM peak generally will not have an impact on the intersection of US Highway 2 & Midway Road due to lower southbound traffic volumes. With higher northbound traffic volumes, the maximum queues for northbound are anticipated to extend 1,346' south of Morris Thomas Road.

The PM Peak hour has higher southbound traffic volumes than the AM peak hour which results in more queueing at the US Highway 2 & Midway Road intersection. The approximate maximum queues for affected movements at the intersection are 75' for eastbound right turns, 167' for westbound left turns, and 1,808' for southbound through. Northbound queues at the railroad crossing extend 1,078' south of Morris Thomas Road. These results are in line with what was observed as part of the existing conditions data collection.

BUILD (2030) RAILROAD CROSSING QUEUEING

During the AM peak hour, a 10-minute crossing event sees queues at the railroad crossing point form less quickly than the PM peak hour due to less traffic volume along Midway Road, but when queues reach the intersection of US Highway 2, queues in the turn lanes (particularly the westbound left turn lane) form quickly due to higher turning volumes. The westbound left turn movement at US Highway 2 & Midway Road is anticipated to see maximum queues of 453' during a 10-minute crossing event in the AM peak. The southbound through movement sees queues of 682' and the eastbound right turn movement sees 93' queues. The 453' westbound queue would extend back to the easternmost access to the retail parcels on the north without blocking it. However, it is recommended that traffic traveling to the site from US Highway 2 south of St. Louis River Road should be routed to turn at St. Louis River Road to avoid the US Highway 2 & Midway Road railroad crossing and reduce potential undesirable queueing in the westbound left turn lane.

During the PM peak hour, a 10-minute crossing event causes queues to form more quickly than the AM peak hour due to greater traffic flow along Midway Road, but queue storage is less of a concern for turning movements since the majority of entering site trips turning eastbound right and westbound left at the intersection occur during the AM peak hour. The westbound left turn movement is anticipated to see maximum queue lengths from a 10-minute crossing event of about 187'. The southbound through movement sees maximum queues of 2,031' and the eastbound right turn movement sees 58' queues. Queueing results for both scenarios are summarized below in **Table 12**.

Table 11: 10-Minute Train Crossing Event Queueing Results

Scenario	Maximum Queue by Movement				
	US Highway 2 & Midway Road			Midway Road & Morris Thomas Road	
	EBR	WBL	SBT	NBT	EBL/R ¹
<i>(Available Queue Storage)</i>	300'	450'	-	-	- / 250'
Existing (2025) Conditions – AM Peak	26'	59'	164'	1,346'	298'
Existing (2025) Conditions – PM Peak	75'	167'	1,808'	1,078'	277'
Build (2030) Conditions – AM Peak	93'	453'	682'	1,504'	432'
Build (2030) Conditions – PM Peak	58'	187'	2,031'	1,349'	1,563'
Build (2030) Conditions Mitigated – AM Peak	72'	204'	626'	1,812'	257'
Build (2030) Conditions Mitigated – PM Peak	44'	142'	1,863'	1,421'	1,169'

¹Dedicated left turn storage (250') was assumed at Midway Road & Morris Thomas Road under Build conditions.

Based on the results of the railroad queueing analysis, the existing storage is anticipated to be sufficient for all maximum queues resulting at the intersection of US Highway 2 & Morris Thomas Road during 10-minute train crossing events except for the westbound left which is at capacity. Rerouting traffic from US Highway 2 southeast of the site onto St. Louis River Road to avoid the US Highway 2 & Midway Road railroad crossing and reduce potential undesirable queueing in the westbound left turn lane.

In review of the MnDOT provided data for the railroad crossing from June through October 2025, a total of 97 railroad crossings occurred during the weekday AM peak hour (7:45 AM to 8:45 AM) when the projected queues for the turn lanes on US 2 are the longest. 97 crossings in the 5 months represents 0.9 events per weekday AM peak. While there are anticipated to be crossings almost every day during the AM peak hour, only 23 crossings exceeded 5 minutes and only 1 crossing in the 5-month time frame was 10 minutes. Therefore, the analysis condition outlined above for a 10-minute train crossing is not anticipated to be a regular occurrence.

Travel demand strategies should be implemented prior to the beginning of construction and will be included in project bid documents, agreements, and notices to sub-contractors, suppliers, and employees.

RAILROAD CROSSING OPERATIONAL ANALYSIS

An operational comparison of the existing side street stop and potential signalization at the intersection of Midway Road & Morris Thomas Road was conducted to determine which traffic control is more appropriate for the intersection. The analysis focused on the worst-case scenario crossing event (10-minutes) for the AM and PM peak hours. For the comparison, two crossing events were analyzed during the peak hours, with 20 minutes between the ending of the first event and the beginning of the second. Analysis results are given below in **Table 13**.

Table 12: Railroad Crossing Operational Analysis (10-minute Queueing Events)

Intersection	Control	Approach	Operations by Movement							
			AM Peak Hour				PM Peak Hour			
			Left	Through	Right	Overall	Left	Through	Right	Overall
Build (2030) with Side Street Stop at Midway & Morris Thomas										
Midway Road & US Highway 2	Signal	EB	C (35)	C (32)	C (30)	D (46)	D (50)	C (30)	D (43)	D (54)
		WB	E (78)	C (25)	A (8)		E (68)	B (20)	A (7)	
		NB	E (57)	E (58)	C (32)		C (30)	C (29)	B (13)	
		SB	D (45)	D (45)	A (7)		F (89)	F (110)	F (81)	
Midway Road & Morris Thomas Road	Side Street Stop	EB	F (199)	-	C (25.1)	F (62)	F (334)	-	F (197)	F (111)
		WB	-	-	-		-	-	-	
		NB	F (73)	F (100)	-		F (96)	F (105)	-	
		SB	-	A (3)	A (3)		-	A (3)	A (1)	
Build (2030) with Signal at Midway & Morris Thomas										
Midway Road & US Highway 2	Signal	EB	D (39)	C (32)	C (27)	D (46)	D (44)	C (30)	D (38)	E (56)
		WB	E (78)	C (27)	A (8)		E (70)	C (21)	A (8)	
		NB	E (56)	E (59)	C (35)		D (38)	D (36)	B (19)	
		SB	D (45)	D (45)	A (5)		F (93)	F (109)	E (78)	
Midway Road & Morris Thomas Road	Signal	EB	F (104)	-	A (7)	E (64)	F (192)	-	F (86)	F (85)
		WB	-	-	-		-	-	-	
		NB	F (83)	-	F (120)		F (111)	F (121)	-	
		SB	-	B (11)	A (6)		-	B (17)	A (6)	

The results of the analysis indicate 10-minute crossing events could cause very high levels of delay at the intersection of Midway Road & Morris Thomas Road, particularly in the PM peak hour. The eastbound left turn movement at this intersection sees severe delays of more than 5 minutes per vehicle due to queueing along Midway Road. With the addition of a signal at Midway Road & Morris Thomas Road, delays at the intersection are anticipated to be reduced by about 24% during the PM peak hour, with eastbound left turn delays reduced to about 3 minutes per vehicle. The overall delay at the intersection sees little change during the AM Peak hour. However, the eastbound left turn movement sees a significant reduction in delay and queueing at this time. The operations at Midway Road & US Highway 2 are relatively unaffected by the installation of a signal at Midway Road & Morris Thomas Road, changing by a few seconds or less during both peak hours.

Due to northbound queues along Midway Road south of the railroad crossing, eastbound queues at Morris Thomas Road dissipate very slowly at the side street stop controlled intersection of these two roads. Queues during the PM peak hour are anticipated to take in excess of 20 minutes to dissipate following a 10-minute train crossing event. The installation of a traffic signal at Midway Road & Morris Thomas Road would allow these queues to dissipate in about half this time (10 minutes).

Based on the anticipated operational benefit of a traffic signal at Midway Road & Morris Thomas Road, along with the potential safety benefits of having a traffic signal near the railroad crossing, it is recommended that a permanent traffic signal be installed at the intersection of Midway Road & Morris Thomas Road under Opening Year (2030) Build conditions. The traffic signal will require railroad crossing preemption to ensure safe crossing conditions as well as coordination with the traffic signal at Midway Road & US Highway 2.

CONCLUSION AND RECOMMENDATIONS

A traffic analysis was performed to quantify the impacts of the proposed development on the adjacent roadway network and study intersections. No-Build, and Build conditions were analyzed in the Potential Opening Year (2030) and the Design Year (2045). An Existing Year (2025) analysis was also conducted.

PROJECT CHARACTERISTICS

The proposed Hermantown Industrial development site is located at the southwest corner of Midway Road & Morris Thomas Road in Hermantown, MN. The proposed development is within the AUAR development scenario intensity. To determine the traffic impacts of the proposed development, the following study intersections were analyzed in the traffic analysis:

- US Highway 2 & Midway Road
- Midway Road & Morris Thomas Road
- Midway Road & St. Louis River Road
- US Highway 2 & Morris Thomas Road
- US Highway 2 & St. Louis River Road

Access to the proposed development is provided via a full-movement intersection along Morris Thomas Road, approximately 0.4 miles west of Midway Road, near the northwest corner of the development site.

BACKGROUND CONDITIONS CAPACITY ANALYSIS SUMMARY

A capacity analysis was conducted for Existing Year (2025) traffic conditions at the study intersections to determine current operating conditions of the roadway network. Based on the analysis, all intersections and individual movements are estimated to operate at LOS C or better.

A capacity analysis was conducted for the Potential Opening Year (2030) No-Build traffic conditions at the study intersections to determine baseline conditions for the 2030 analysis year. Based on the analysis, all intersections and individual movements are anticipated to continue operating at LOS C or better.

A capacity analysis was conducted for the Design Year (2045) No-Build traffic conditions at the study intersections to determine baseline conditions for the 2045 analysis year. Based on the analysis, all intersections and individual movements are anticipated to continue operating at LOS C or better.

BUILD CONDITIONS CAPACITY ANALYSIS SUMMARY

A capacity analysis was conducted for the Potential Opening Year (2030) Build traffic conditions at the study intersection. It was found that the addition of site traffic causes generally minor increases in network delays compared to the Potential Opening Year (2030) No-Build conditions. Turn lane improvements are recommended at the intersection of Morris Thomas Road & Midway Road. Additionally, a signal may be required at the intersection to alleviate queueing during railroad crossing events.

Under Design Year (2045) Build traffic conditions, it was found that with turn lane improvements and a traffic signal installed at the intersection of Midway Road & Morris Thomas Road, all study intersections would operate at LOS C or better and all individual movements would operate at LOS D or better.

MITIGATION PLAN

The following provides a summary of mitigation improvements that were identified as part of the traffic analysis for the proposed development. Based on St. Louis County's review of the proposed development's traffic impacts, the following mitigations will be required as a result of the proposed development:

1. Intersection of Morris Thomas Rd (CSAH 56) and development driveway
 - a. Construct a westbound dedicated left-turn lane on Morris Thomas Road at the driveway.
 - b. Driveway will be stop controlled.
2. Intersection of Midway Rd (CSAH 13) and Morris Thomas Rd (CSAH 56)
 - a. Construct a northbound dedicated left-turn lane on Midway Road at Morris Thomas Road.
 - b. Construct eastbound dedicated left-turn and right-turn lanes on Morris Thomas Road at Midway Road. Storage for the right-turn lane will ensure vehicles are not occluded from accessing the right-turn lane during 95% of the time.
 - c. Construct a southbound dedicated right-turn lane on Midway Road at Morris Thomas Road.
 - d. Install a permanent traffic signal.
 - e. Install conduit/cable to coordinate the signal controller with the railroad crossing controller (USDOT #251905S) and the signal controller at the US 2 signal system.
3. Railroad crossing (DOT #251905S)
 - a. Install a traffic queue cutter signal system that will face southbound Midway Road traffic and be located immediately north of Old Hwy 2
 - b. The need for railroad crossing upgrades will be coordinated with the MnDOT Rail Office (Paul DeLaRosa, paul.delarosa@state.mn.us).
4. Intersection of US 2 and Midway Road (CSAH 13)
 - a. Install conduit/cable to coordinate the signal controller with the railroad crossing controller (USDOT #251905S) and the signal controller at the Midway Road/Morris Thomas Road signal system.
5. Intersection of US 2 and St. Louis River Road
 - a. Construct a northwest bound dedicated left turn lane to accommodate additional site traffic.
6. Signal timing
 - a. Develop optimized signal timing models for both the Midway Road/Morris Thomas Road and US 2/Midway Road signal systems to accommodate non-train and train events.
7. Travel Demand Management (TDM)
 - a. A plan completed prior to the beginning of construction will be included in project bid documents, agreements, and notices to sub-contractors, suppliers, and employees. The TDM plan will direct all traffic traveling to the site from US Highway 2 southeast of St. Louis River Road to turn onto St. Louis River Road and enter from the south along Midway Road instead of turning left onto Midway Road from US Highway 2.
 - b. If the TDM plan does not prove to be effective at limiting queues at Midway Road & US Highway 2, additional mitigation such as variable message signs or other advanced warning during train event could be implemented at US Highway 2 & St. Louis River Road.

