Hope Community Development Project

Environmental Assessment Worksheet Notice of Decision

Contents

Record of Decision

Based on the EAW, the Response to Comments and the Findings of Fact, the City of Corcoran City Council concludes the following:

1. All requirements for environmental review of the proposed project have been met.
2. The EAW and the development processes related to the Project have generated information which is adequate to determine whether the Project has the potential for significant environmental effects.
3. Areas where potential environmental effects have been identified have included proper mitigative responses to be included within the final design of the Project. Mitigation will be required to be provided where impacts are expected to result from Project construction, operation or maintenance. Mitigative measures will be required to be incorporated into project design, and have been or will be coordinated with state and federal agencies during the applicable permit process.
4. Based on the criteria in Minnesota Rules part 4410.4300, Subpart 14, the Project does not have the potential for significant environmental effects.
5. An Environmental Impact Statement is not required for the proposed Hope Community Development Project.

Response to Comments

The Hope Community Development Project mandatory Environmental Assessment Worksheet (EAW) was approved for distribution to the Environmental Quality Board (EQB) and persons and agencies on the official EQB distribution list in accordance with EQB rules on May 23, 2023. The EQB published notice of availability in the *EQB Monitor* on June 6, 2023. The 30-day comment period ended on July 6, 2023. The City of Corcoran received five EAW comment letters or emails. The letters and emails are on file at the City of Corcoran.

The following comment letters were sent to the City of Corcoran:

Letter 1: Hennepin County Public Works – Letter dated July 5, 2023 from Ashley Morello, Transportation Planner to Natalie Davis McKeown, City Planner

Letter 2: Minnesota Department of Natural Resources - Letter dated May 5, 2023 from Melissa Collins, Regional Environmental Assessment Ecologist, Ecological and Water Resources to Kendra Lindahl, City Planner

Letter 3: Metropolitan Council - Letter dated July 6, 2023 from Angela Torres, AICP, Senior Manager, Local Planning Assistance to Natalie Davis McKeown, City Planner

Letter 4: Minnesota Department of Agriculture – Email dated June 1, 2023 from Stephan Roos, Environmental Planner, Energy and Environment Section, Agricultural Marketing and Development Division to Natalie Davis McKeown, City Planner

Letter 5: US Army Corps of Engineers – Letter dated June 2, 2023 to Natalie Davis McKeown, City Planner

Letter 6: Minnesota State Historic Preservation Office – Letter dated July 7, 2023 (*received after the close of the 30-day comment period*) from Sarah J. Beimers, Environmental Review Program Manager to Natalie Davis McKeown, City Planner

Letter 7: Three Rivers Park District – Email dated July 14, 2023 (*received after the close of the 30-day comment period*) from Stephan Shurson, Landscape Architect to Natalie David McKeown, City Planner.

The following information and clarifications are provided in response to all EAW comments received during the 30-day comment period. Comments are provided in italicized text.

Letter 1: Hennepin County Public Works

Comment 1: *General/Site Plan:*

- *The site plan should be updated to depict proposed turn lanes as part of this development and programmed turn lanes in the area.*
- *The county requests 130' right-of-way (ROW) for CSAH 30 and 120' ROW for CR 116 to accommodate future trail, drainage and utility needs on these roadways. The final 10' will be accepted in easement to mitigate any setback concerns.*
- *The county requests 25-by-25-foot triangles at the NW quadrant of the CSAH 30/CR 116 intersection, the NW and SW quadrants of the County Road 116/Hunters Ridge/Oswald Farm Rd intersection, and at the NE and NW quadrants of the CSAH 30/new access intersection to accommodate space for utilities and preserve sight distance.*

- *Development should consider including trail on both CSAH 30 and CR 116.*
- *The proposed regional trail should connect to county roadways intersections and be ADA compliant.*
- *Please note that the turn lane design will need to be reviewed and approved by county staff.*
- *Storm water and drainage discharge rates are to be less than existing flow rates. The county storm water system will not take water from new drainage areas. Documentation will need to be submitted demonstrating that peak stormwater discharge rates remain less than the existing condition. Additional treatments may be necessary if flow rates cannot match existing.*
- *Please inform the developer that all construction within county ROW will require an approved Hennepin County permit prior to beginning construction. This includes, but is not limited to, driveway and street access, drainage and utility construction, trail development, and landscaping.*

Response: Thank you for your comment. Site plans will reflect applicable turn lanes and provide for necessary ROW, including trails. It is noted that Hennepin County will need to review and approve plans for construction within Hennepin County ROW; review and approve turn lane designs; and, review documentation demonstrating that peak stormwater discharge rates remain less than the existing condition.

Comment 2: *Section 8, Cover Types:*

- *On page 10, Table 3 identifies 1.2 acres of wetlands and shallow lakes (<2 meters deep) for before conditions; MPCA will need to review and approve this during the wetland delineation process.*
- *On page 10, Tables 3 and 4, please review and confirm that there is enough storage for the added impervious surface. NPDES permit requires 1 inch of the runoff from new impervious surface waters to be retained on site using volume and rate reduction. The infiltration sizing calculations and an existing drainage map should be included in the appendix.*
- *On page 10, Table 4, consider other types of green infrastructure to add to the project.*
- *On page 11, Table 5, add the approximate number of trees that will be removed.*
- *On page 11, Table 5, assess whether any mature trees can be retained.*

Response: Wetland impacts and water storage will be reviewed during the applicable permitting processes. Preliminary infiltration sizing calculations and an existing drainage map, provided by the project proposer, have