APPENDIX

Appendix A: Exhibits

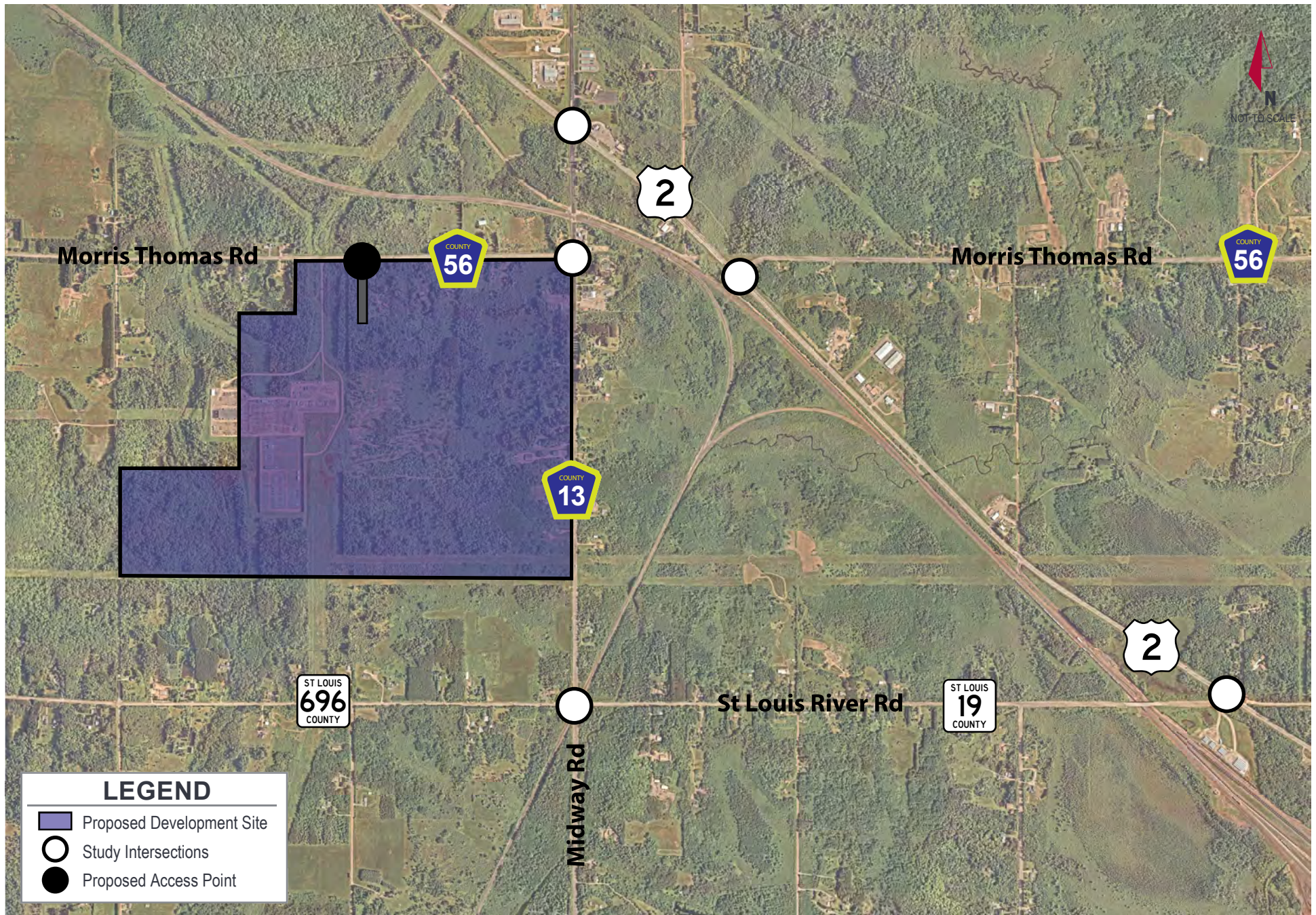
Appendix B: Turning Movement Counts

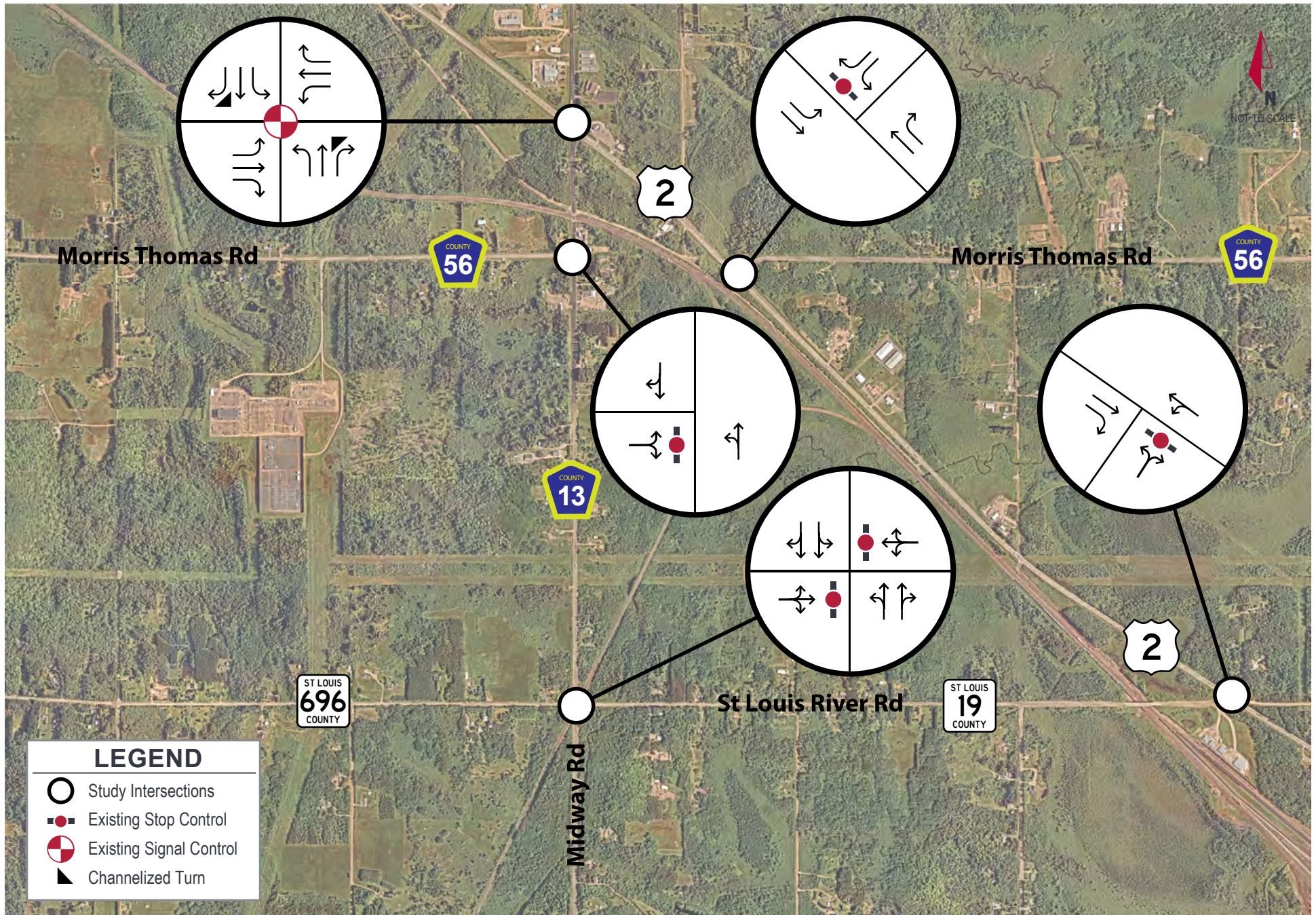
Appendix C: SimTraffic Reports

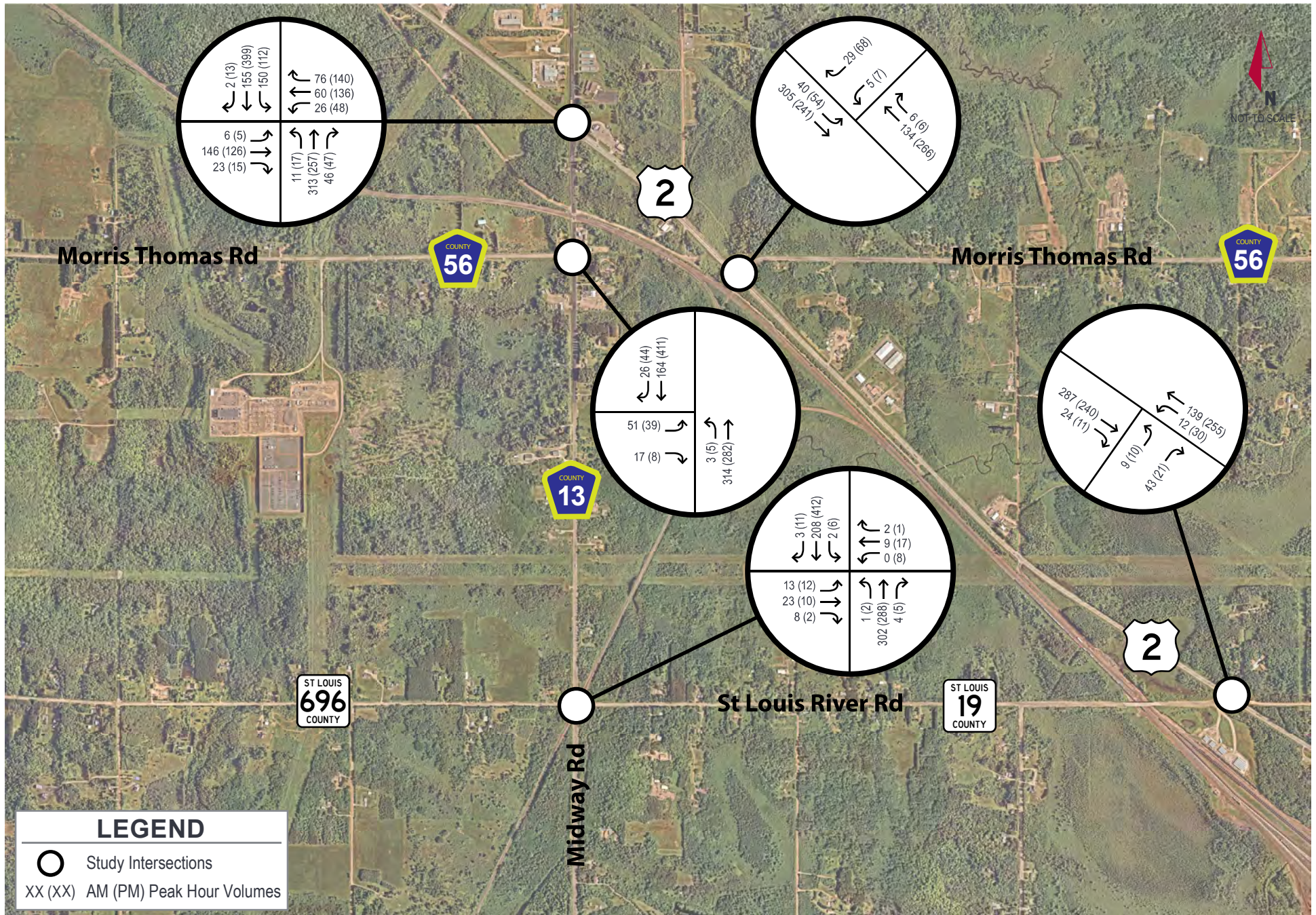
Appendix D: Turn Lane Warrant Sheets

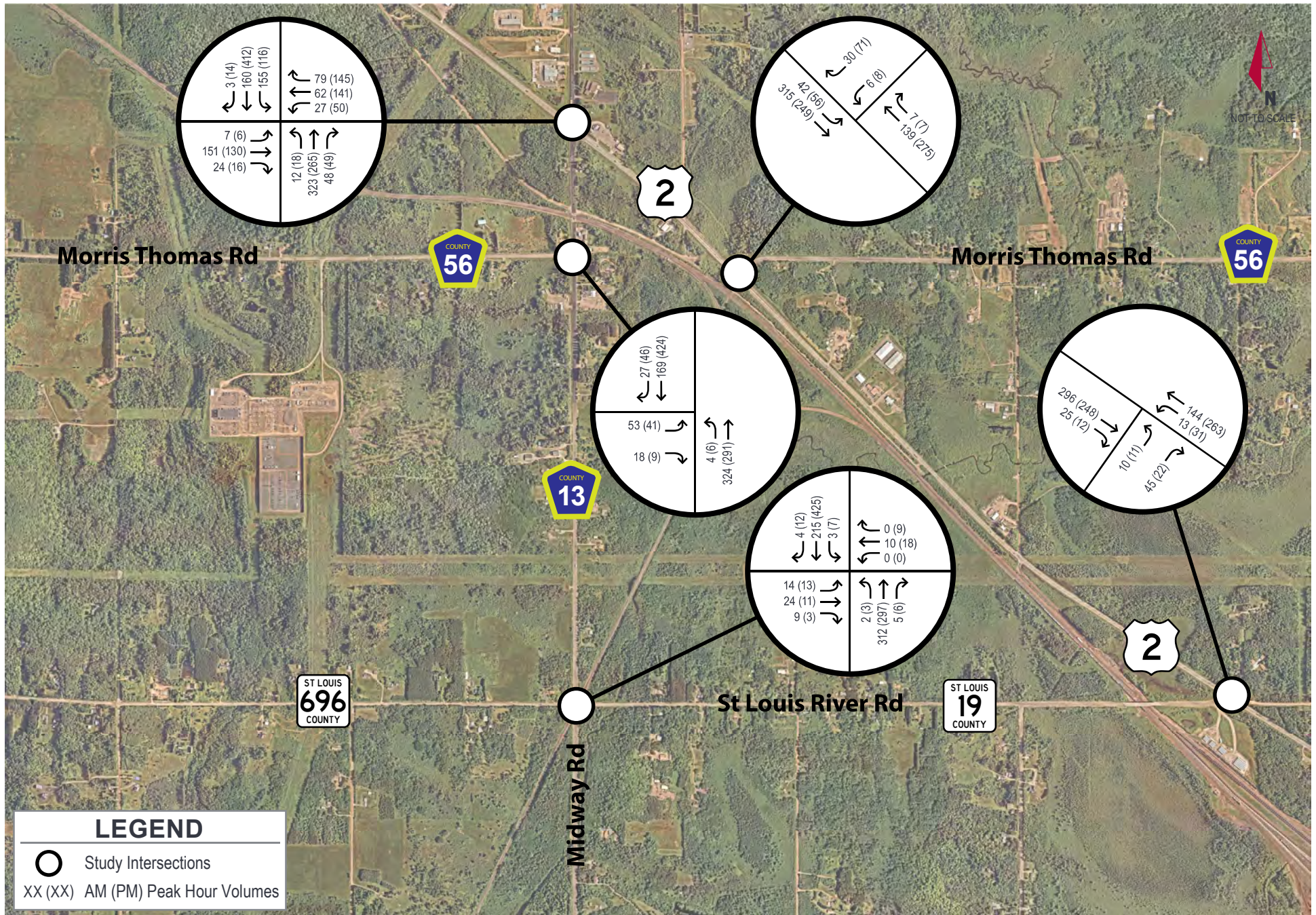
Appendix A:

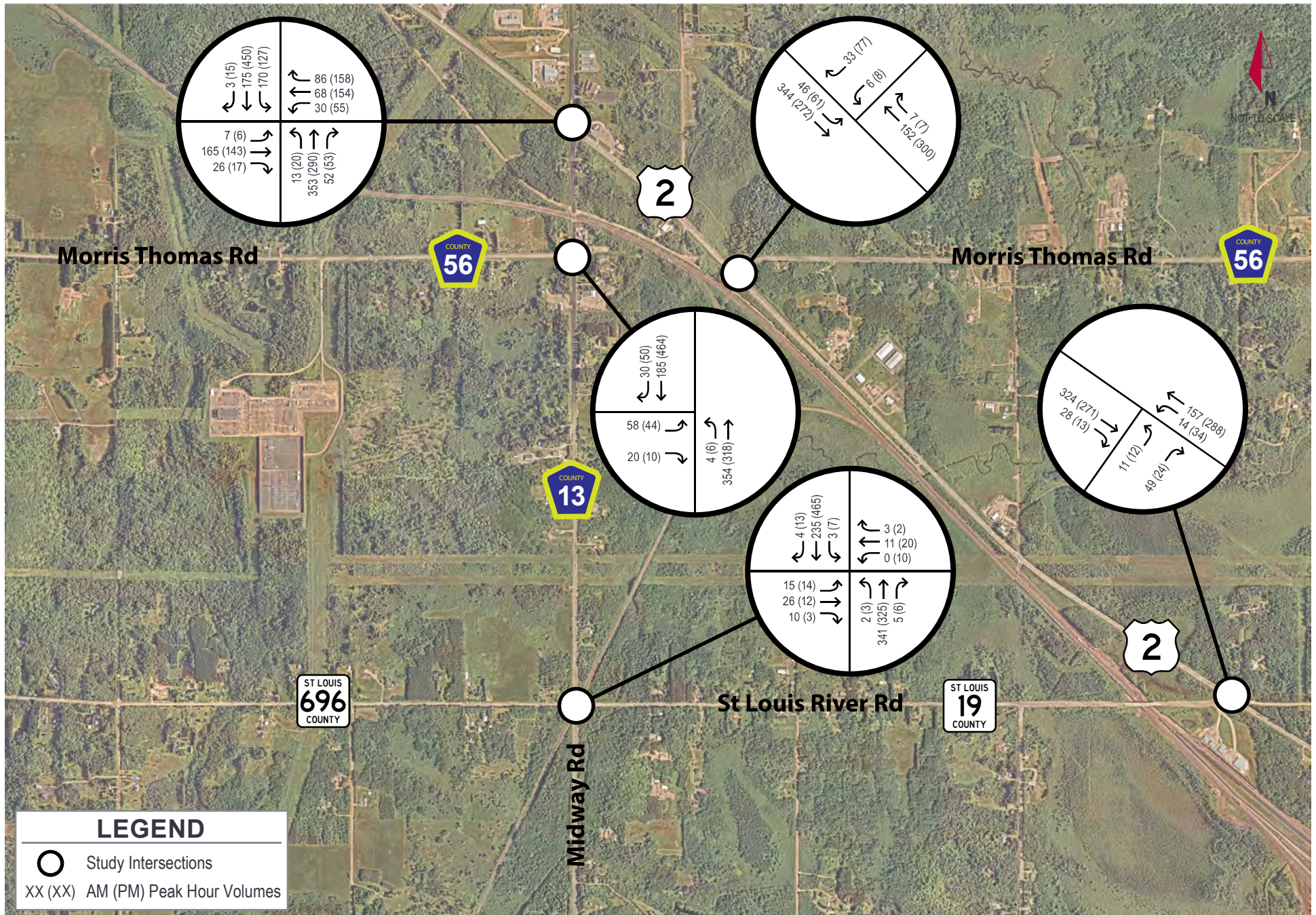
Exhibits

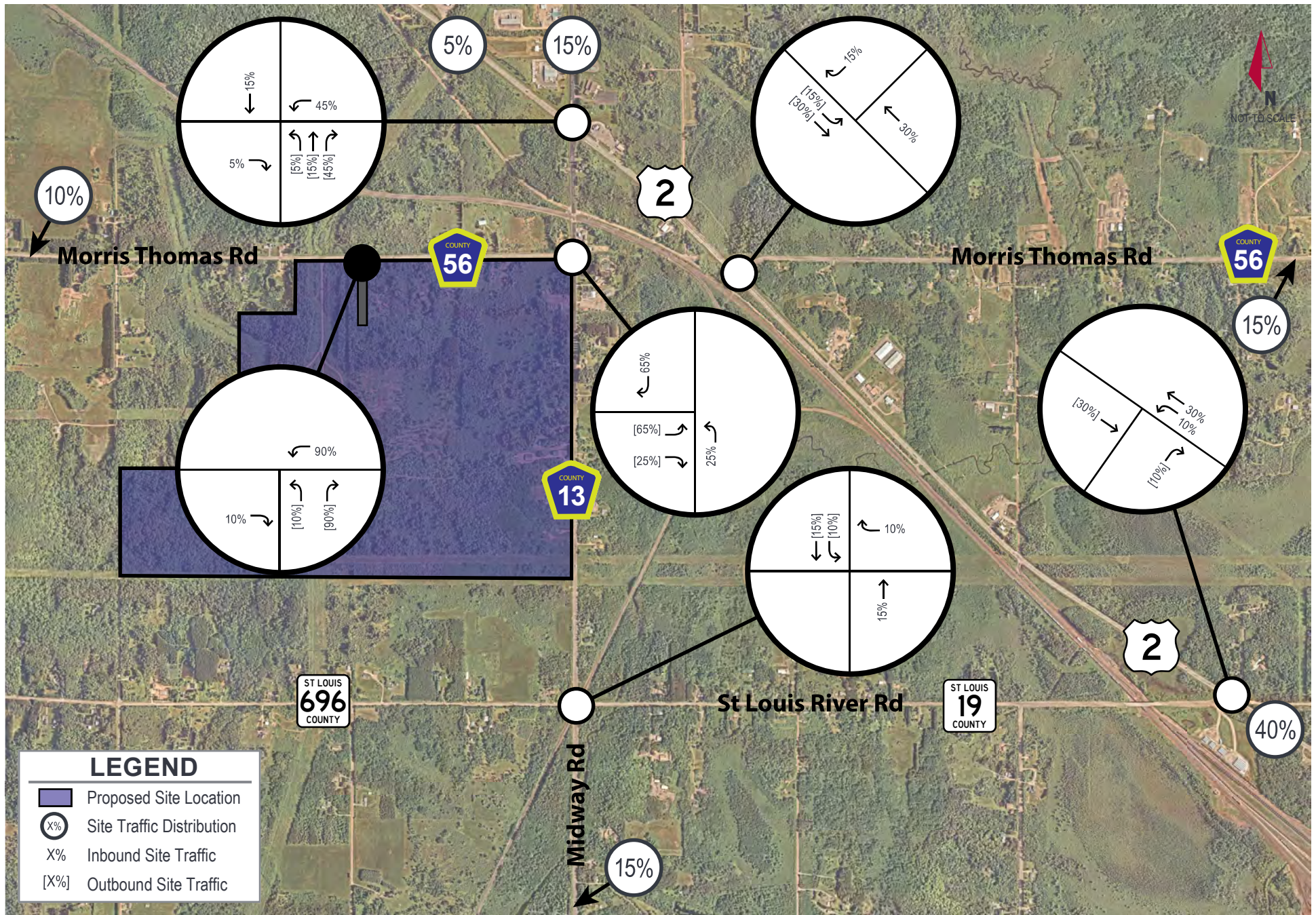


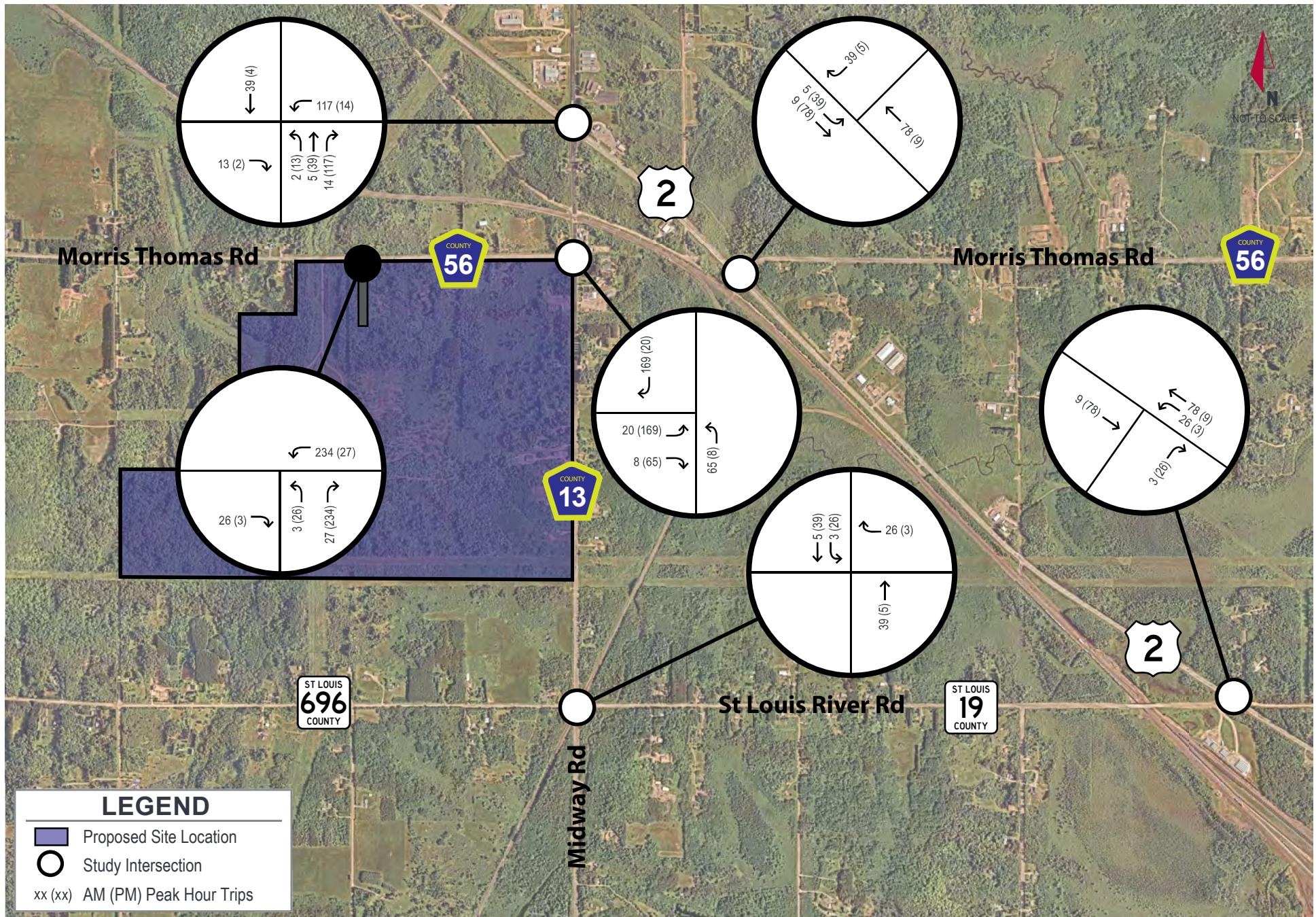


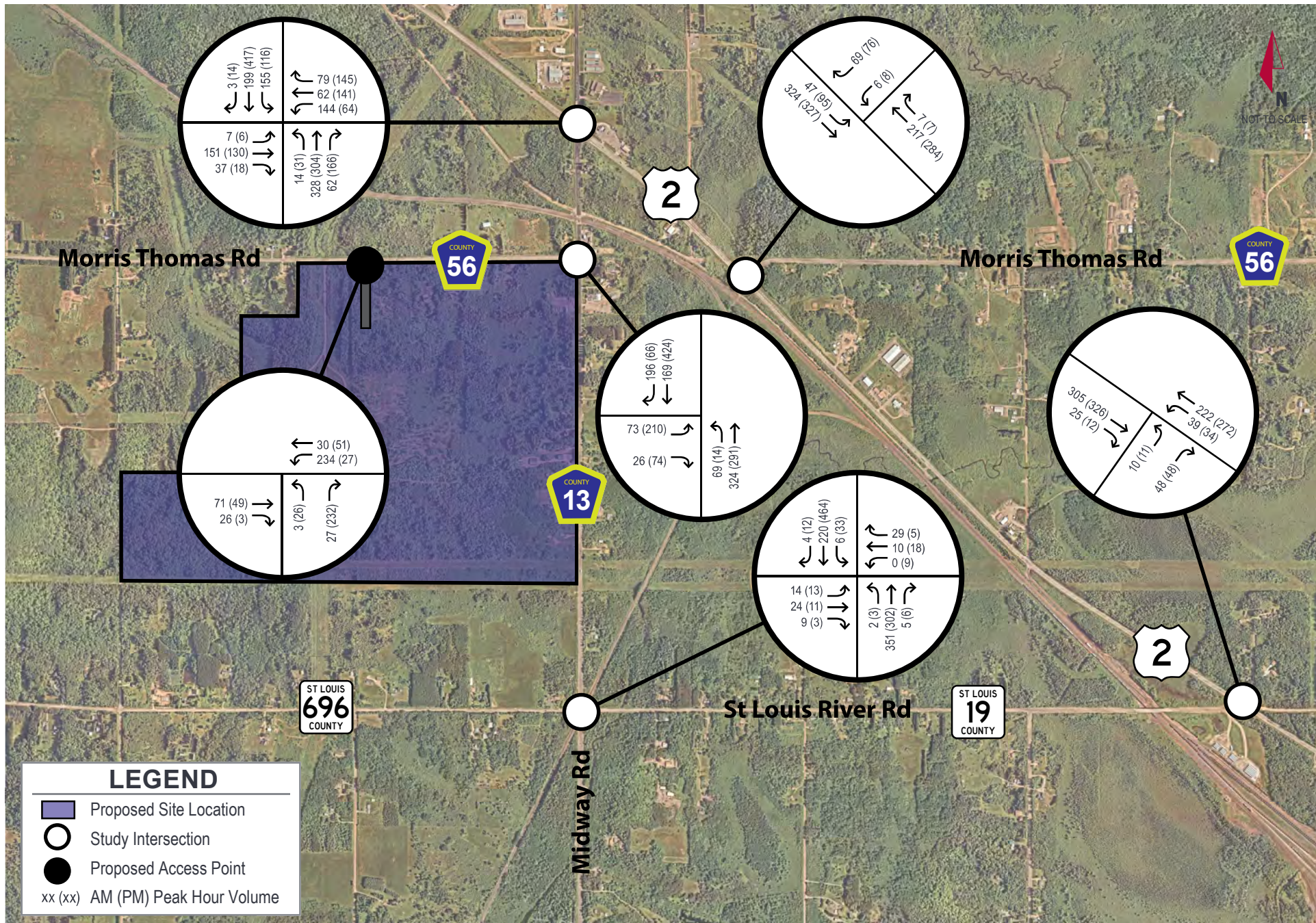


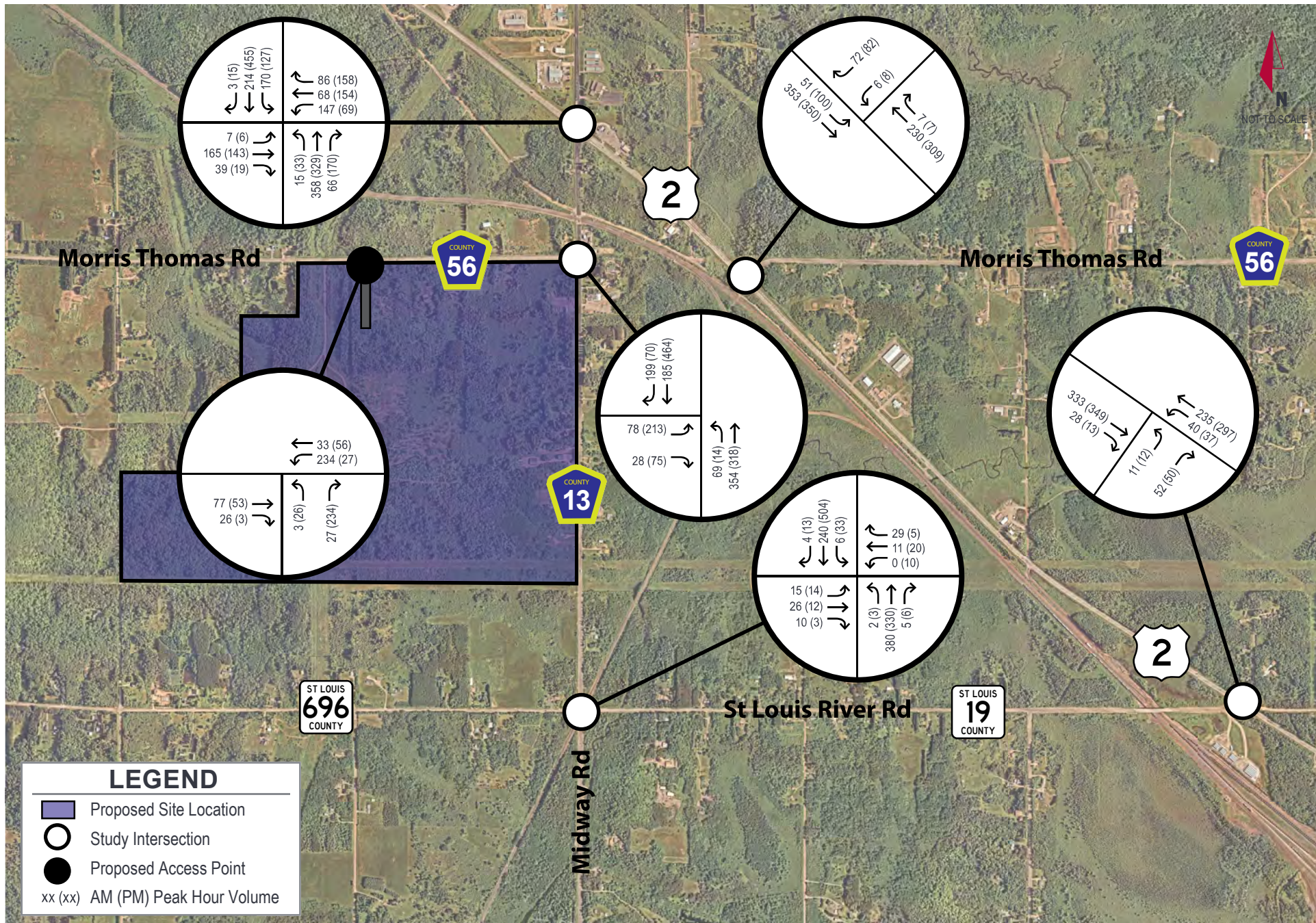












Appendix B:

Turning Movement Counts



Kimley-Horn
4201 Winfield Road Suite 600

Warrenville, Illinois, United States 60555
(630) 487-5550 ethan.scowcroft@kimley-horn.com

Count Name: Midway Rd & Morris Thomas Rd
Site Code:
Start Date: 04/09/2025
Page No: 1

Turning Movement Data

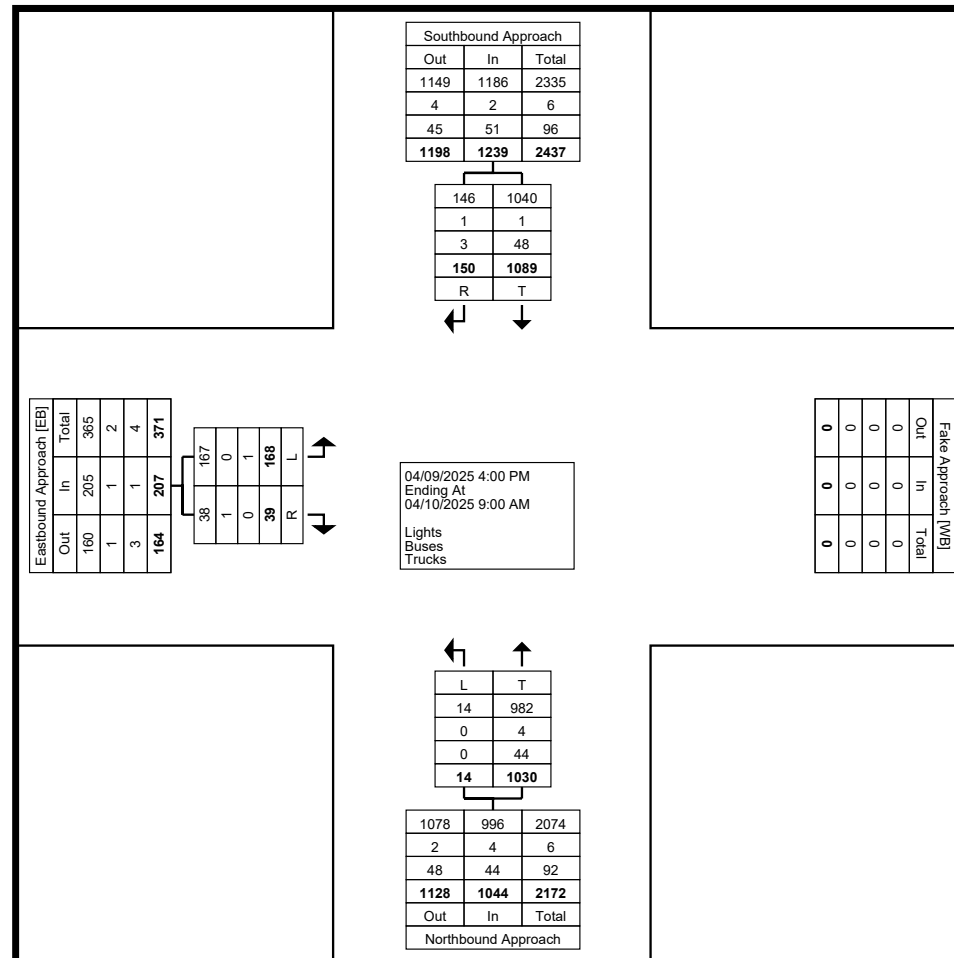
Start Time	Eastbound Approach			Northbound Approach			Southbound Approach			Int. Total
	Eastbound			Northbound			Southbound			
	Left	Right	App. Total	Left	Thru	App. Total	Thru	Right	App. Total	
4:00 PM	13	1	14	4	56	60	109	14	123	197
4:15 PM	13	2	15	0	83	83	83	10	93	191
4:30 PM	11	2	13	1	82	83	116	12	128	224
4:45 PM	6	4	10	3	60	63	91	5	96	169
Hourly Total	43	9	52	8	281	289	399	41	440	781
5:00 PM	9	0	9	1	57	58	121	17	138	205
5:15 PM	7	1	8	0	44	44	107	21	128	180
5:30 PM	4	0	4	2	39	41	77	20	97	142
5:45 PM	2	1	3	0	56	56	65	11	76	135
Hourly Total	22	2	24	3	196	199	370	69	439	662
*** BREAK ***	-	-	-	-	-	-	-	-	-	-
7:00 AM	12	4	16	0	64	64	41	2	43	123
7:15 AM	8	2	10	0	66	66	27	6	33	109
7:30 AM	21	7	28	0	97	97	52	7	59	184
7:45 AM	16	3	19	2	94	96	55	4	59	174
Hourly Total	57	16	73	2	321	323	175	19	194	590
8:00 AM	6	5	11	1	57	58	30	9	39	108
8:15 AM	16	4	20	0	63	63	33	5	38	121
8:30 AM	15	0	15	0	57	57	38	2	40	112
8:45 AM	9	3	12	0	55	55	44	5	49	116
Hourly Total	46	12	58	1	232	233	145	21	166	457
Grand Total	168	39	207	14	1030	1044	1089	150	1239	2490
Approach %	81.2	18.8	-	1.3	98.7	-	87.9	12.1	-	-
Total %	6.7	1.6	8.3	0.6	41.4	41.9	43.7	6.0	49.8	-
Lights	167	38	205	14	982	996	1040	146	1186	2387
% Lights	99.4	97.4	99.0	100.0	95.3	95.4	95.5	97.3	95.7	95.9
Buses	0	1	1	0	4	4	1	1	2	7
% Buses	0.0	2.6	0.5	0.0	0.4	0.4	0.1	0.7	0.2	0.3
Trucks	1	0	1	0	44	44	48	3	51	96
% Trucks	0.6	0.0	0.5	0.0	4.3	4.2	4.4	2.0	4.1	3.9



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Count Name: Midway Rd & Morris Thomas Rd
Site Code:
Start Date: 04/09/2025
Page No: 2



Turning Movement Data Plot



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Count Name: Midway Rd & Morris Thomas Rd
Site Code:
Start Date: 04/09/2025
Page No: 3

Turning Movement Peak Hour Data (4:15 PM)

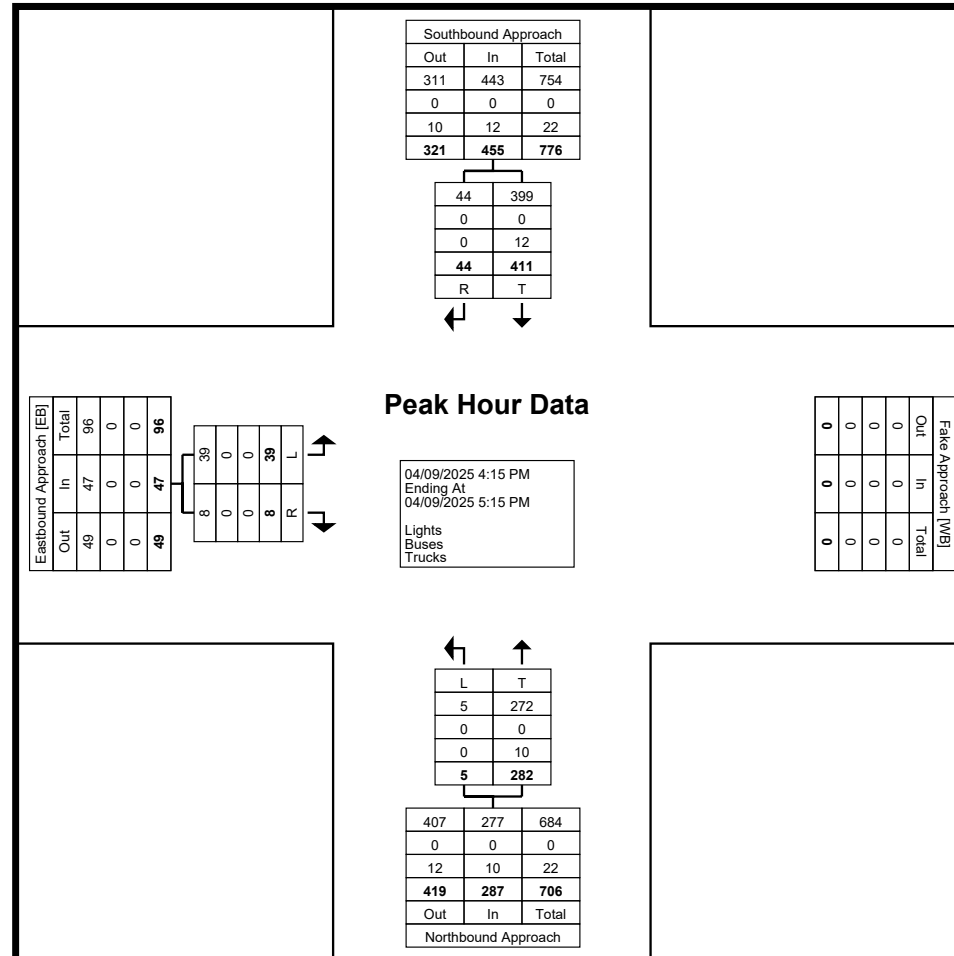
Start Time	Eastbound Approach			Northbound Approach			Southbound Approach			Int. Total
	Left	Right	App. Total	Left	Thru	App. Total	Thru	Right	App. Total	
4:15 PM	13	2	15	0	83	83	83	10	93	191
4:30 PM	11	2	13	1	82	83	116	12	128	224
4:45 PM	6	4	10	3	60	63	91	5	96	169
5:00 PM	9	0	9	1	57	58	121	17	138	205
Total	39	8	47	5	282	287	411	44	455	789
Approach %	83.0	17.0	-	1.7	98.3	-	90.3	9.7	-	-
Total %	4.9	1.0	6.0	0.6	35.7	36.4	52.1	5.6	57.7	-
PHF	0.750	0.500	0.783	0.417	0.849	0.864	0.849	0.647	0.824	0.881
Lights	39	8	47	5	272	277	399	44	443	767
% Lights	100.0	100.0	100.0	100.0	96.5	96.5	97.1	100.0	97.4	97.2
Buses	0	0	0	0	0	0	0	0	0	0
% Buses	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trucks	0	0	0	0	10	10	12	0	12	22
% Trucks	0.0	0.0	0.0	0.0	3.5	3.5	2.9	0.0	2.6	2.8



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Count Name: Midway Rd & Morris Thomas Rd
Site Code:
Start Date: 04/09/2025
Page No: 4



Turning Movement Peak Hour Data Plot (4:15 PM)



Kimley-Horn
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Count Name: Midway Rd & Morris Thomas Rd
Site Code:
Start Date: 04/09/2025
Page No: 5

Turning Movement Peak Hour Data (7:00 AM)

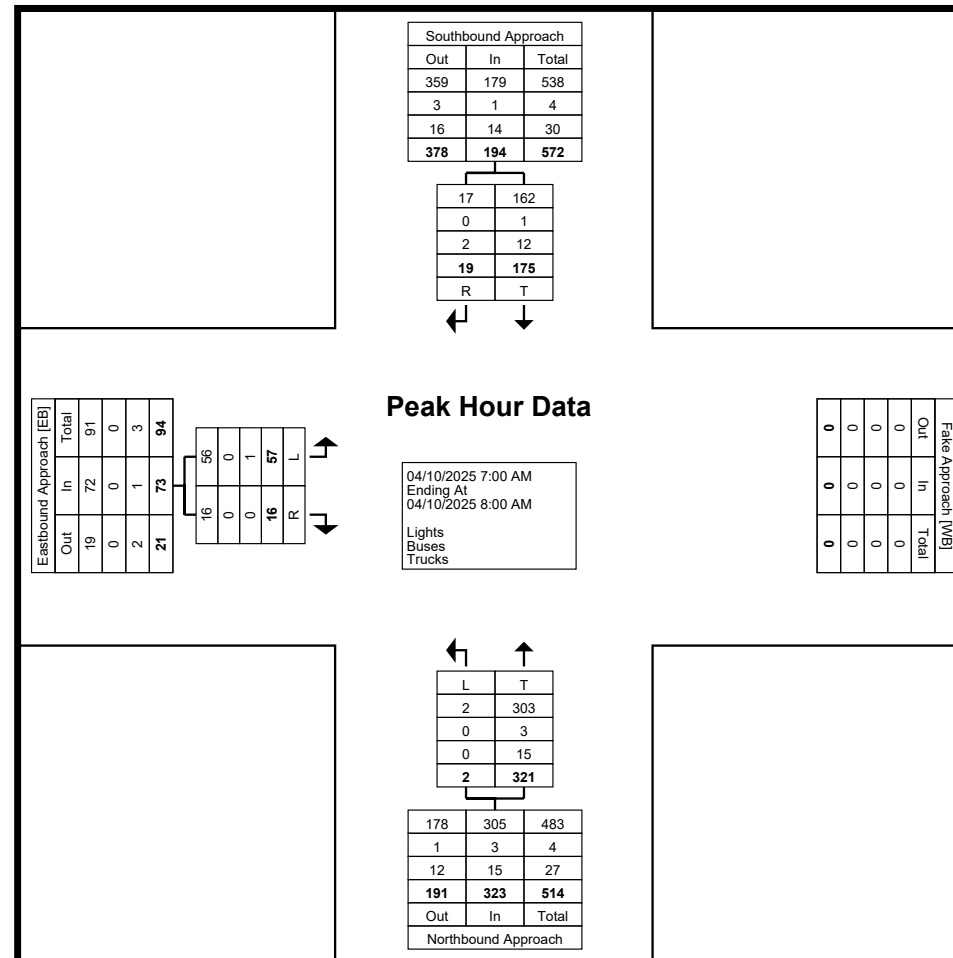
Start Time	Eastbound Approach			Northbound Approach			Southbound Approach			Int. Total
	Left	Right	App. Total	Left	Thru	App. Total	Thru	Right	App. Total	
7:00 AM	12	4	16	0	64	64	41	2	43	123
7:15 AM	8	2	10	0	66	66	27	6	33	109
7:30 AM	21	7	28	0	97	97	52	7	59	184
7:45 AM	16	3	19	2	94	96	55	4	59	174
Total	57	16	73	2	321	323	175	19	194	590
Approach %	78.1	21.9	-	0.6	99.4	-	90.2	9.8	-	-
Total %	9.7	2.7	12.4	0.3	54.4	54.7	29.7	3.2	32.9	-
PHF	0.679	0.571	0.652	0.250	0.827	0.832	0.795	0.679	0.822	0.802
Lights	56	16	72	2	303	305	162	17	179	556
% Lights	98.2	100.0	98.6	100.0	94.4	94.4	92.6	89.5	92.3	94.2
Buses	0	0	0	0	3	3	1	0	1	4
% Buses	0.0	0.0	0.0	0.0	0.9	0.9	0.6	0.0	0.5	0.7
Trucks	1	0	1	0	15	15	12	2	14	30
% Trucks	1.8	0.0	1.4	0.0	4.7	4.6	6.9	10.5	7.2	5.1



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Count Name: Midway Rd & Morris Thomas Rd
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Start Date: 04/09/2025
Page No: 6



Turning Movement Peak Hour Data Plot (7:00 AM)



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Count Name: Midway Rd & US Hwy 2
Site Code:
Start Date: 04/09/2025
Page No: 1

Turning Movement Data

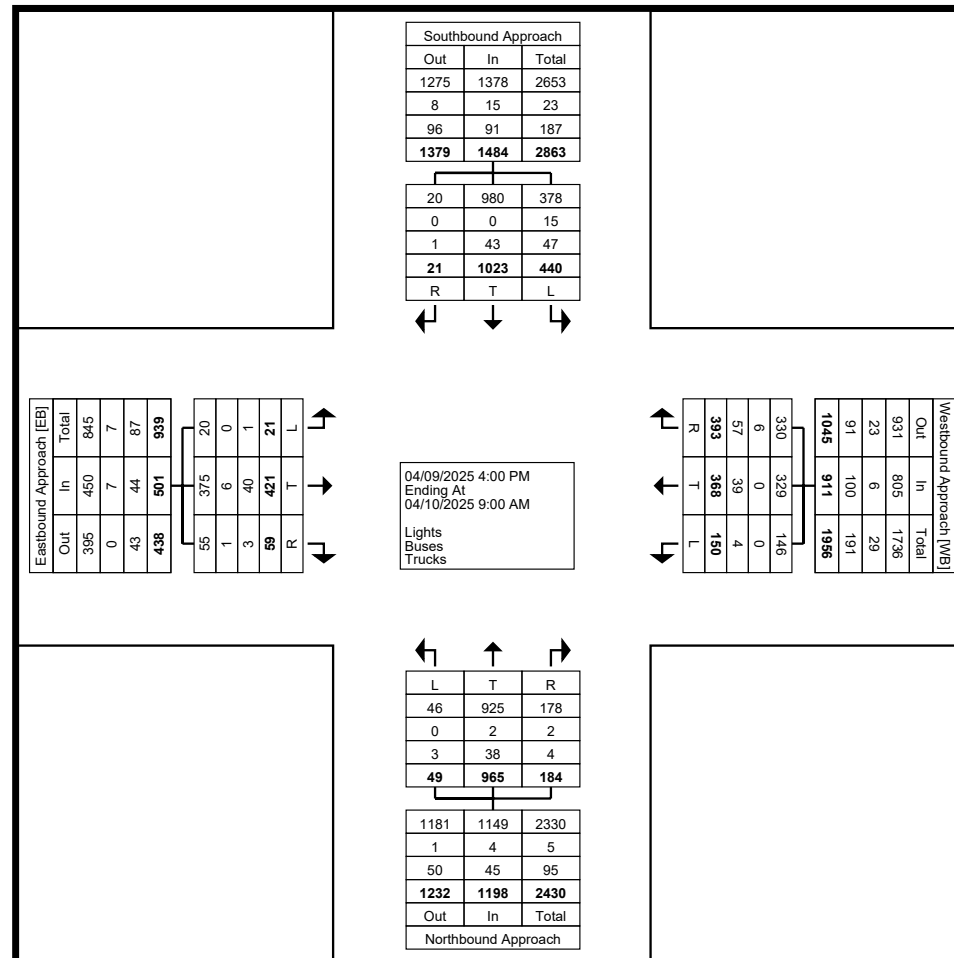
Start Time	Eastbound Approach Eastbound				Westbound Approach Westbound				Northbound Approach Northbound				Southbound Approach Southbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
4:00 PM	3	22	3	28	13	32	32	77	3	53	13	69	29	87	1	117	291
4:15 PM	0	35	5	40	9	33	25	67	3	72	19	94	28	99	2	129	330
4:30 PM	2	42	6	50	13	35	43	91	7	80	10	97	26	101	1	128	366
4:45 PM	0	27	3	30	9	43	41	93	3	52	13	68	24	93	9	126	317
Hourly Total	5	126	17	148	44	143	141	328	16	257	55	328	107	380	13	500	1304
5:00 PM	3	22	1	26	17	25	31	73	4	53	5	62	34	106	1	141	302
5:15 PM	0	18	4	22	18	24	29	71	3	38	13	54	25	115	0	140	287
5:30 PM	1	18	8	27	16	30	18	64	4	36	5	45	19	70	3	92	228
5:45 PM	1	9	0	10	10	21	13	44	3	54	5	62	17	62	0	79	195
Hourly Total	5	67	13	85	61	100	91	252	14	181	28	223	95	353	4	452	1012
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7:00 AM	0	20	1	21	4	11	20	35	1	49	20	70	23	34	0	57	183
7:15 AM	2	34	7	43	5	13	12	30	2	66	7	75	25	26	0	51	199
7:30 AM	2	44	7	53	7	17	22	46	2	95	18	115	54	45	0	99	313
7:45 AM	2	44	6	52	8	19	21	48	4	99	11	114	44	45	1	90	304
Hourly Total	6	142	21	169	24	60	75	159	9	309	56	374	146	150	1	297	999
8:00 AM	0	24	3	27	6	11	21	38	3	53	10	66	27	39	1	67	198
8:15 AM	3	22	2	27	1	18	25	44	2	57	19	78	17	34	0	51	200
8:30 AM	2	24	2	28	6	18	27	51	3	64	9	76	21	36	1	58	213
8:45 AM	0	16	1	17	8	18	13	39	2	44	7	53	27	31	1	59	168
Hourly Total	5	86	8	99	21	65	86	172	10	218	45	273	92	140	3	235	779
Grand Total	21	421	59	501	150	368	393	911	49	965	184	1198	440	1023	21	1484	4094
Approach %	4.2	84.0	11.8	-	16.5	40.4	43.1	-	4.1	80.6	15.4	-	29.6	68.9	1.4	-	-
Total %	0.5	10.3	1.4	12.2	3.7	9.0	9.6	22.3	1.2	23.6	4.5	29.3	10.7	25.0	0.5	36.2	-
Lights	20	375	55	450	146	329	330	805	46	925	178	1149	378	980	20	1378	3782
% Lights	95.2	89.1	93.2	89.8	97.3	89.4	84.0	88.4	93.9	95.9	96.7	95.9	85.9	95.8	95.2	92.9	92.4
Buses	0	6	1	7	0	0	6	6	0	2	2	4	15	0	0	15	32
% Buses	0.0	1.4	1.7	1.4	0.0	0.0	1.5	0.7	0.0	0.2	1.1	0.3	3.4	0.0	0.0	1.0	0.8
Trucks	1	40	3	44	4	39	57	100	3	38	4	45	47	43	1	91	280
% Trucks	4.8	9.5	5.1	8.8	2.7	10.6	14.5	11.0	6.1	3.9	2.2	3.8	10.7	4.2	4.8	6.1	6.8



Kimley-Horn
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Count Name: Midway Rd & US Hwy 2
Site Code:
Start Date: 04/09/2025
Page No: 2



Turning Movement Data Plot



Kimley-Horn
4201 Winfield Road Suite 600

Warrenville, Illinois, United States 60555
(630) 487-5550 ethan.scowcroft@kimley-horn.com

Count Name: Midway Rd & US Hwy 2
Site Code:
Start Date: 04/09/2025
Page No: 3

Turning Movement Peak Hour Data (4:15 PM)

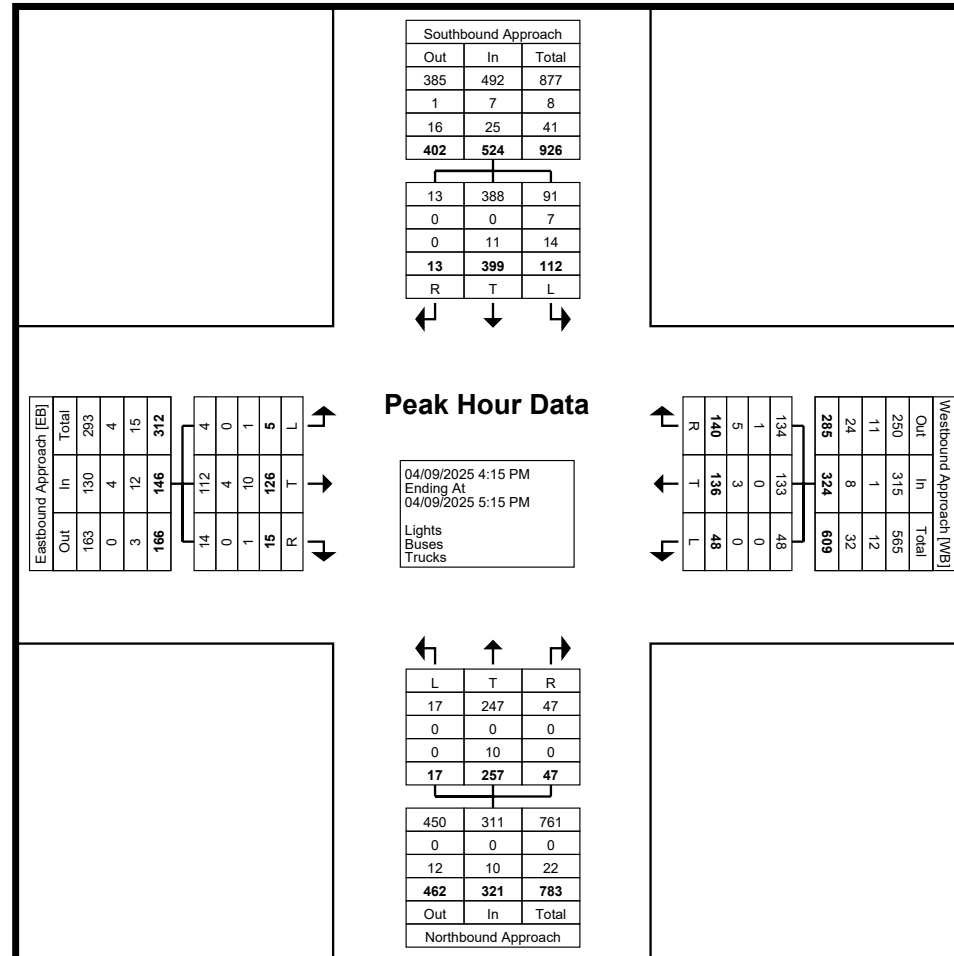
Start Time	Eastbound Approach Eastbound				Westbound Approach Westbound				Northbound Approach Northbound				Southbound Approach Southbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
4:15 PM	0	35	5	40	9	33	25	67	3	72	19	94	28	99	2	129	330
4:30 PM	2	42	6	50	13	35	43	91	7	80	10	97	26	101	1	128	366
4:45 PM	0	27	3	30	9	43	41	93	3	52	13	68	24	93	9	126	317
5:00 PM	3	22	1	26	17	25	31	73	4	53	5	62	34	106	1	141	302
Total	5	126	15	146	48	136	140	324	17	257	47	321	112	399	13	524	1315
Approach %	3.4	86.3	10.3	-	14.8	42.0	43.2	-	5.3	80.1	14.6	-	21.4	76.1	2.5	-	-
Total %	0.4	9.6	1.1	11.1	3.7	10.3	10.6	24.6	1.3	19.5	3.6	24.4	8.5	30.3	1.0	39.8	-
PHF	0.417	0.750	0.625	0.730	0.706	0.791	0.814	0.871	0.607	0.803	0.618	0.827	0.824	0.941	0.361	0.929	0.898
Lights	4	112	14	130	48	133	134	315	17	247	47	311	91	388	13	492	1248
% Lights	80.0	88.9	93.3	89.0	100.0	97.8	95.7	97.2	100.0	96.1	100.0	96.9	81.3	97.2	100.0	93.9	94.9
Buses	0	4	0	4	0	0	1	1	0	0	0	0	7	0	0	7	12
% Buses	0.0	3.2	0.0	2.7	0.0	0.0	0.7	0.3	0.0	0.0	0.0	0.0	6.3	0.0	0.0	1.3	0.9
Trucks	1	10	1	12	0	3	5	8	0	10	0	10	14	11	0	25	55
% Trucks	20.0	7.9	6.7	8.2	0.0	2.2	3.6	2.5	0.0	3.9	0.0	3.1	12.5	2.8	0.0	4.8	4.2



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Count Name: Midway Rd & US Hwy 2
Site Code:
Start Date: 04/09/2025
Page No: 4



Turning Movement Peak Hour Data Plot (4:15 PM)



Kimley-Horn
4201 Winfield Road Suite 600

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Count Name: Midway Rd & US Hwy 2
Site Code:
Start Date: 04/09/2025
Page No: 5

Turning Movement Peak Hour Data (7:30 AM)

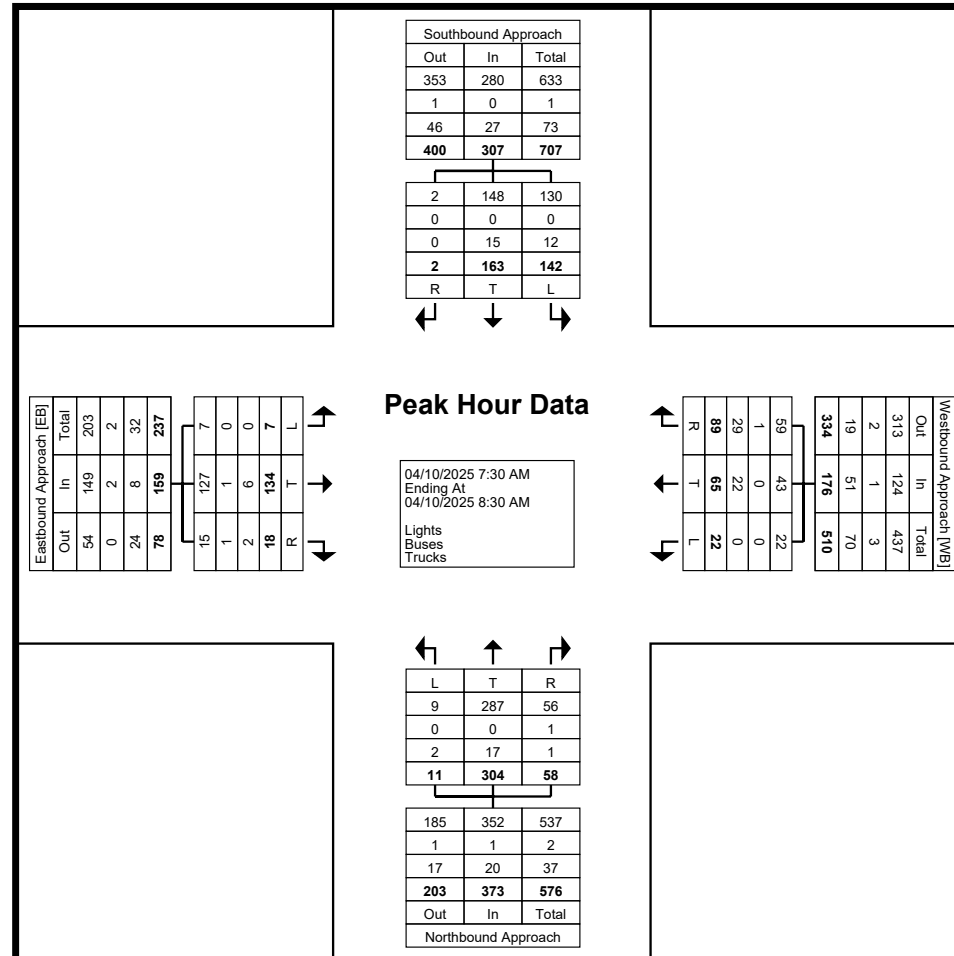
Start Time	Eastbound Approach Eastbound				Westbound Approach Westbound				Northbound Approach Northbound				Southbound Approach Southbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
7:30 AM	2	44	7	53	7	17	22	46	2	95	18	115	54	45	0	99	313
7:45 AM	2	44	6	52	8	19	21	48	4	99	11	114	44	45	1	90	304
8:00 AM	0	24	3	27	6	11	21	38	3	53	10	66	27	39	1	67	198
8:15 AM	3	22	2	27	1	18	25	44	2	57	19	78	17	34	0	51	200
Total	7	134	18	159	22	65	89	176	11	304	58	373	142	163	2	307	1015
Approach %	4.4	84.3	11.3	-	12.5	36.9	50.6	-	2.9	81.5	15.5	-	46.3	53.1	0.7	-	-
Total %	0.7	13.2	1.8	15.7	2.2	6.4	8.8	17.3	1.1	30.0	5.7	36.7	14.0	16.1	0.2	30.2	-
PHF	0.583	0.761	0.643	0.750	0.688	0.855	0.890	0.917	0.688	0.768	0.763	0.811	0.657	0.906	0.500	0.775	0.811
Lights	7	127	15	149	22	43	59	124	9	287	56	352	130	148	2	280	905
% Lights	100.0	94.8	83.3	93.7	100.0	66.2	66.3	70.5	81.8	94.4	96.6	94.4	91.5	90.8	100.0	91.2	89.2
Buses	0	1	1	2	0	0	1	1	0	0	1	1	0	0	0	0	4
% Buses	0.0	0.7	5.6	1.3	0.0	0.0	1.1	0.6	0.0	0.0	1.7	0.3	0.0	0.0	0.0	0.0	0.4
Trucks	0	6	2	8	0	22	29	51	2	17	1	20	12	15	0	27	106
% Trucks	0.0	4.5	11.1	5.0	0.0	33.8	32.6	29.0	18.2	5.6	1.7	5.4	8.5	9.2	0.0	8.8	10.4



Kimley-Horn
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Count Name: Midway Rd & US Hwy 2
Site Code:
Start Date: 04/09/2025
Page No: 6



Turning Movement Peak Hour Data Plot (7:30 AM)

Study Name Midway Rd & St. Louis River Rd

Start Date 04/09/2025

Start Time 4:00 PM

Site Code

Type Road
Classification Totals

	St. Louis River Road Eastbound			St. Louis River Road Westbound			Midway Road Northbound			Midway Road Southbound		
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
4:00 PM	2	1	1	1	6	0	0	62	1	0	105	3
4:15 PM	0	4	0	1	4	0	0	83	1	1	93	3
4:30 PM	5	4	0	3	5	0	1	86	3	1	90	6
4:45 PM	5	0	1	3	4	0	0	68	1	2	66	1
5:00 PM	2	2	1	1	4	1	1	51	0	2	163	1
5:15 PM	3	1	0	0	4	3	0	38	2	1	115	4
5:30 PM	3	1	1	1	2	1	1	39	0	1	76	2
5:45 PM	3	2	0	0	3	1	1	49	0	1	84	1
7:00 AM	4	5	1	0	0	0	1	56	0	1	39	2
7:15 AM	3	4	4	0	2	1	0	65	0	0	40	0
7:30 AM	3	8	3	0	3	0	0	89	2	0	61	1
7:45 AM	5	4	1	0	2	0	1	93	1	1	68	0
8:00 AM	2	7	0	0	2	1	0	55	1	1	39	2
8:15 AM	2	3	0	2	0	3	0	55	0	1	34	2
8:30 AM	2	2	0	0	0	0	0	54	1	0	32	0
8:45 AM	0	3	0	0	0	1	0	52	1	0	37	0

Study Name US Hwy 2 & Morris Thomas Rd

Start Date 04/09/2025

Start Time 4:00 PM

Site Code

Type Road
Classification Totals

	WB Morris Thomas Rd. Westbound			SB US Hwy 2 Southbound			NB US Hwy 2 Northwestbound		
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
4:00 PM	4		21	10	55			57	2
4:15 PM	1		13	22	62			58	1
4:30 PM	3		18	8	72			72	2
4:45 PM	3		20	16	52			82	1
5:00 PM	0		17	8	55			54	2
5:15 PM	1		16	13	45			57	1
5:30 PM	1		9	7	33			55	3
5:45 PM	2		9	4	29			37	1
7:00 AM	2		5	18	42			34	1
7:15 AM	1		9	9	61			21	2
7:30 AM	2		10	16	100			38	2
7:45 AM	1		5	6	94			43	1
8:00 AM	1		5	9	50			32	1
8:15 AM	0		1	12	44			45	0
8:30 AM	2		8	11	46			50	2
8:45 AM	0		6	5	41			29	0

Study Name US Hwy 2 & St. Louis River Rd

Start Date 04/09/2025

Start Time 4:00 PM

Site Code

Type Road
Classification Totals

Start Time	EB St. Louis River Rd. Eastbound			SB US Hwy 2 Southbound			NB US Hwy 2 Northbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
4:00 PM	0		2		53	6	8	57	
4:15 PM	4		2		61	2	13	64	
4:30 PM	5		6		76	2	3	60	
4:45 PM	1		6		47	7	7	75	
5:00 PM	0		7		56	0	7	56	
5:15 PM	1		4		41	3	9	63	
5:30 PM	3		3		34	1	9	46	
5:45 PM	0		3		29	2	7	39	
7:00 AM	3		11		44	2	2	28	
7:15 AM	1		7		53	7	4	24	
7:30 AM	5		13		95	10	2	40	
7:45 AM	1		10		89	5	5	37	
8:00 AM	2		13		50	2	1	38	
8:15 AM	4		4		43	0	1	43	
8:30 AM	1		8		47	0	1	42	
8:45 AM	2		4		41	0	1	26	

Appendix C:

SimTraffic Reports

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.7	0.3	3.8	0.2	0.0	0.3	0.1	0.0	0.0	3.6	0.6	3.8
Total Del/Veh (s)	24.5	18.1	4.3	21.2	9.7	4.9	11.6	17.9	4.6	11.5	8.3	4.9

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.8
Total Del/Veh (s)	13.2

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.1	2.2	1.3	2.7	3.3	2.7	3.1

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.1	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.8	10.1	1.8	2.6	2.1		0.2	0.0	0.6	0.6	0.0	1.0

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.5	3.8	0.2
Total Del/Veh (s)	6.9	6.5	1.7	0.1	6.6	1.5	4.9

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.7	0.1	1.2	0.2	4.9	2.2	0.7

Total Network Performance

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	20.5

Queuing and Blocking Report
Existing (2025) - AM Peak Hour

05/20/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	L	T
Maximum Queue (ft)	32	132	26	66	84	65	35	220	124	101
Average Queue (ft)	3	44	3	17	17	15	6	99	48	36
95th Queue (ft)	18	95	16	47	52	45	22	173	89	84
Link Distance (ft)	1621			2530			1423			1155
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	325		325	350		450	200		300	
Storage Blk Time (%)								1		
Queuing Penalty (veh)								0		

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB
Directions Served	LR
Maximum Queue (ft)	52
Average Queue (ft)	24
95th Queue (ft)	44
Link Distance (ft)	1646
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB
Directions Served	LTR	LTR	LT
Maximum Queue (ft)	65	37	5
Average Queue (ft)	25	8	0
95th Queue (ft)	51	29	3
Link Distance (ft)	1279	6729	299
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report
Existing (2025) - AM Peak Hour

05/20/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	35	24	54
Average Queue (ft)	4	2	14
95th Queue (ft)	20	13	36
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350	150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	31	50
Average Queue (ft)	2	16
95th Queue (ft)	15	37
Link Distance (ft)	134	811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.4	0.3	4.1	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.7	3.4
Total Del/Veh (s)	22.9	18.2	6.7	20.1	13.3	5.4	12.2	14.9	4.4	11.8	10.7	4.5

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.6
Total Del/Veh (s)	12.1

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.9	3.8	3.7	2.4	4.8	3.6	3.9

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.0	9.6	1.7	8.7	6.0	0.9	1.2	0.2	0.0	1.7	0.6	0.0

3: Midway Rd & St Louis River Rd Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	1.0

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.0	0.3	3.4	0.4
Total Del/Veh (s)	7.5	6.4	3.1	3.0	6.1	2.5	4.7

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.4	0.0	1.5	0.4	3.7	1.9	0.6

Total Network Performance

Movement	All
Denied Del/Veh (s)	0.8
Total Del/Veh (s)	20.3

Queuing and Blocking Report
Existing (2025) - PM Peak Hour

05/20/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	L	T
Maximum Queue (ft)	33	121	41	69	91	81	30	177	79	170
Average Queue (ft)	3	36	3	18	28	13	7	72	37	72
95th Queue (ft)	17	87	19	48	68	44	25	138	70	131
Link Distance (ft)	1621			2530			1423			1155
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	325		325	350		450	200		300	
Storage Blk Time (%)									0	
Queuing Penalty (veh)										
								0		

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	59	15
Average Queue (ft)	20	1
95th Queue (ft)	44	6
Link Distance (ft)	1646	4896
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LT
Maximum Queue (ft)	34	47	15	46
Average Queue (ft)	14	11	1	3
95th Queue (ft)	35	31	8	21
Link Distance (ft)	1279	6727	299	289
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
Existing (2025) - PM Peak Hour

05/20/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	49	22	74
Average Queue (ft)	12	3	22
95th Queue (ft)	38	15	47
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350	150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	42	23
Average Queue (ft)	6	9
95th Queue (ft)	26	21
Link Distance (ft)	134	811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.8	0.3	3.9	0.1	0.0	0.3	0.1	0.0	0.1	3.6	0.7	4.3
Total Del/Veh (s)	26.9	20.7	4.5	22.5	13.2	5.9	11.6	18.1	4.8	12.2	8.5	4.6

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.8
Total Del/Veh (s)	14.1

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.2	2.8	2.0	2.7	3.1	2.8	3.1

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.6	10.5	1.7	2.6	1.8	0.5	0.2	0.0	1.4	0.6	0.0	1.0

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.2	3.5	0.2
Total Del/Veh (s)	7.3	6.7	1.8	1.6	5.1	1.3	5.0

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	0.6	0.0	1.6	0.1	4.2	2.5	0.7

Total Network Performance

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	21.4

Queuing and Blocking Report
Opening Year (2030) No-Build - AM Peak Hour

05/20/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	L	T
Maximum Queue (ft)	20	151	24	102	99	90	31	208	132	99
Average Queue (ft)	4	48	3	19	23	17	6	102	54	37
95th Queue (ft)	16	111	12	65	67	55	23	174	102	83
Link Distance (ft)		1621			2530			1423		1155
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	325		325	350		450	200		300	
Storage Blk Time (%)								0		
Queuing Penalty (veh)								0		

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	55	10
Average Queue (ft)	25	0
95th Queue (ft)	42	5
Link Distance (ft)	1646	4896
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	SB
Directions Served	LTR	LTR	LT
Maximum Queue (ft)	75	33	21
Average Queue (ft)	24	9	1
95th Queue (ft)	54	31	10
Link Distance (ft)	1279	6729	289
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report
Opening Year (2030) No-Build - AM Peak Hour

05/20/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	33	33	47
Average Queue (ft)	6	5	14
95th Queue (ft)	24	23	34
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350	150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	43	64
Average Queue (ft)	3	17
95th Queue (ft)	23	40
Link Distance (ft)	134	811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.8	0.2	3.8	0.0	0.0	0.0	0.1	0.0	0.1	3.3	0.7	3.3
Total Del/Veh (s)	26.8	20.6	6.1	25.7	14.7	5.6	12.8	16.8	4.5	12.9	12.5	4.8

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.6
Total Del/Veh (s)	13.8

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.4	3.5	4.3	2.6	5.1	4.0	4.2

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.9	10.9	1.6	5.6	5.7	1.4	2.9	0.2	0.0	1.1	0.6	0.0

3: Midway Rd & St Louis River Rd Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	0.9

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.3	0.0	0.0	0.2	0.3	3.7	0.4
Total Del/Veh (s)	7.7	6.8	3.4	1.5	5.1	2.5	4.9

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.5	0.0	1.0	0.3	5.4	1.5	0.5

Total Network Performance

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	22.0

Queuing and Blocking Report
Opening Year (2030) No-Build - PM Peak Hour

05/20/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	L	T
Maximum Queue (ft)	30	124	33	83	113	66	36	190	91	211
Average Queue (ft)	4	43	3	25	35	15	8	82	39	90
95th Queue (ft)	18	97	15	61	82	45	27	153	76	166
Link Distance (ft)		1621			2530			1423		1155
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	325		325	350		450	200		300	
Storage Blk Time (%)								0		
Queuing Penalty (veh)								0		

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	54	43	4
Average Queue (ft)	21	2	0
95th Queue (ft)	43	19	3
Link Distance (ft)	1646	4896	1423
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LT
Maximum Queue (ft)	39	30	22	26
Average Queue (ft)	18	11	1	1
95th Queue (ft)	38	27	11	14
Link Distance (ft)	1279	6727	299	289
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
Opening Year (2030) No-Build - PM Peak Hour

05/20/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	57	28	61
Average Queue (ft)	11	3	24
95th Queue (ft)	37	15	47
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350	150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	39	23
Average Queue (ft)	5	9
95th Queue (ft)	23	20
Link Distance (ft)	134	811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.7	0.3	3.9	0.4	0.0	0.4	0.3	0.0	0.1	3.6	0.7	2.6
Total Del/Veh (s)	25.6	21.2	4.8	24.7	13.5	6.3	11.1	19.7	4.8	14.1	9.4	4.1

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.8
Total Del/Veh (s)	15.0

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.2	3.3	2.5	2.9	3.4	2.8	3.3

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.6	10.8	2.4	2.2	1.0	0.7	0.2	0.0	1.9	0.6	0.0	1.0

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	3.7	0.2
Total Del/Veh (s)	7.7	6.7	2.0	1.7	5.7	1.8	5.2

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	0.7	0.0	1.9	0.3	5.6	3.0	0.9

Total Network Performance

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	22.5

Queuing and Blocking Report
Design Year (2045) No-Build - AM Peak Hour

05/20/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	L	T
Maximum Queue (ft)	20	134	37	84	97	86	31	249	143	120
Average Queue (ft)	3	50	3	20	23	19	6	104	59	40
95th Queue (ft)	13	106	16	56	64	55	23	191	110	91
Link Distance (ft)	1621			2530			1423			1155
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	325		325	350		450	200		300	
Storage Blk Time (%)									1	
Queuing Penalty (veh)									1	

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	61	5
Average Queue (ft)	28	1
95th Queue (ft)	51	6
Link Distance (ft)	1646	4896
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LT
Maximum Queue (ft)	67	37	5	15
Average Queue (ft)	27	9	0	1
95th Queue (ft)	52	31	4	10
Link Distance (ft)	1279	6729	299	289
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	38	27	51
Average Queue (ft)	7	4	15
95th Queue (ft)	26	18	37
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350	150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	52	61
Average Queue (ft)	4	20
95th Queue (ft)	26	44
Link Distance (ft)	134	811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	4.2	0.3	3.7	0.0	0.0	0.0	0.1	0.0	0.2	3.2	0.8	3.2
Total Del/Veh (s)	28.2	22.2	6.7	26.7	15.1	6.0	14.6	18.7	4.7	14.7	12.7	4.4

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.6
Total Del/Veh (s)	14.8

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	8.7	4.4	5.4	3.0	5.6	4.1	4.6

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.5	11.2	2.0	5.4	6.3	2.6	1.0	0.2	0.0	1.2	0.7	0.1

3: Midway Rd & St Louis River Rd Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	1.0

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.1	0.3	3.7	0.4
Total Del/Veh (s)	8.0	6.6	3.3	1.6	5.2	2.9	4.9

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.5	0.0	1.5	0.4	4.4	1.9	0.7

Total Network Performance

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	23.6

Queuing and Blocking Report
Design Year (2045) No-Build - PM Peak Hour

05/20/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	L	T
Maximum Queue (ft)	29	169	21	72	104	70	30	215	118	233
Average Queue (ft)	4	49	2	27	34	15	8	95	49	93
95th Queue (ft)	18	113	12	60	91	45	25	185	97	181
Link Distance (ft)		1621			2530			1423		1155
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	325		325	350		450	200		300	
Storage Blk Time (%)								1		0
Queuing Penalty (veh)								0		0

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	52	36
Average Queue (ft)	22	2
95th Queue (ft)	44	16
Link Distance (ft)	1646	4896
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LT
Maximum Queue (ft)	35	35	11	33
Average Queue (ft)	17	12	1	2
95th Queue (ft)	38	28	7	13
Link Distance (ft)	1279	6727	299	289
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	59	24	60
Average Queue (ft)	13	5	22
95th Queue (ft)	40	19	40
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350	150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	42	32
Average Queue (ft)	6	11
95th Queue (ft)	27	24
Link Distance (ft)	134	811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.6	0.4	3.8	0.5	0.0	0.5	0.1	0.0	0.0	3.5	0.7	3.2
Total Del/Veh (s)	38.4	34.0	8.2	73.3	22.5	20.6	18.6	28.8	6.6	22.1	16.2	4.3

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.8
Total Del/Veh (s)	30.9

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	53.0	43.6	14.2	11.4	7.7	5.0	14.7

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.7	10.6	2.3	3.6	1.9	1.1	0.4	0.0	1.9	0.8	0.0	1.2

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.1	3.6	0.4
Total Del/Veh (s)	8.8	8.5	3.9	3.8	7.5	3.4	6.3

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.9	0.0	2.4	1.0	7.8	3.0	1.3

6: Industrial Access & Morris Thomas Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.2	0.1	0.1
Total Del/Veh (s)	2.1	0.4	5.2	4.5	13.6	3.7	4.4

Total Network Performance

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	41.8

Queuing and Blocking Report
Opening Year (2030) Build - AM Peak Hour

05/20/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	L	T
Maximum Queue (ft)	34	179	46	370	569	266	40	290	164	215
Average Queue (ft)	5	75	9	198	121	50	10	136	72	73
95th Queue (ft)	21	143	30	380	641	259	31	242	135	148
Link Distance (ft)		1621			2530			1423		1155
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	325		325	350		450	200		300	
Storage Blk Time (%)				9	0	0		3		
Queuing Penalty (veh)				13	0	0		3		

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	420	312	52
Average Queue (ft)	102	75	7
95th Queue (ft)	302	204	30
Link Distance (ft)	2226	4896	1423
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LT
Maximum Queue (ft)	70	57	20	42
Average Queue (ft)	24	26	1	5
95th Queue (ft)	50	51	9	24
Link Distance (ft)	1279	6729	299	289
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
Opening Year (2030) Build - AM Peak Hour

05/20/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	62	22	60
Average Queue (ft)	15	4	28
95th Queue (ft)	44	16	53
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350		150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	129	57
Average Queue (ft)	24	20
95th Queue (ft)	79	43
Link Distance (ft)	134	811
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Industrial Access & Morris Thomas Rd

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	17	81	73
Average Queue (ft)	1	34	36
95th Queue (ft)	6	68	59
Link Distance (ft)	675	2226	861
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 16

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	4.2	0.3	3.9	0.0	0.0	0.0	0.0	0.0	0.1	3.3	0.8	3.3
Total Del/Veh (s)	31.8	28.3	10.5	27.4	14.7	6.6	17.4	20.4	6.2	14.5	16.2	5.0

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	16.3

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	1.1	0.0	0.0	0.0	0.0	0.0	0.3
Total Del/Veh (s)	283.6	281.9	6.4	4.9	8.0	5.2	102.1

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	7.7	11.6	1.2	7.5	8.3	3.2	1.8	0.3	0.0	2.0	1.5	0.0

3: Midway Rd & St Louis River Rd Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	1.6

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.3	0.0	0.0	0.4	0.5	3.7	0.4
Total Del/Veh (s)	13.0	11.1	3.9	2.9	8.9	3.2	8.0

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.9	0.0	2.1	0.7	5.2	0.0	3.2	1.1

6: Industrial Access & Morris Thomas Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.4	0.4	0.3
Total Del/Veh (s)	3.0	0.2	1.2	1.9	13.2	10.7	7.8

Total Network Performance

Denied Del/Veh (s)	1.0
Total Del/Veh (s)	89.6

Queuing and Blocking Report
Opening Year (2030) Build - PM Peak Hour

05/20/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T
Maximum Queue (ft)	33	132	45	135	105	77	52	204	75	94	210
Average Queue (ft)	4	55	5	55	35	16	19	98	2	41	113
95th Queue (ft)	20	112	22	105	83	48	42	164	32	78	194
Link Distance (ft)		1621			2530			1424			1155
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	325		325	350		450	200		300	300	
Storage Blk Time (%)								0			
Queuing Penalty (veh)								1			

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	1990	87	9
Average Queue (ft)	1001	19	0
95th Queue (ft)	2117	57	6
Link Distance (ft)	2228	4896	1424
Upstream Blk Time (%)	3		
Queuing Penalty (veh)	12		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LT
Maximum Queue (ft)	35	49	20	73
Average Queue (ft)	17	18	1	16
95th Queue (ft)	37	37	10	54
Link Distance (ft)	1279	6727	299	289
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
Opening Year (2030) Build - PM Peak Hour

05/20/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	79	24	60
Average Queue (ft)	25	4	25
95th Queue (ft)	60	17	46
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350		150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	67	48
Average Queue (ft)	13	17
95th Queue (ft)	44	35
Link Distance (ft)	134	811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Industrial Access & Morris Thomas Rd

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	33	227
Average Queue (ft)	5	94
95th Queue (ft)	23	196
Link Distance (ft)	2228	936
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 13

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.8	0.3	3.8	0.3	0.0	0.3	0.1	0.0	0.1	3.5	0.7	3.3
Total Del/Veh (s)	33.3	34.2	9.1	34.2	12.5	8.8	21.8	31.4	6.5	23.7	17.2	4.5

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	24.0

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0		0.0	0.0	0.0	0.1	0.4	0.1
Total Del/Veh (s)	26.4		3.5	10.6	6.6	8.3	6.9	9.4

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	7.2	11.0	1.9	2.5	1.8	0.3	0.4	0.0	2.3	0.8	0.0	1.2

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.2	3.6	0.5
Total Del/Veh (s)	9.2	8.3	3.9	3.7	7.2	3.3	6.1

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.8	0.0	2.7	1.0	8.1	3.0	1.2

6: Industrial Access & Morris Thomas Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.2	0.2	0.1
Total Del/Veh (s)	2.2	0.3	5.8	5.3	18.0	4.4	5.1

Total Network Performance

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	33.7

Queuing and Blocking Report
Opening Year (2030) Build Mitigated - AM Peak Hour

05/22/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T
Maximum Queue (ft)	41	149	48	343	156	81	204	332	208	178	185
Average Queue (ft)	6	69	9	162	27	18	15	149	5	71	77
95th Queue (ft)	26	134	32	291	100	60	76	266	73	135	152
Link Distance (ft)	1621			2530			1423			1155	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	325		325	350		450	200		300	300	
Storage Blk Time (%)				0						4	
Queuing Penalty (veh)				0						6	

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	129	39	109	100	102	128
Average Queue (ft)	63	16	44	32	32	52
95th Queue (ft)	110	35	86	79	80	98
Link Distance (ft)	2220		4884		1423	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	250	250		250		
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	SB
Directions Served	LTR	LTR	LT
Maximum Queue (ft)	59	50	70
Average Queue (ft)	23	24	6
95th Queue (ft)	49	46	33
Link Distance (ft)	1278	6729	288
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report
Opening Year (2030) Build Mitigated - AM Peak Hour

05/22/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	43	24	65
Average Queue (ft)	11	4	29
95th Queue (ft)	36	18	52
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350		150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	EB	WB	B16	NB
Directions Served	T	LT	T	LR
Maximum Queue (ft)	4	129	6	60
Average Queue (ft)	0	24	0	20
95th Queue (ft)	3	81	4	43
Link Distance (ft)	336	134	1476	811
Upstream Blk Time (%)	0			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Industrial Access & Morris Thomas Rd

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	25	100	93
Average Queue (ft)	1	41	41
95th Queue (ft)	9	81	70
Link Distance (ft)	675	2220	855
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 6

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	4.1	0.3	3.8	0.0	0.0	0.0	0.0	0.0	0.1	3.3	0.7	3.2
Total Del/Veh (s)	32.3	28.2	7.6	28.0	14.7	6.6	18.7	22.9	7.9	15.1	15.4	4.8

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	16.7

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	15.8	6.3	14.8	9.4	16.4	7.7	12.9

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	8.0	12.2	1.8	7.4	6.8	3.1	1.0	0.3	0.0	2.0	1.8	0.0

3: Midway Rd & St Louis River Rd Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	1.8

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.8	0.5	3.7	0.4
Total Del/Veh (s)	13.9	12.2	3.7	2.3	12.5	2.8	8.7

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.9	0.0	2.1	0.7	8.2	0.6	3.6	1.2

6: Industrial Access & Morris Thomas Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.4	0.4	0.3
Total Del/Veh (s)	2.9	0.1	1.9	2.6	10.1	7.0	5.6

Total Network Performance

Denied Del/Veh (s)	0.8
Total Del/Veh (s)	34.6

Queuing and Blocking Report
Opening Year (2030) Build Mitigated - PM Peak Hour

05/22/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	
Directions Served	L	T	R	L	T	R	L	T	R	L	T	
Maximum Queue (ft)	36	140	34	126	83	67	56	235	132	91	257	
Average Queue (ft)	4	57	4	54	31	15	20	111	5	40	106	
95th Queue (ft)	19	118	17	103	71	48	46	198	58	78	193	
Link Distance (ft)	1621			2530			1423			1155		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	325		325	350		450	200		300	300		
Storage Blk Time (%)								1		0		
Queuing Penalty (veh)								3		0		

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	196	69	54	127	210	64
Average Queue (ft)	99	29	23	53	98	31
95th Queue (ft)	160	58	49	103	177	58
Link Distance (ft)	2222		4884		1423	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	250	250		250		
Storage Blk Time (%)					0	
Queuing Penalty (veh)					0	

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LT
Maximum Queue (ft)	43	48	11	118
Average Queue (ft)	18	16	1	18
95th Queue (ft)	40	35	9	75
Link Distance (ft)	1278	6727	299	288
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
Opening Year (2030) Build Mitigated - PM Peak Hour

05/22/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	73	38	49
Average Queue (ft)	22	6	23
95th Queue (ft)	53	25	40
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350	150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	70	55
Average Queue (ft)	12	20
95th Queue (ft)	44	41
Link Distance (ft)	134	811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Industrial Access & Morris Thomas Rd

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	48	178
Average Queue (ft)	7	79
95th Queue (ft)	30	130
Link Distance (ft)	2222	930
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 3

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.6	0.4	3.7	0.4	0.0	0.3	0.0	0.0	0.1	3.5	0.7	3.2
Total Del/Veh (s)	41.7	38.6	9.6	41.2	14.5	10.9	23.5	33.3	7.6	28.6	20.2	4.3

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	27.5

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0		0.0	0.0	0.0	0.0	0.4	0.1
Total Del/Veh (s)	13.6		3.2	10.3	7.9	9.7	8.2	9.0

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.5	11.6	2.4	3.3	2.1	1.5	0.5	0.0	2.2	0.8	0.0	1.3

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.3	3.6	0.4
Total Del/Veh (s)	10.1	8.3	4.2	2.6	9.1	3.8	6.3

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	0.9	0.0	2.9	1.1	10.7	2.9	1.4

6: Industrial Access & Morris Thomas Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.2	0.2	0.1
Total Del/Veh (s)	2.4	0.3	6.0	5.4	14.8	4.4	5.1

Total Network Performance

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	36.8

Queuing and Blocking Report
Design Year (2045) Build - AM Peak Hour

05/22/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T
Maximum Queue (ft)	38	226	53	358	252	196	164	426	350	200	204
Average Queue (ft)	6	82	10	173	48	33	16	175	15	82	94
95th Queue (ft)	24	166	31	319	222	158	84	328	132	164	177
Link Distance (ft)		1621			2530			1423			1155
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	325		325	350		450	200		300	300	
Storage Blk Time (%)				3				7			0
Queuing Penalty (veh)				5				9			0

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	118	43	92	120	112	134
Average Queue (ft)	48	15	41	41	40	58
95th Queue (ft)	89	34	76	96	87	100
Link Distance (ft)		2220		4884	1423	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	250		250		250	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LT
Maximum Queue (ft)	58	64	15	53
Average Queue (ft)	26	28	1	5
95th Queue (ft)	51	53	8	28
Link Distance (ft)	1278	6729	299	288
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
Design Year (2045) Build - AM Peak Hour

05/22/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	55	31	80
Average Queue (ft)	13	5	31
95th Queue (ft)	40	21	60
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350		150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	101	55
Average Queue (ft)	28	20
95th Queue (ft)	79	43
Link Distance (ft)	134	811
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Industrial Access & Morris Thomas Rd

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	17	141	98
Average Queue (ft)	1	42	40
95th Queue (ft)	7	93	70
Link Distance (ft)	675	2220	855
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 14

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.9	0.3	3.7	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.8	3.3
Total Del/Veh (s)	33.5	30.3	11.1	27.7	18.0	7.5	20.0	22.6	8.6	17.0	17.2	5.3

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	17.8

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	15.7	7.3	16.5	10.1	17.1	8.2	13.4

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	9.3	14.6	1.2	8.0	7.5	3.5	2.3	0.4	0.0	2.4	1.9	0.0

3: Midway Rd & St Louis River Rd Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	1.9

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.1	0.3	3.6	0.4
Total Del/Veh (s)	14.6	12.3	3.9	3.0	12.3	3.5	9.0

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.9	0.0	2.5	0.6	7.5	0.0	3.3	1.1

6: Industrial Access & Morris Thomas Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.4	0.4	0.3
Total Del/Veh (s)	3.0	0.2	1.9	2.6	9.3	7.0	5.6

Total Network Performance

Denied Del/Veh (s)	0.8
Total Del/Veh (s)	36.0

Queuing and Blocking Report
Design Year (2045) Build - PM Peak Hour

05/22/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T
Maximum Queue (ft)	39	163	38	133	116	69	52	238	152	105	275
Average Queue (ft)	4	65	5	52	43	20	21	117	13	46	125
95th Queue (ft)	19	130	23	101	93	53	45	202	100	86	225
Link Distance (ft)	1621			2530			1423			1155	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	325		325	350		450	200		300	300	
Storage Blk Time (%)								1	0		0
Queuing Penalty (veh)								4	0		0

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	227	87	78	143	215	70
Average Queue (ft)	99	32	22	60	99	29
95th Queue (ft)	172	66	54	118	183	56
Link Distance (ft)	2222		4884		1423	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	250		250		250	
Storage Blk Time (%)	0				0	
Queuing Penalty (veh)	0				0	

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LT
Maximum Queue (ft)	46	39	26	82
Average Queue (ft)	17	16	1	19
95th Queue (ft)	40	33	11	58
Link Distance (ft)	1278	6727	299	288
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
Design Year (2045) Build - PM Peak Hour

05/22/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	92	32	66
Average Queue (ft)	24	5	26
95th Queue (ft)	64	20	51
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350	150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	68	50
Average Queue (ft)	16	20
95th Queue (ft)	49	40
Link Distance (ft)	134	811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Industrial Access & Morris Thomas Rd

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	55	157
Average Queue (ft)	9	77
95th Queue (ft)	36	127
Link Distance (ft)	2222	930
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 5

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	1.6	0.3	2.1	2.6	0.6	2.9	0.1	0.0	0.0	2.0	0.5	1.4
Total Del/Veh (s)	35.0	32.1	30.2	77.9	25.1	7.5	56.7	58.3	31.9	45.1	44.7	6.7

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	45.7

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	1.8	0.2	2.0	0.4	0.0	0.0	0.5
Total Del/Veh (s)	198.9	25.1	73.6	100.1	3.0	2.6	62.1

4: Midway Rd & Railroad Crossing Performance by movement

Movement	NBT	SBT	All
Denied Del/Veh (s)	2.8	0.0	1.4
Total Del/Veh (s)	57.4	108.8	82.8

Total Network Performance

Movement	All
Denied Del/Veh (s)	2.0
Total Del/Veh (s)	130.8

Queuing and Blocking Report

10 Minute Crossing - 2030 Build AM Peak

06/27/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T
Maximum Queue (ft)	32	172	93	453	202	176	170	980	350	314	682
Average Queue (ft)	4	61	14	117	33	19	10	220	30	94	134
95th Queue (ft)	20	131	62	345	163	97	71	762	191	247	458
Link Distance (ft)	3164			2724			966			2950	
Upstream Blk Time (%)								3			
Queuing Penalty (veh)								10			
Storage Bay Dist (ft)	325	325		700	450		200	300		300	
Storage Blk Time (%)				0	1				10	4	5
Queuing Penalty (veh)				0	2				8	8	10

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB
Directions Served	L	R	L	T	R
Maximum Queue (ft)	292	432	300	1504	56
Average Queue (ft)	99	64	46	341	3
95th Queue (ft)	267	308	193	1181	22
Link Distance (ft)	2892		2789		
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	250	250		250	
Storage Blk Time (%)	16	0		21	
Queuing Penalty (veh)	4	2		16	

Intersection: 4: Midway Rd & Railroad Crossing

Movement	NB	SB
Directions Served	T	T
Maximum Queue (ft)	398	990
Average Queue (ft)	178	302
95th Queue (ft)	479	980
Link Distance (ft)	392	966
Upstream Blk Time (%)	27	14
Queuing Penalty (veh)	115	60
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 236

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.6	0.2	2.5	2.5	0.5	2.7	0.5	0.0	0.0	3.3	2.1	3.6
Total Del/Veh (s)	50.3	29.7	43.4	68.0	19.6	7.3	29.6	28.8	13.2	89.1	109.8	81.2

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	1.3
Total Del/Veh (s)	53.7

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	1.7	0.4	1.5	0.3	0.0	0.0	0.5
Total Del/Veh (s)	333.6	197.1	96.4	104.5	3.1	1.1	111.5

4: Midway Rd & Railroad Crossing Performance by movement

Movement	NBT	SBT	All
Denied Del/Veh (s)	1.8	1.0	1.4
Total Del/Veh (s)	44.5	90.2	67.6

Total Network Performance

Denied Del/Veh (s)	2.3
Total Del/Veh (s)	162.9

Queuing and Blocking Report

10 Minute Crossing - 2030 Build PM Peak

06/27/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	23	144	52	187	145	116	150	805	350	350	2031	140
Average Queue (ft)	6	55	7	54	51	32	16	122	18	79	525	7
95th Queue (ft)	20	117	30	140	115	85	71	448	139	259	1667	91
Link Distance (ft)	3164			2724			966			2950		
Upstream Blk Time (%)								0		1		
Queuing Penalty (veh)								2		0		
Storage Bay Dist (ft)	325	325		700	450		200	300		300	300	
Storage Blk Time (%)								4	0	0	23	
Queuing Penalty (veh)								8	1	0	33	

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB
Directions Served	L	R	L	T	R
Maximum Queue (ft)	300	1563	200	1349	21
Average Queue (ft)	208	560	13	303	1
95th Queue (ft)	393	1484	97	1043	9
Link Distance (ft)	2892		2789		
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	250	250		250	
Storage Blk Time (%)	56			23	
Queuing Penalty (veh)	43			3	

Intersection: 4: Midway Rd & Railroad Crossing

Movement	NB	SB
Directions Served	T	T
Maximum Queue (ft)	399	991
Average Queue (ft)	165	335
95th Queue (ft)	473	1054
Link Distance (ft)	392	966
Upstream Blk Time (%)	29	20
Queuing Penalty (veh)	156	109
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 355

Queuing and Blocking Report
10 Minute Crossing - 2030 Build Rerouted AM Peak

11/05/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T
Maximum Queue (ft)	47	168	72	204	98	72	163	978	350	314	626
Average Queue (ft)	6	53	13	48	21	14	10	195	30	78	113
95th Queue (ft)	25	122	48	141	62	47	71	685	191	214	408
Link Distance (ft)	3164			2724			966			2950	
Upstream Blk Time (%)								2			
Queuing Penalty (veh)								7			
Storage Bay Dist (ft)	325	325		700	450		200	300		300	
Storage Blk Time (%)								9	0	0	5
Queuing Penalty (veh)								7	0	1	9

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	257	220	300	1812	399	280
Average Queue (ft)	79	20	74	436	48	32
95th Queue (ft)	219	116	243	1443	200	126
Link Distance (ft)	2892		2789		392	
Upstream Blk Time (%)					1	
Queuing Penalty (veh)					2	
Storage Bay Dist (ft)	250	250		250		
Storage Blk Time (%)	5	2		24	2	0
Queuing Penalty (veh)	2	7		38	2	0

Intersection: 4: Midway Rd & Railroad Crossing

Movement	NB	SB
Directions Served	T	T
Maximum Queue (ft)	400	992
Average Queue (ft)	168	310
95th Queue (ft)	471	966
Link Distance (ft)	392	966
Upstream Blk Time (%)	26	11
Queuing Penalty (veh)	112	38
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 225

Queuing and Blocking Report

10 Minute Crossing - 2030 Build Rerouted PM Peak

11/05/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	35	160	44	142	137	139	227	968	350	350	1863	136
Average Queue (ft)	7	56	6	41	48	35	22	151	41	83	468	7
95th Queue (ft)	25	128	27	112	108	90	107	579	221	263	1469	88
Link Distance (ft)	3164			2724			966			2950		
Upstream Blk Time (%)								1				
Queuing Penalty (veh)								4				
Storage Bay Dist (ft)	325	325		700	450		200	300		300	300	
Storage Blk Time (%)								6	0	1	22	
Queuing Penalty (veh)								12	0	5	31	

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	300	1169	299	1421	411	251
Average Queue (ft)	160	298	30	366	98	34
95th Queue (ft)	350	955	149	1125	330	170
Link Distance (ft)	2892		2789		392	
Upstream Blk Time (%)					4	
Queuing Penalty (veh)					19	
Storage Bay Dist (ft)	250	250		250		
Storage Blk Time (%)	31			28	6	0
Queuing Penalty (veh)	25			7	3	0

Intersection: 4: Midway Rd & Railroad Crossing

Movement	NB	SB
Directions Served	T	T
Maximum Queue (ft)	397	993
Average Queue (ft)	172	413
95th Queue (ft)	478	1119
Link Distance (ft)	392	966
Upstream Blk Time (%)	28	19
Queuing Penalty (veh)	155	103
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 364

Appendix D:

Turn Lane Warrant Sheets

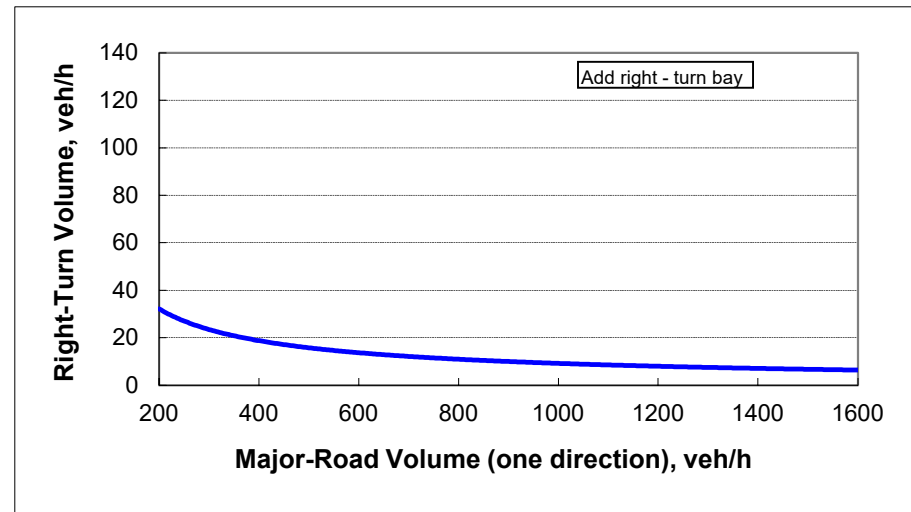
Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	111
Right-turn volume, veh/h:	34

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	51
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



Morris Thomas Road & Industrial Access Eastbound Right (2045 Build Conditions)

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

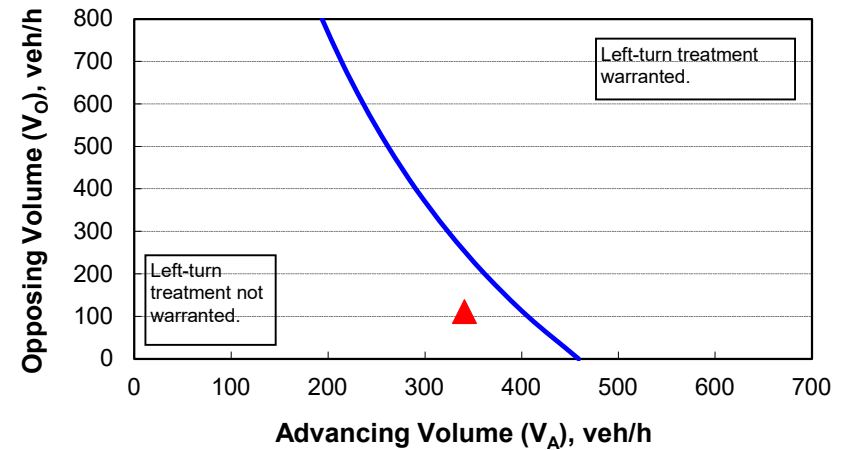
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	90%
Advancing volume (V_A), veh/h:	341
Opposing volume (V_O), veh/h:	111

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	401
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Morris Thomas Road & Industrial Access Westbound Left (2045 Build Conditions)

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

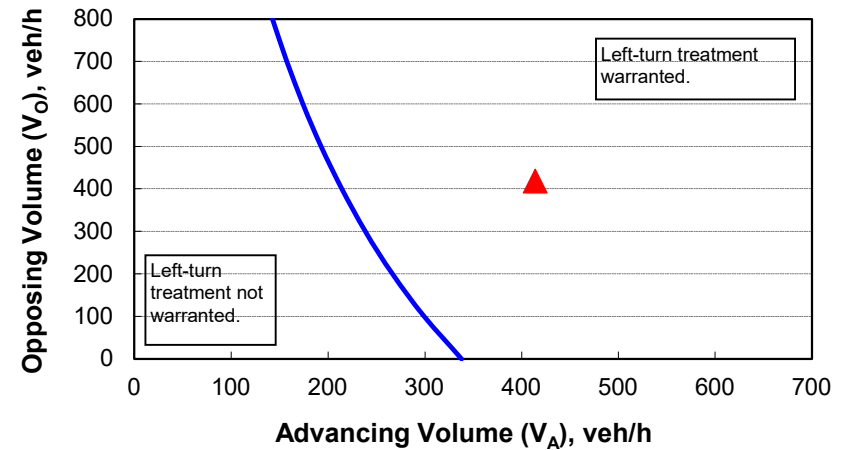
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	21%
Advancing volume (V_A), veh/h:	414
Opposing volume (V_O), veh/h:	418

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	210
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Midway Road & Morris Thomas Road Northbound Right (2030 Build Conditions)

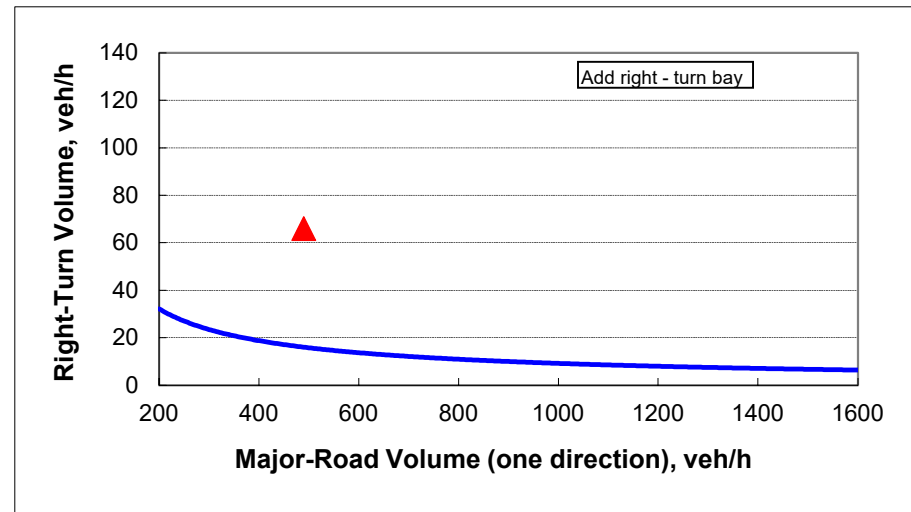
Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	490
Right-turn volume, veh/h:	66

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	16
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Add right-turn bay.	



Midway Road & Morris Thomas Road Southbound Right (2030 Build Conditions)

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

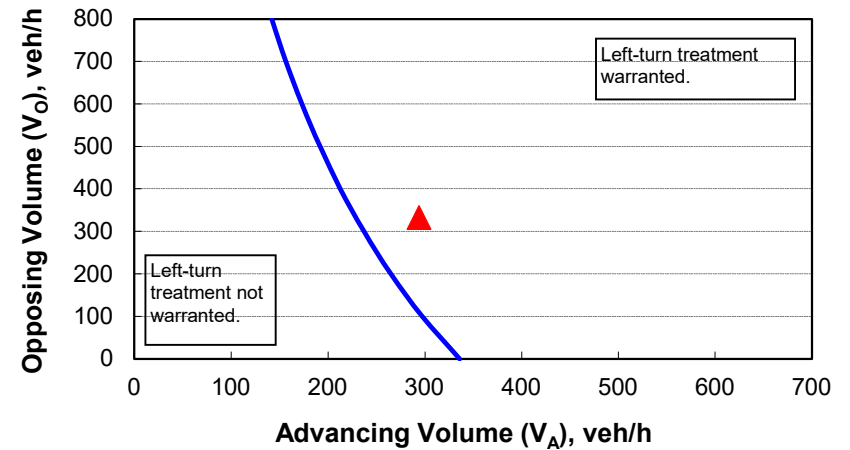
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	60
Percent of left-turns in advancing volume (V_A), %:	16%
Advancing volume (V_A), veh/h:	294
Opposing volume (V_O), veh/h:	332

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	229
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

US-2 & St Louis River Road Westbound Left (2030 Build Conditions)



TRAFFIC MEMORANDUM

To: MnDOT, St. Louis County, & City of Hermantown
From: Jacob Rojer P.E., PTOE
Date: March 27, 2026
Subject: Hermantown Industrial - Construction Conditions (2027) Traffic Analysis

INTRODUCTION

This memo analyzes the impact of Hermantown Industrial construction traffic on the surrounding roadway network and determines any mitigations necessary to support the temporarily elevated traffic levels. The Hermantown Industrial site is located at the southwest corner of Midway Road & Morris Thomas Road in Hermantown, MN. The project site location and study area is shown in **Exhibit 1**. All Exhibits are presented in **Attachment A**. A Traffic Impact Analysis (TIA) was completed for the Hermantown Industrial site which analyzed the impacts of the completed development in the short- and long-term. This memorandum includes the volume development for the construction conditions in the potential construction year of 2027. It also includes a capacity analysis for the construction conditions, and the determination of any mitigation measures necessary to facilitate access to the construction site while maintaining acceptable traffic conditions at the nearby study intersections.

All intersections studied in the Hermantown Industrial TIA were also analyzed for this memorandum. Existing geometry and intersection control is shown in **Exhibit 2**. Turning Movement Counts (TMCs) were collected at five (5) study intersections in April 2025, with the PM peak (4:00 PM to 6:00PM) collected on Wednesday, April 9, and the AM peak (7:00 AM to 9:00 AM) collected on Thursday, April 10.

VOLUME DEVELOPMENT

For the purpose of this memo, trip generation includes the construction of Phase One of the site, which includes an administrative building and one of four industrial buildings in the year 2027. Construction trip generation estimates were determined using estimates for similar sized projects. The expected construction trips generated are shown below in **Table 1**. At the peak of construction, there are expected to be 390 construction trips (330 entering, 60 exiting) during the AM peak hour and 340 construction trips (70 entering, 270 exiting) during the PM peak hour.

To determine the effects of the busiest construction period on the roadway network, the AM and PM peak periods of construction traffic were studied instead of the peak periods of adjacent street traffic. Based on the anticipated arrival patterns, the AM peak hour of street traffic is estimated to be 7:15 AM to 8:15 AM, while the PM peak hour of site traffic is estimated to coincide with the PM peak hour of adjacent street traffic at 4:15 PM to 5:15 PM. The Existing (2025) peak hour traffic volumes are shown in **Exhibit 3**.

A small percentage of truck trips are estimated to be generated throughout the day, but these trips are expected to be spread relatively throughout the workday and are generally not expected to coincide with the peak periods for passenger vehicle trips. Because there is not expected to be substantial truck trips during the peak periods, existing heavy vehicle percentages were utilized for the analysis.

Table 1: Construction Trip Generation

Trip Type	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Total	330	60	390	70	270	340

The distribution of construction site trips was determined via a review of the existing roadway characteristics, traffic patterns, and knowledge of the site characteristics. The global distribution for traffic traveling to/from the site is as follows:

- 40% to/from southeast on US Highway 2
- 15% to/from north on Midway Road
- 15% to/from south on Midway Road
- 15% to/from east on Morris Thomas Road
- 10% to/from west on Morris Thomas Road
- 5% to/from northwest on US Highway 2

For the sake of this analysis, it was assumed that all construction traffic would access the site from the primary access point located along Morris Thomas Road. The overall trip distribution for the site is shown in **Exhibit 4**, while the trip assignment for the Hermantown Technology Park Construction traffic is shown in **Exhibit 5**.

Based on an analysis of Hermantown population growth and expected traffic volume growth, an annual growth rate of 0.6% was determined to be used for background growth. Two years of background growth was applied to the Existing (2025) traffic volumes to determine No-Build (2027) traffic volumes, shown in **Exhibit 6**. The Construction Conditions (2027) traffic volumes were determined by applying trip assignment in **Exhibit 5** to No-Build (2027) traffic volumes in **Exhibit 6**. The Construction Conditions (2027) traffic volumes are shown in **Exhibit 7**.

RAILROAD CROSSING QUEUE ANALYSIS

A railroad crossing conditions analysis was conducted on the Construction Conditions (2027) to determine the necessary mitigation for 10-minute train crossing events during the peak construction conditions. Results of the analysis, along with the Existing (2025) Conditions results are given below in **Table 2**.

Table 2: 10-Minute Train Crossing Event Queueing Results

Scenario	Maximum Queue by Movement				
	US Highway 2 & Midway Road			Midway Road & Morris Thomas Road	
	EBR	WBL	SBT	NBT	EBL/R ¹
(Available Queue Storage)	300'	450'	-	-	- / 250'
Existing (2025) Conditions – AM Peak	26'	59'	164'	1,346'	298'
Existing (2025) Conditions – PM Peak	75'	167'	1,808'	1,078'	277'
Construction Conditions (2027) – AM Peak	167'	720'	1,286'	2,129'	292'
Construction Conditions (2027) – PM Peak	62'	227'	2,175'	1,517'	2,686'
Rerouted Construction (2027) – AM Peak	157'	420'	1,180'	2,627'	284'
Rerouted Construction (2027) – PM Peak	57'	209'	2,169'	1,477'	2,828'

¹Dedicated left turn storage (250') was assumed at Midway Road & Morris Thomas Road under Construction Conditions.

Based on the results of the analysis, the peak construction conditions are anticipated to cause significant increases in queueing during 10-minute crossing events compared to the existing conditions. During the AM Peak hour of the Construction Conditions (2027), the westbound left turn lane at US Highway 2 & Midway Road is anticipated to exceed its storage capacity with maximum queues of 720'. It is recommended that traffic traveling to the site from US Highway 2 south of St. Louis River Road should be routed to turn at St. Louis River Road to avoid this railroad crossing and reduce potential undesirable queueing in the westbound left turn lane.

The Rerouted Construction (2027) Traffic Volumes are shown in **Exhibit 8**. Under the rerouted construction conditions, the westbound left turn queue is reduced to 420' which is within the available storage. During the PM peak hour of the Construction Conditions (2027), the eastbound approach of Midway Road & Morris Thomas Road is anticipated to see maximum queues of approximately ½ mile. Eastbound queues do not extend to any major intersection and are not expected to cause significant issues. All other movements are generally anticipated to see acceptable levels of queueing during 10-minute crossing events and no further mitigation is required.

In review of the MnDOT provided data for the railroad crossing from June through October 2025, a total of 97 railroad crossings occurred during the weekday AM peak hour (7:45 AM to 8:45 AM) when the projected queues for the turn lanes on US 2 are the longest. 97 crossings in the 5 months represents 0.9 events per weekday AM peak. While there are anticipated to be crossings almost every day during the AM peak hour, only 23 crossings exceeded 5 minutes and only 1 crossing in the 5-month time frame was 10 minutes. Therefore, the analysis condition outlined above for a 10-minute training crossing is not anticipated to be a regular occurrence.

CONSTRUCTION CONDITIONS (2027) CAPACITY ANALYSIS

Traffic analysis was conducted for the Construction Conditions (2027) scenario as described above. Analysis was conducted using capacity analysis software SimTraffic within Synchro 12. Sim Traffic Reports are presented in **Attachment B**. The level of service is shown in **Table 3**.

Table 3: Construction Conditions (2027) Level of Service

Intersection	Control	Approach	Operations by Movement							
			AM Peak Hour				PM Peak Hour			
			Left	Through	Right	Overall	Left	Through	Right	Overall
Midway Road & US Highway 2	Signal	EB	C (26.1)	C (25.4)	A (6.1)	C (26)	C (23.6)	C (20.3)	A (6.2)	B (14.2)
		WB	E (57.4)	B (15.2)	B (10.6)		C (24.2)	B (15.2)	A (5.8)	
		NB	B (19.2)	C (27.4)	A (7.4)		B (17.2)	B (19.3)	A (6.1)	
		SB	B (19.9)	B (15.8)	A (4.2)		B (14.4)	B (13.9)	A (4.8)	
Midway Road & Morris Thomas Road	Side Street Stop	EB	F (82.1)	-	F (76.8)	F (82.1)	F (100+)	-	F (100+)	F (100+)
		WB	-	-	-		-	-	-	
		NB	C (19.6)	C (19.5)	-		A (6.1)	A (4.3)	-	
		SB	-	A (8.2)	A (5.4)		-	A (7)	A (4.2)	
Midway Road & St Louis River Road	Side Street Stop	EB	A (7.6)	B (10.8)	A (2.3)	B (10.8)	A (8.1)	B (12)	A (1.7)	B (12)
		WB	-	A (4.3)	A (3.7)		A (9.8)	A (7)	A (2.4)	
		NB	A (0.3)	A (0.6)	A (0)		A (2.2)	A (0.4)	A (0)	
		SB	A (2.7)	A (0.7)	A (0)		A (2.3)	A (2.4)	A (0)	
US Highway 2 & Morris Thomas Road	Side Street Stop	EB	A (5.7)	A (6)	-	A (6.3)	B (12.9)	B (10.4)	-	B (12.9)
		WB	-	A (3.5)	A (2.6)		-	A (3.6)	A (3.4)	
		NB	-	-	-		-	-	-	
		SB	A (6.3)	-	A (3)		A (9.7)	-	A (2.8)	
St Louis River Road & US Highway 2	Side Street Stop	EB	-	A (0.9)	A (0.1)	A (9.6)	-	A (1.2)	A (0)	A (8.5)
		WB	A (2.9)	A (1.7)	-		A (2.3)	A (0.6)	-	
		NB	A (9.6)	-	A (2.8)		A (8.5)	A (0.7)	A (4)	
		SB	-	-	-		-	-	-	
Morris Thomas Road & Industrial Access	Side Street Stop	EB	-	B (11.2)	A (3.1)	E (39.8)	-	C (19.7)	A (4.1)	F (81.6)
		WB	E (39.8)	D (31.8)	-		A (7)	A (7)	-	
		NB	A (8.9)	-	A (2.5)		F (71.6)	-	F (81.6)	
		SB	-	-	-		-	-	-	

Note: Worst side street delay is reported instead of overall delay at side-street stop-controlled intersections.

Based on the Construction Conditions (2027) analysis, the following individual movements are expected to operate at LOS F:

- Eastbound left at Midway Road & Morris Thomas Road (AM & PM)
- Eastbound right at Midway Road & Morris Thomas Road (AM & PM)

- Northbound left at Morris Thomas Road & Construction Access (PM)
- Northbound right Morris Thomas Road & Construction Access (PM)

The current intersection control at Midway Road & Morris Thomas Road is Side Street Stop Control. Due to this, the eastbound approach is the only approach with a stop sign. Vehicles are unable to make an eastbound left or right turn in a timely matter because of limited turning opportunities on Midway Road. In order to reduce delays at this intersection, it is recommended that this intersection be signalized. Based on the recommendation given in the Hermantown Industrial Traffic Impact Analysis, installation of a permanent traffic signal is recommended to mitigate issues related to queueing at the nearby railroad crossing along Midway Road. The delay and queueing issues at Morris Thomas Road & Construction Access are almost entirely due to the problems previously discussed at Midway Road & Morris Thomas Road. Thus, proper mitigation at Midway Road & Morris Thomas Road is expected to resolve conflict at Morris Thomas Road & Construction Access.

Analysis of 95th percentile queue lengths shows all queues remain in their respective storage bays apart from the westbound left movement at Midway Road & US Highway 2. The 95th percentile queue is expected to be at a maximum of 14 feet beyond the 350-foot storage bay in the AM peak hour. This queue is not expected to extend onto the through lane because vehicles should fit within the taper length. The extended queue is primarily due to the current signal phasing which does not have enough allotted time to allow the full westbound left queue to complete the movement in one cycle. An adjustment of the signal time is expected to be enough to provide reduced queue lengths.

MITIGATED CONSTRUCTION CONDITIONS (2027) CAPACITY ANALYSIS

In order to show the impact of mitigation strategies on the roadway network, the Mitigated Construction Conditions (2027) Capacity Analysis was conducted. The following modifications recommended in the Hermantown Industrial Traffic Impact Study were applied to the model:

- Install a permanent traffic signal at Midway Road & Morris Thomas Road. The traffic signal would require coordination with the railroad crossing and the existing signal at US Highway 2 & Midway Road
- Install northbound-left, southbound-right, and eastbound-left turn lanes at Midway Road & Morris Thomas Road
- Optimize signal timings at US Highway 2 & Midway Road and implement coordination with the proposed signal at Midway Road & Morris Thomas Road
- Install a westbound left turn lane at the development driveway/construction access
- Reroute all entering traffic from US Highway 2 that is coming from the southeast onto St. Louis River Road

Analysis was conducted using capacity analysis software SimTraffic within Synchro 12. The level of service is shown in **Table 4**.

Table 4: Construction Conditions (2027) Level of Service

Intersection	Control	Approach	Operations by Movement							
			AM Peak Hour				PM Peak Hour			
			Left	Through	Right	Overall	Left	Through	Right	Overall
Midway Road & US Highway 2	Signal	EB	C (26.6)	C (22.6)	A (5)	B (19.1)	C (30.5)	C (20.2)	A (6.2)	B (14.7)
		WB	C (29.2)	B (19.7)	A (8.1)		C (24.8)	B (15.8)	A (7.3)	
		NB	B (20)	C (23.7)	A (5.9)		B (18.4)	B (19.9)	A (8.1)	
		SB	B (17.7)	B (14.5)	A (4.2)		B (14.9)	B (13.9)	A (5)	
Midway Road & Morris Thomas Road	Signal	EB	C (26.1)	-	A (3.4)	B (10.7)	B (13.8)	A (1.2)	A (5.5)	B (13.2)
		WB	-	-	-		-	-	-	
		NB	B (12.3)	A (8)	-		B (14.6)	B (10.9)	-	
		SB	-	B (10.7)	A (7.6)		-	B (18.2)	A (7.4)	
Midway Road & St Louis River Road	Side Street Stop	EB	A (6.8)	B (12.3)	A (1.9)	B (12.3)	A (9.3)	C (15.1)	A (1.9)	C (15.1)
		WB	-	A (2.8)	A (6.6)		A (9.9)	A (6.7)	A (3.2)	
		NB	A (0.6)	A (1)	A (0.1)		A (2.1)	A (0.4)	A (0)	
		SB	A (6.2)	A (1.1)	A (0)		A (2.2)	A (2)	A (0)	
US Highway 2 & Morris Thomas Road	Side Street Stop	EB	A (7.9)	A (6.4)	-	A (7.9)	B (13.6)	B (12.3)	-	B (13.6)
		WB	-	A (2.3)	A (1.1)		-	A (3.7)	A (2.4)	
		NB	-	-	-		-	-	-	
		SB	A (6.9)	-	A (2.8)		B (12)	-	A (2.8)	
St Louis River Road & US Highway 2	Side Street Stop	EB	-	A (1.5)	A (0.1)	B (11.2)	-	A (1.3)	A (0)	A (9.5)
		WB	A (4.7)	A (1.2)	-		A (2.1)	A (0.3)	-	
		NB	B (11.2)	-	A (3.7)		A (9.5)	A (0.1)	A (4)	
		SB	-	-	-		-	-	-	
Morris Thomas Road & Industrial Access	Side Street Stop	EB	-	A (1.8)	A (0.2)	B (14.8)	-	A (3.1)	A (0.1)	B (13.6)
		WB	A (5.5)	A (4)	-		A (1.4)	A (1.6)	-	
		NB	B (14.8)	-	A (3.3)		B (13.6)	-	B (10.7)	
		SB	-	-	-		-	-	-	

Results from the Construction Conditions (2027) Capacity Analysis show that all intersections are expected to operate at LOS D or better and all individual movements are expected to operate at LOS D or better. After a review of 95th percentile queue lengths, all turn lane queues are expected to remain within their respective storage bays.

CONCLUSION AND RECOMMENDATIONS

Build-out of the Hermantown Industrial Project was modeled to occur in the year 2027. A capacity analysis on the Construction Conditions (2027) on the existing roadway system was conducted. The results showed that multiple delay issues present themselves at Midway Road & Morris Thomas Road and Morris Thomas Road and Construction Access. Based on the results of this analysis and coordination with St. Louis County & MnDOT, the following mitigation measures will be required as a result of the proposed development:

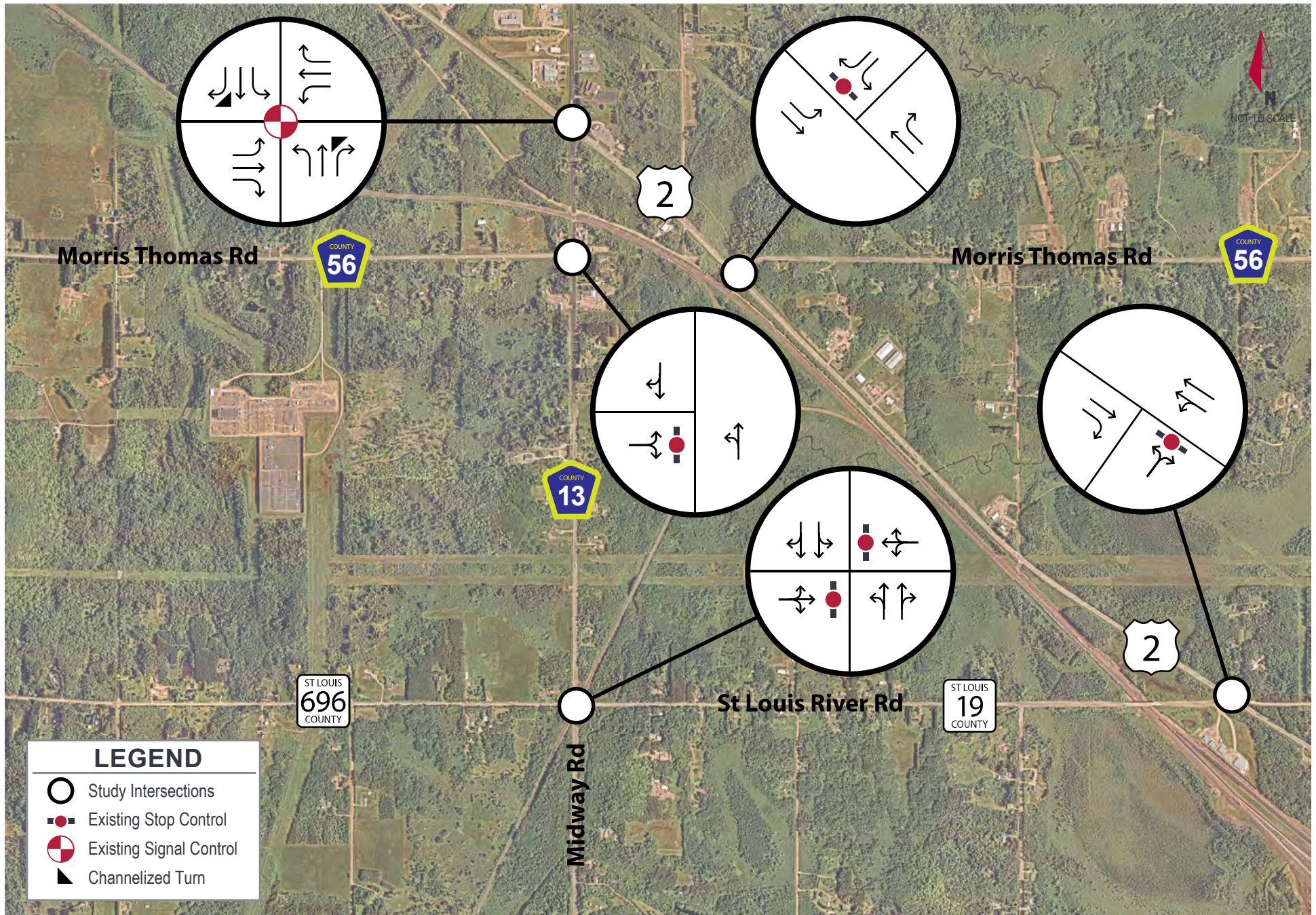
1. Intersection of Morris Thomas Rd (CSAH 56) and development driveway
 - a. Construct a westbound dedicated left-turn lane on Morris Thomas Road at the driveway.
 - b. Driveway will be stop controlled.
2. Intersection of Midway Rd (CSAH 13) and Morris Thomas Rd (CSAH 56)
 - a. Construct a northbound dedicated left-turn lane on Midway Road at Morris Thomas Road.
 - b. Construct eastbound dedicated left-turn and right-turn lanes on Morris Thomas Road at Midway Road. Storage for the right-turn lane will ensure vehicles are not occluded from accessing the right-turn lane during 95% of the time.
 - c. Construct a southbound dedicated right-turn lane on Midway Road at Morris Thomas Road.
 - d. Install a permanent traffic signal.
 - e. Install conduit/cable to coordinate the signal controller with the railroad crossing controller (USDOT #251905S) and the signal controller at the US 2 signal system.
3. Railroad crossing (DOT #251905S)
 - a. Install a traffic queue cutter signal system that will face southbound Midway Road traffic and be located immediately north of Old Hwy 2
 - b. The need for railroad crossing upgrades will be coordinated with the MnDOT Rail Office (Paul DeLaRosa, paul.delarosa@state.mn.us).
4. Intersection of US 2 and Midway Road (CSAH 13)
 - a. Install conduit/cable to coordinate the signal controller with the railroad crossing controller (USDOT #251905S) and the signal controller at the Midway Road/Morris Thomas Road signal system.
5. Intersection of US 2 and St. Louis River Road
 1. Construct a northwest bound dedicated left turn lane to accommodate additional site traffic.
6. Signal timing
 - a. Develop optimized signal timing models for both the Midway Road/Morris Thomas Road and US 2/Midway Road signal systems to accommodate non-train and train events.

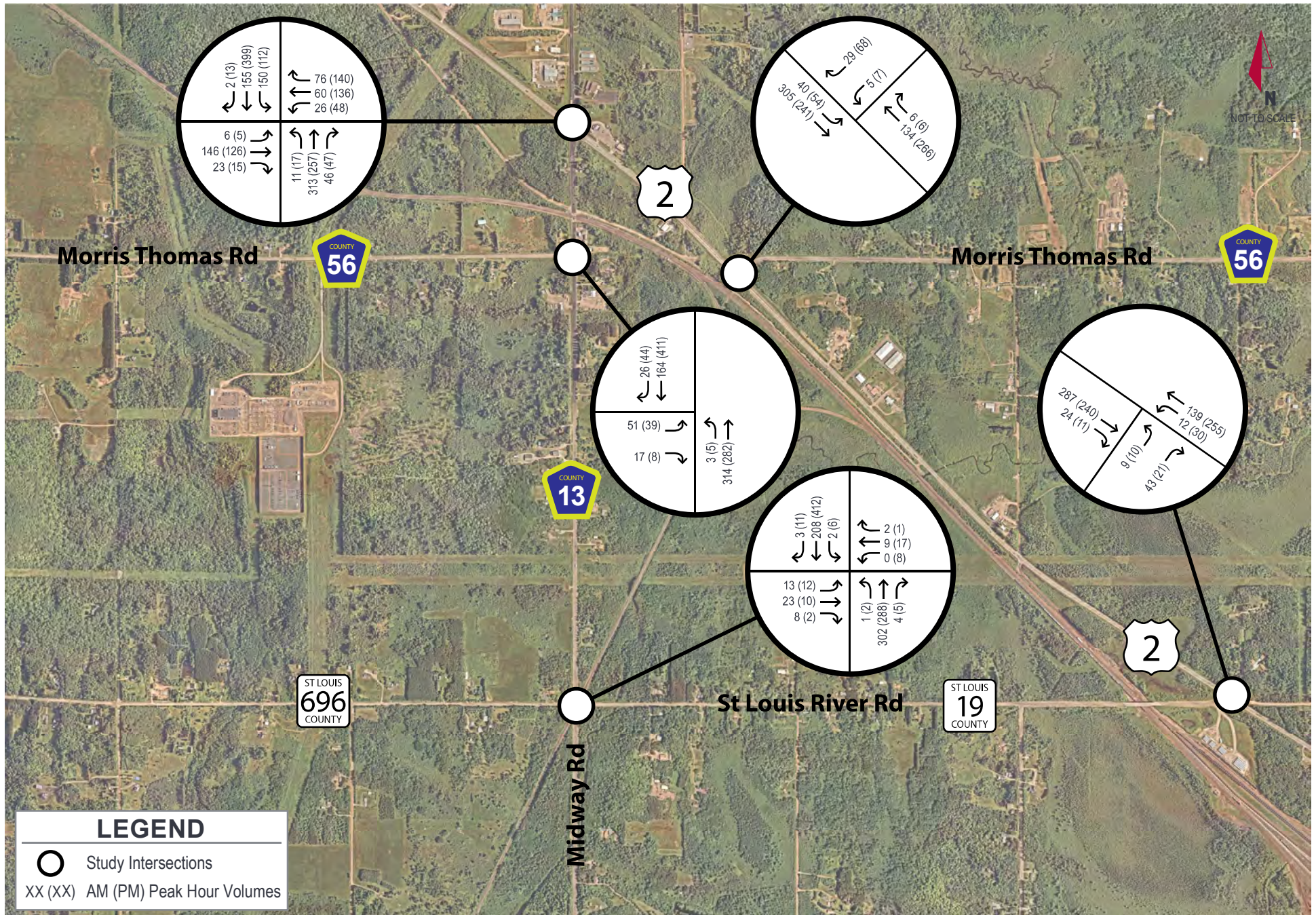
7. Travel Demand Management (TDM)

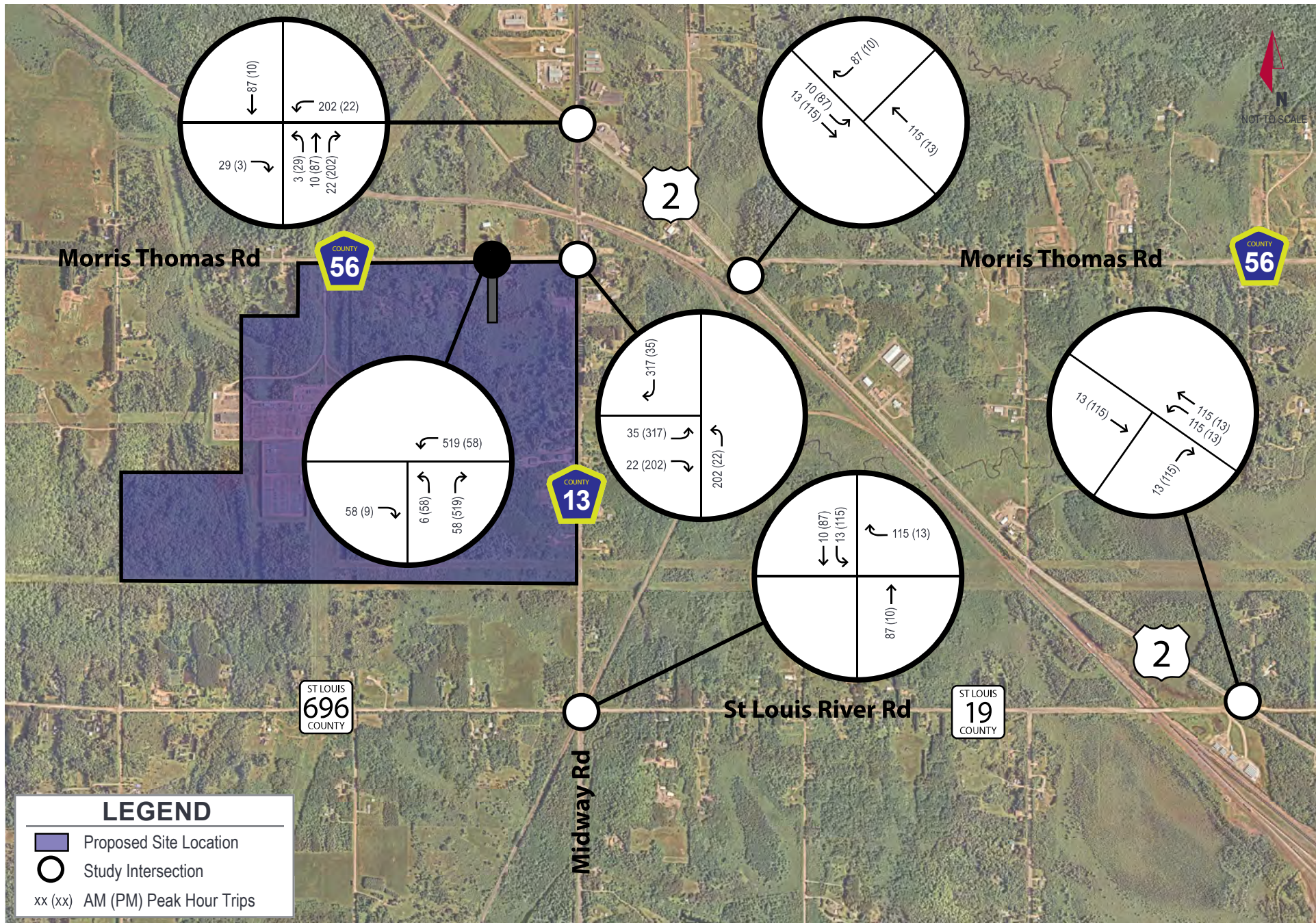
1. A plan completed prior to the beginning of construction will be included in project bid documents, agreements, and notices to sub-contractors, suppliers, and employees. The TDM plan will direct all traffic traveling to the site from US Highway 2 southeast of St. Louis River Road to turn onto St. Louis River Road and enter from the south along Midway Road instead of turning left onto Midway Road from US Highway 2.
- b. If the TDM plan does not prove to be effective at limiting queues at Midway Road & US Highway 2, additional mitigation such as variable message signs or other advanced warning during train event could be implemented at US Highway 2 & St. Louis River Road.

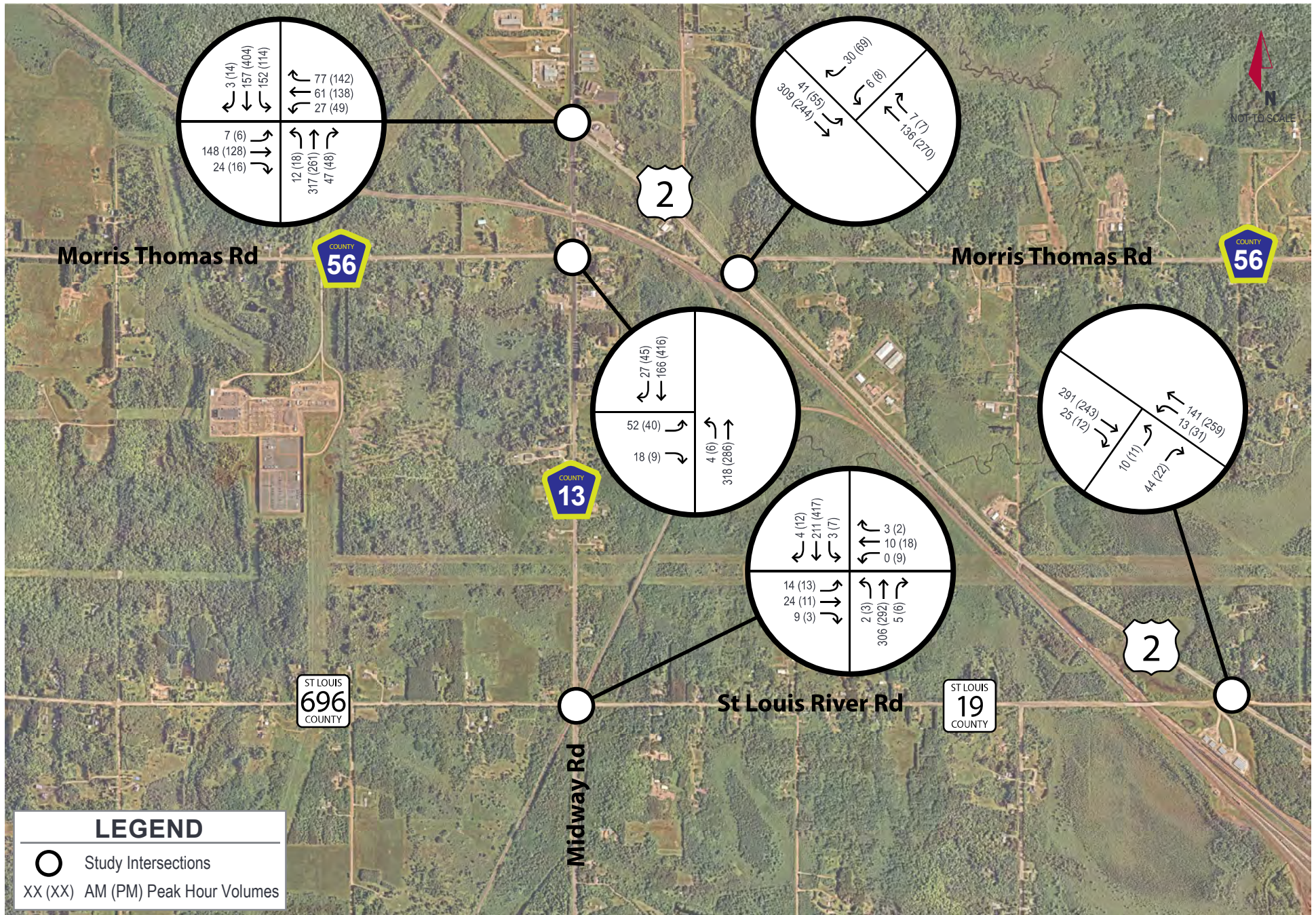
The mitigation plan is shown graphically in **Exhibit 9**. All mitigation aligns with the recommended permanent mitigation outlined in the Hermantown Industrial Site Specific TIA.

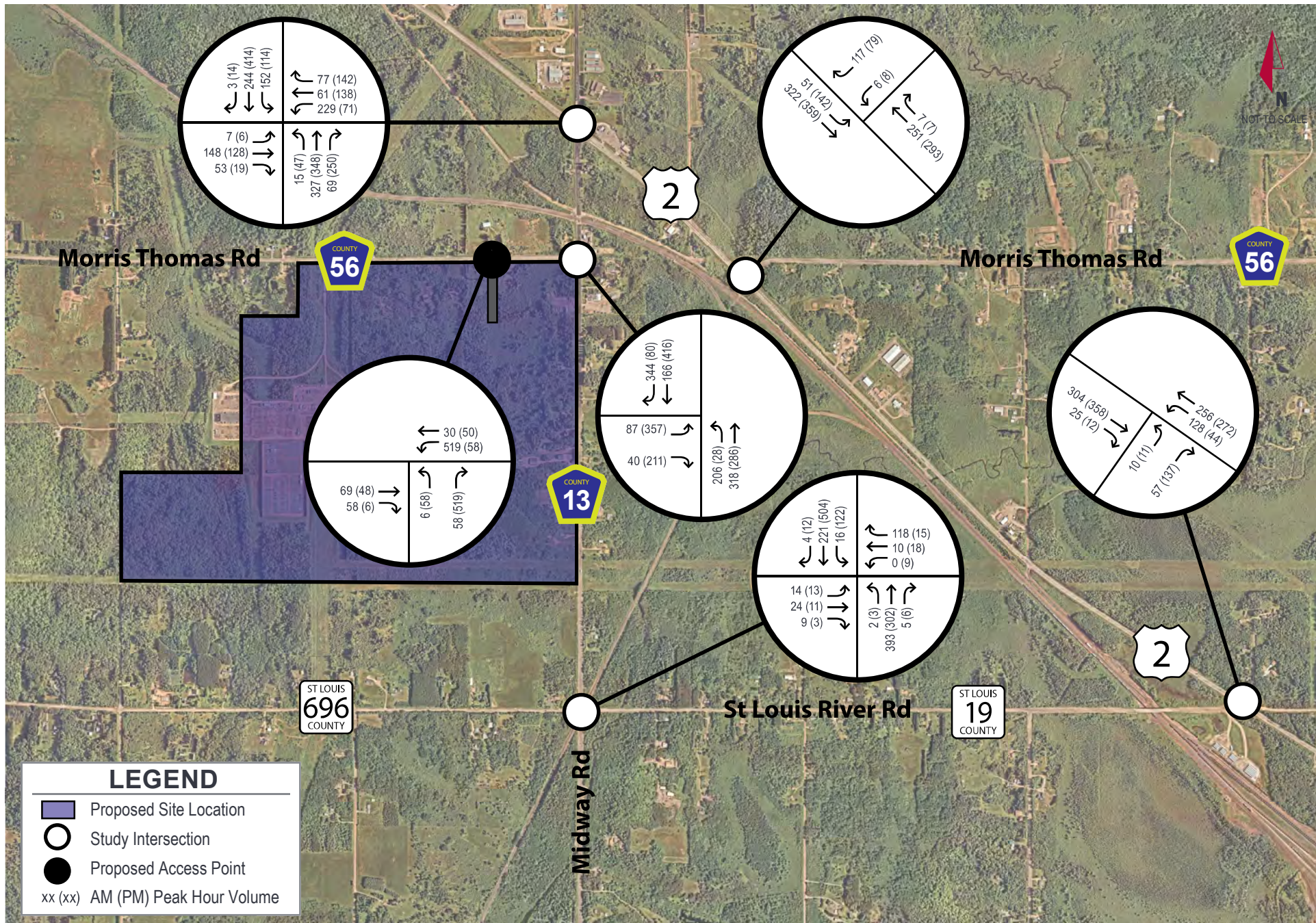
ATTACHMENT A: EXHIBITS

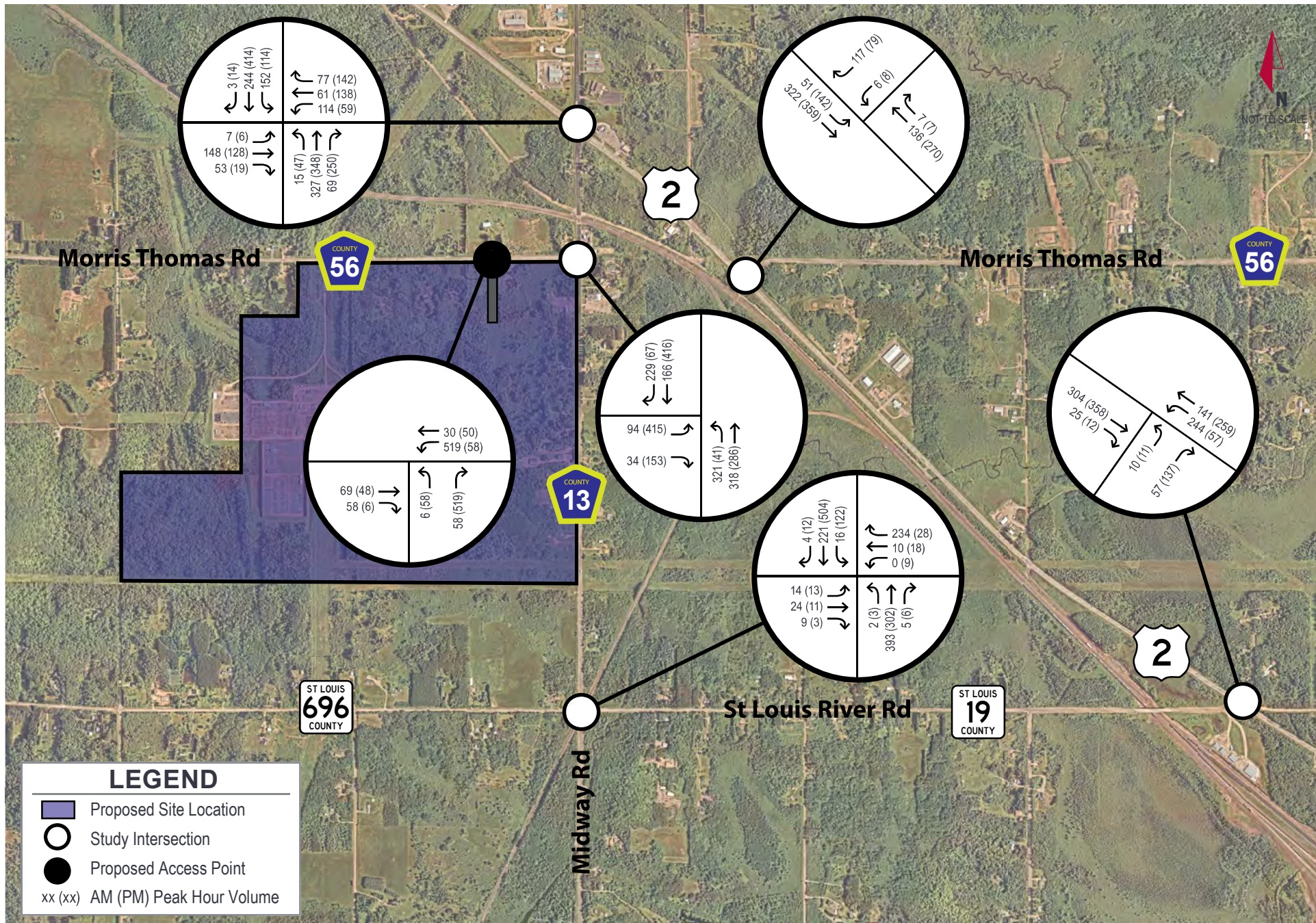


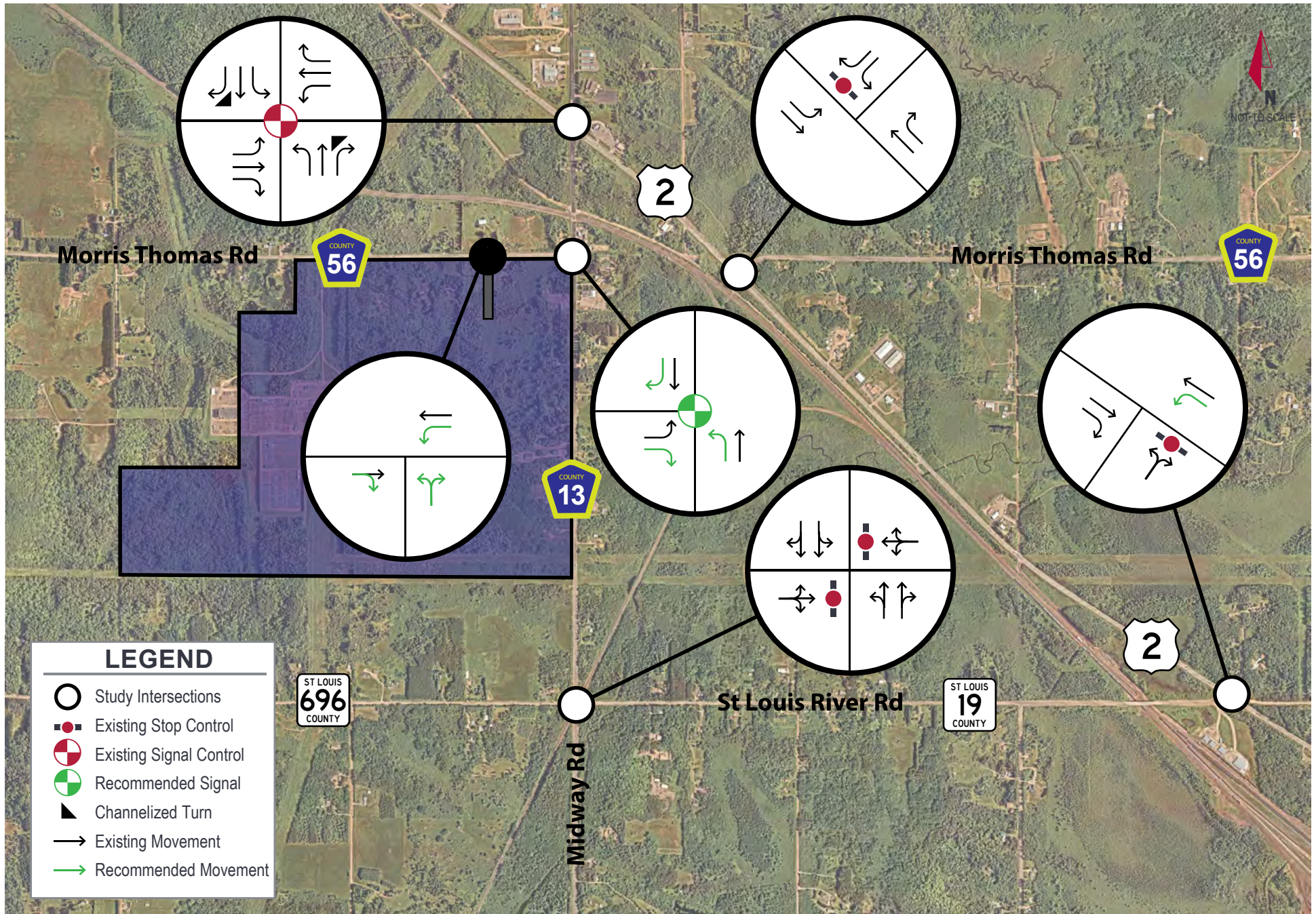












ATTACHMENT B: SIM TRAFFIC REPORTS

SimTraffic Performance Report
Construction Conditions (2027) - AM Peak Hour

07/29/2025

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.2	0.1	0.4	0.0	0.4	0.1	0.0	0.0	3.5	0.7	3.4
Total Del/Veh (s)	26.1	25.4	6.1	57.4	15.2	10.6	19.2	27.4	7.4	19.9	15.8	4.2

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.6
Total Del/Veh (s)	26.0

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	82.1	11.5	76.8	19.6	19.5	8.2	5.4	19.8

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	7.6	10.8	2.3	4.3	3.7	0.3	0.6	0.0	2.7	0.7	0.0	1.7

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.4	3.6	0.6
Total Del/Veh (s)	5.7	6.0	3.5	2.6	6.3	3.0	4.6

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.9	0.1	2.9	1.7	9.6	2.8	1.7

6: Construction Access & Morris Thomas Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.2	0.1	0.6	0.0	0.1	0.1	0.5
Total Del/Veh (s)	11.2	3.1	39.8	31.8	8.9	2.5	30.8

Total Network Performance

Movement	All
Denied Del/Veh (s)	1.1
Total Del/Veh (s)	50.9

Queuing and Blocking Report
Construction Conditions (2027) - AM Peak Hour

07/29/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	L	T
Maximum Queue (ft)	26	175	50	382	471	334	47	274	196	232
Average Queue (ft)	4	68	11	186	72	36	7	128	63	78
95th Queue (ft)	19	134	33	364	365	201	29	221	135	161
Link Distance (ft)	1622	1622	1622		2530			1423		1155
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)				350		450	200		300	
Storage Blk Time (%)				8	0			1		0
Queuing Penalty (veh)				11	0			1		0

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	352	448	56
Average Queue (ft)	108	124	10
95th Queue (ft)	309	339	38
Link Distance (ft)	985	4896	1423
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	SB
Directions Served	LTR	LTR	LT
Maximum Queue (ft)	62	62	47
Average Queue (ft)	22	36	7
95th Queue (ft)	49	57	29
Link Distance (ft)	1279	6729	289
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report
Construction Conditions (2027) - AM Peak Hour

07/29/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	46	24	74
Average Queue (ft)	9	4	30
95th Queue (ft)	33	19	58
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350		150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	146	52
Average Queue (ft)	39	17
95th Queue (ft)	99	38
Link Distance (ft)	134	811
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Construction Access & Morris Thomas Rd

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	82	651	53
Average Queue (ft)	33	250	23
95th Queue (ft)	67	600	52
Link Distance (ft)	604	985	749
Upstream Blk Time (%)		0	
Queuing Penalty (veh)		0	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 13

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	3.2	0.7	3.3
Total Del/Veh (s)	23.6	20.3	6.2	24.2	15.2	5.8	17.2	19.3	6.1	14.4	13.9	4.8

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	14.2

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	26.7	0.0	17.8	0.0	0.0	0.0	0.0	8.6
Total Del/Veh (s)	191.8	89.5	178.9	6.1	4.3	7.0	4.2	75.1

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	8.1	12.0	1.7	9.8	7.0	2.4	2.2	0.4	0.0	2.3	2.4	0.0

3: Midway Rd & St Louis River Rd Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	2.1

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.0	0.2	3.7	0.4
Total Del/Veh (s)	12.9	10.4	3.6	3.4	9.7	2.8	7.8

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	1.2	0.0	2.3	0.6	8.5	0.7	4.0	1.6

6: Construction Access & Morris Thomas Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	39.4	42.6	32.7
Total Del/Veh (s)	19.7	4.1	7.0	7.0	71.6	81.6	64.3

Total Network Performance

Denied Del/Veh (s)	17.2
Total Del/Veh (s)	88.7

Queuing and Blocking Report
Construction Conditions (2027) - PM Peak Hour

07/29/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T
Maximum Queue (ft)	26	133	45	100	97	65	49	165	42	114	236
Average Queue (ft)	3	54	6	35	33	12	19	96	1	44	97
95th Queue (ft)	16	111	23	75	74	39	41	156	30	85	176
Link Distance (ft)	1622	1622	1622		2530			1424			1155
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)				350		450	200		300	300	
Storage Blk Time (%)								0			0
Queuing Penalty (veh)								0			0

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	998	69	4
Average Queue (ft)	764	10	0
95th Queue (ft)	1227	40	3
Link Distance (ft)	985	4896	1424
Upstream Blk Time (%)	14		
Queuing Penalty (veh)	83		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LT
Maximum Queue (ft)	35	48	21	105
Average Queue (ft)	15	14	1	29
95th Queue (ft)	36	33	8	74
Link Distance (ft)	1279	6727	299	289
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
Construction Conditions (2027) - PM Peak Hour

07/29/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	69	36	65
Average Queue (ft)	25	6	23
95th Queue (ft)	55	25	44
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350		150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	66	70
Average Queue (ft)	14	28
95th Queue (ft)	45	53
Link Distance (ft)	134	811
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Construction Access & Morris Thomas Rd

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	93	77	898
Average Queue (ft)	24	31	389
95th Queue (ft)	65	63	974
Link Distance (ft)	604	985	849
Upstream Blk Time (%)			27
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 83

SimTraffic Performance Report
Construction Conditions (2027) Rerouted - AM Peak Hour

11/04/2025

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.7	0.4	2.6	0.6	0.0	0.5	0.1	0.0	0.1	3.5	0.6	3.3
Total Del/Veh (s)	26.6	22.6	5.0	29.2	19.7	8.1	20.0	23.7	5.9	17.7	14.5	4.2

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	19.1

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	26.1	3.4	12.3	8.0	10.7	7.6	10.7

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.8	12.3	1.9	2.8	6.6	0.6	1.0	0.1	6.2	1.1	0.0	2.9

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.3	3.5	0.6
Total Del/Veh (s)	7.9	6.4	2.3	1.1	6.9	2.8	4.9

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	1.5	0.1	4.7	1.2	11.2	3.7	2.7

6: Morris Thomas Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0	0.1	0.1	0.1
Total Del/Veh (s)	1.8	0.2	5.5	4.0	14.8	3.3	4.6

Total Network Performance

Denied Del/Veh (s)	1.1
Total Del/Veh (s)	29.2

Queuing and Blocking Report
Construction Conditions (2027) Rerouted - AM Peak Hour

11/04/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	L	T
Maximum Queue (ft)	156	166	44	194	129	94	40	234	174	164
Average Queue (ft)	58	60	8	73	33	16	8	116	57	74
95th Queue (ft)	118	119	26	148	92	50	28	195	116	135
Link Distance (ft)		1621			2530			1423		1155
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300		300	350		450	200		300	
Storage Blk Time (%)								1		
Queuing Penalty (veh)								1		

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	122	52	169	94	123	136
Average Queue (ft)	51	15	76	25	39	51
95th Queue (ft)	103	39	135	67	90	103
Link Distance (ft)		969		4884	1423	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	300		300		300	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	LT	TR	LT	TR
Maximum Queue (ft)	56	102	5	6	96	9
Average Queue (ft)	24	49	0	0	5	0
95th Queue (ft)	50	81	4	5	47	6
Link Distance (ft)	1278	6729	299	299	288	288
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Queuing and Blocking Report
Construction Conditions (2027) Rerouted - AM Peak Hour

11/04/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	43	23	78
Average Queue (ft)	7	4	31
95th Queue (ft)	29	18	59
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350		150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	EB	EB	WB	NB
Directions Served	T	R	L	LR
Maximum Queue (ft)	4	15	134	81
Average Queue (ft)	0	1	55	21
95th Queue (ft)	0	8	107	52
Link Distance (ft)	568			806
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		300	300	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Morris Thomas Rd

Movement	EB	WB	NB
Directions Served	TR	L	LR
Maximum Queue (ft)	22	106	82
Average Queue (ft)	1	44	33
95th Queue (ft)	8	88	62
Link Distance (ft)	1188		902
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		150	
Storage Blk Time (%)		0	
Queuing Penalty (veh)		0	

Network Summary

Network wide Queuing Penalty: 1

SimTraffic Performance Report
Construction Conditions (2027) Rerouted - PM Peak Hour

11/04/2025

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.4	0.2	2.8	0.0	0.0	0.0	0.1	0.0	0.1	3.4	0.7	3.4
Total Del/Veh (s)	30.5	20.2	6.2	24.8	15.8	7.3	18.4	19.9	8.1	14.9	13.9	5.0

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	14.7

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Total Del/Veh (s)	13.8	1.2	5.5	14.6	10.9	18.2	7.4	13.2

3: Midway Rd & St Louis River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	9.3	15.1	1.9	9.9	6.7	3.2	2.1	0.4	0.0	2.2	2.0	0.0

3: Midway Rd & St Louis River Rd Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	2.0

4: US Highway 2 & Morris Thomas Rd Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.3	0.0	0.0	0.1	0.4	3.5	0.4
Total Del/Veh (s)	13.6	12.3	3.7	2.4	12.0	2.8	9.0

5: St Louis River Rd & US Highway 2 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	1.3	0.0	2.1	0.3	9.5	0.1	4.0	1.4

6: Morris Thomas Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.6	0.5	0.4
Total Del/Veh (s)	3.1	0.1	1.4	1.6	13.6	10.7	9.0

Total Network Performance

Denied Del/Veh (s)	0.8
Total Del/Veh (s)	34.1

Queuing and Blocking Report
Construction Conditions (2027) Rerouted - PM Peak Hour

11/04/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T
Maximum Queue (ft)	26	128	39	76	120	90	97	204	168	102	243
Average Queue (ft)	3	52	5	29	33	22	20	104	7	43	97
95th Queue (ft)	16	104	20	62	81	61	60	173	68	79	184
Link Distance (ft)	1621			2530			1423			1155	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	300		300	350		450	200		300	300	
Storage Blk Time (%)	0										
Queuing Penalty (veh)	2										

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	214	91	60	150	247	57
Average Queue (ft)	115	35	23	60	103	22
95th Queue (ft)	178	69	52	117	197	47
Link Distance (ft)	980		4884		1423	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	300	300		300		
Storage Blk Time (%)	0					0
Queuing Penalty (veh)	0					0

Intersection: 3: Midway Rd & St Louis River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LT
Maximum Queue (ft)	43	44	20	91
Average Queue (ft)	16	18	1	19
95th Queue (ft)	39	34	10	60
Link Distance (ft)	1278	6727	299	288
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report
Construction Conditions (2027) Rerouted - PM Peak Hour

11/04/2025

Intersection: 4: US Highway 2 & Morris Thomas Rd

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	74	33	60
Average Queue (ft)	24	6	24
95th Queue (ft)	56	24	44
Link Distance (ft)	1667		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	350		150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: St Louis River Rd & US Highway 2

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	38	67
Average Queue (ft)	14	22
95th Queue (ft)	36	47
Link Distance (ft)	805	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Morris Thomas Rd

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	4	40	312
Average Queue (ft)	0	4	112
95th Queue (ft)	3	21	238
Link Distance (ft)	1181	980	693
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 2

Queuing and Blocking Report

10 Minute Crossing - Existing (2025) - AM Peak

11/03/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T
Maximum Queue (ft)	26	162	26	59	66	76	84	975	280	116	164
Average Queue (ft)	4	40	4	11	17	18	5	132	15	48	39
95th Queue (ft)	16	97	14	36	50	53	22	533	132	93	103
Link Distance (ft)	3164			2724			966			2950	
Upstream Blk Time (%)								1			
Queuing Penalty (veh)								3			
Storage Bay Dist (ft)	325	325		700	450		200	300		300	
Storage Blk Time (%)								5			
Queuing Penalty (veh)								3			

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	NB	NB
Directions Served	LR	L	T
Maximum Queue (ft)	298	131	1346
Average Queue (ft)	76	7	239
95th Queue (ft)	228	78	940
Link Distance (ft)	2892		2801
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			19
Queuing Penalty (veh)			1

Intersection: 4: Midway Rd & Railroad Crossing

Movement	NB	SB
Directions Served	T	T
Maximum Queue (ft)	398	941
Average Queue (ft)	160	221
95th Queue (ft)	459	736
Link Distance (ft)	392	966
Upstream Blk Time (%)	25	2
Queuing Penalty (veh)	101	5
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 113

Queuing and Blocking Report

10 Minute Crossing - Existing (2025) - PM Peak

11/03/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	30	138	75	167	142	202	212	892	350	350	1808	140
Average Queue (ft)	3	44	12	41	45	31	13	120	20	87	423	5
95th Queue (ft)	16	105	48	116	103	100	74	485	154	287	1330	74
Link Distance (ft)	3164			2724			966			2950		
Upstream Blk Time (%)								0				
Queuing Penalty (veh)								1				
Storage Bay Dist (ft)	325	325		700	450		200	300		300	300	
Storage Blk Time (%)								5		0	20	
Queuing Penalty (veh)								3		2	28	

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	NB	NB
Directions Served	LR	L	T
Maximum Queue (ft)	277	25	1078
Average Queue (ft)	65	1	199
95th Queue (ft)	202	11	765
Link Distance (ft)	2892	2801	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	250		
Storage Blk Time (%)	17		
Queuing Penalty (veh)	1		

Intersection: 4: Midway Rd & Railroad Crossing

Movement	NB	SB
Directions Served	T	T
Maximum Queue (ft)	398	984
Average Queue (ft)	155	334
95th Queue (ft)	454	1050
Link Distance (ft)	392	966
Upstream Blk Time (%)	24	20
Queuing Penalty (veh)	84	101
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 220

SimTraffic Performance Report
10 Minute Crossing - 2027 Construction AM Peak (Signalized)

10/10/2025

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	1.9	0.3	2.2	2.6	0.7	2.8	0.0	0.0	0.2	2.0	0.5	1.9
Total Del/Veh (s)	38.2	37.8	62.3	148.4	34.4	16.7	49.1	57.7	28.5	85.2	91.8	29.0

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	1.1
Total Del/Veh (s)	74.8

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	2.1	0.2	2.0	0.6	0.0	0.0	0.7
Total Del/Veh (s)	106.5	4.2	115.6	126.7	15.3	13.5	70.4

4: Midway Rd & Railroad Crossing Performance by movement

Movement	NBT	SBT	All
Denied Del/Veh (s)	1.7	0.2	0.9
Total Del/Veh (s)	54.9	96.6	78.1

Total Network Performance

Movement	All
Denied Del/Veh (s)	1.9
Total Del/Veh (s)	158.1

Queuing and Blocking Report

10 Minute Crossing - 2027 Construction AM Peak (Signalized)

10/10/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	34	173	167	720	936	79	209	983	350	350	1286	70
Average Queue (ft)	5	70	33	279	121	13	12	219	26	133	298	5
95th Queue (ft)	22	145	110	686	606	44	82	724	177	339	947	73
Link Distance (ft)	3164			2724			966			2950		
Upstream Blk Time (%)								2				
Queuing Penalty (veh)								8				
Storage Bay Dist (ft)	325	325		700	450		200	300		300	300	
Storage Blk Time (%)				8	0				12	5		16
Queuing Penalty (veh)				13	0				10	13		27

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	292	238	300	2129	404	300
Average Queue (ft)	87	32	102	561	79	70
95th Queue (ft)	230	159	287	1736	281	224
Link Distance (ft)	2892		2789		392	
Upstream Blk Time (%)				0	1	
Queuing Penalty (veh)				0	6	
Storage Bay Dist (ft)	250	250		250		
Storage Blk Time (%)	6	10		22	0	3
Queuing Penalty (veh)	3	31		50	1	6

Intersection: 4: Midway Rd & Railroad Crossing

Movement	NB	SB
Directions Served	T	T
Maximum Queue (ft)	398	988
Average Queue (ft)	172	376
95th Queue (ft)	473	1082
Link Distance (ft)	392	966
Upstream Blk Time (%)	26	20
Queuing Penalty (veh)	114	118
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 400

SimTraffic Performance Report
10 Minute Crossing - 2027 Construction PM Peak (Signalized)

10/10/2025

1: Midway Rd & US Highway 2 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.2	0.2	2.3	2.7	0.6	2.7	0.3	0.0	0.1	1.9	0.6	1.9
Total Del/Veh (s)	51.9	31.6	49.9	81.1	20.3	7.0	31.6	32.1	19.3	88.7	117.8	94.5

1: Midway Rd & US Highway 2 Performance by movement

Movement	All
Denied Del/Veh (s)	0.8
Total Del/Veh (s)	55.4

2: Midway Rd & Morris Thomas Rd Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	4.4	3.2	1.6	0.3	0.0	0.0	1.8
Total Del/Veh (s)	254.3	201.8	136.6	142.2	22.6	7.2	140.4

4: Midway Rd & Railroad Crossing Performance by movement

Movement	NBT	SBT	All
Denied Del/Veh (s)	3.3	1.1	2.4
Total Del/Veh (s)	38.8	107.4	68.7

Total Network Performance

Denied Del/Veh (s)		3.3
Total Del/Veh (s)		187.8

Queuing and Blocking Report

10 Minute Crossing - 2027 Construction PM Peak (Signalized)

10/10/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	31	150	62	227	182	107	233	973	350	349	2175	210
Average Queue (ft)	5	55	11	64	46	28	28	153	48	80	538	5
95th Queue (ft)	20	116	40	170	118	71	109	542	236	256	1652	73
Link Distance (ft)	3164			2724			966			2950		
Upstream Blk Time (%)								0		0		
Queuing Penalty (veh)								3		0		
Storage Bay Dist (ft)	325	325		700	450		200	300		300	300	
Storage Blk Time (%)								5	2	0	24	
Queuing Penalty (veh)								16	7	0	34	

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	300	2684	299	1517	411	300
Average Queue (ft)	219	1027	34	415	126	49
95th Queue (ft)	379	2686	149	1196	370	205
Link Distance (ft)	2892		2789		392	
Upstream Blk Time (%)	3				4	
Queuing Penalty (veh)	0				21	
Storage Bay Dist (ft)	250			250		
Storage Blk Time (%)	44	1			30	7
Queuing Penalty (veh)	97	2			9	6

Intersection: 4: Midway Rd & Railroad Crossing

Movement	NB	SB
Directions Served	T	T
Maximum Queue (ft)	403	991
Average Queue (ft)	177	435
95th Queue (ft)	485	1130
Link Distance (ft)	392	966
Upstream Blk Time (%)	30	20
Queuing Penalty (veh)	206	112
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 512

Queuing and Blocking Report

10 Minute Crossing - 2027 Mitigated Construction AM Peak

11/03/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	26	183	157	420	247	148	130	954	280	350	1180	70
Average Queue (ft)	5	58	28	100	39	17	10	171	25	116	261	2
95th Queue (ft)	20	126	96	277	173	91	63	579	174	311	826	51
Link Distance (ft)	3164			2724			966			2950		
Upstream Blk Time (%)								0				
Queuing Penalty (veh)								2				
Storage Bay Dist (ft)	325	325		700	450		200	300		300	300	
Storage Blk Time (%)					0		9		0	4	14	
Queuing Penalty (veh)					1		8		0	11	24	

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	284	311	300	2627	406	300
Average Queue (ft)	93	38	125	767	61	65
95th Queue (ft)	233	183	315	2358	228	207
Link Distance (ft)	2892		2789		392	
Upstream Blk Time (%)				5	1	
Queuing Penalty (veh)				0	3	
Storage Bay Dist (ft)	250	250		250		
Storage Blk Time (%)	5	11		23	1	1
Queuing Penalty (veh)	2	34		83	2	2

Intersection: 4: Midway Rd & Railroad Crossing

Movement	NB	SB
Directions Served	T	T
Maximum Queue (ft)	401	991
Average Queue (ft)	158	354
95th Queue (ft)	462	1050
Link Distance (ft)	392	966
Upstream Blk Time (%)	26	18
Queuing Penalty (veh)	115	81
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 369

Queuing and Blocking Report

10 Minute Crossing - 2027 Mitigated Construction PM Peak

11/03/2025

Intersection: 1: Midway Rd & US Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R
Maximum Queue (ft)	32	163	57	209	187	126	213	964	350	350	2169	70
Average Queue (ft)	4	55	9	55	47	28	31	165	42	85	517	2
95th Queue (ft)	18	121	35	149	126	78	126	587	223	267	1623	51
Link Distance (ft)	3164			2724			966			2950		
Upstream Blk Time (%)								0				
Queuing Penalty (veh)								3				
Storage Bay Dist (ft)	325	325		700	450		200	300		300	300	
Storage Blk Time (%)							0	5	1	0	22	
Queuing Penalty (veh)							0	17	4	0	32	

Intersection: 2: Midway Rd & Morris Thomas Rd

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	300	2684	299	1477	412	300
Average Queue (ft)	224	1100	46	412	128	47
95th Queue (ft)	378	2828	174	1200	367	194
Link Distance (ft)	2892		2789		392	
Upstream Blk Time (%)	4				5	
Queuing Penalty (veh)	0				27	
Storage Bay Dist (ft)	250			250	250	
Storage Blk Time (%)	45	1	0	28	8	
Queuing Penalty (veh)	98	3	0	13	6	

Intersection: 4: Midway Rd & Railroad Crossing

Movement	NB	SB
Directions Served	T	T
Maximum Queue (ft)	397	992
Average Queue (ft)	178	437
95th Queue (ft)	487	1127
Link Distance (ft)	392	966
Upstream Blk Time (%)	30	19
Queuing Penalty (veh)	207	106
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 514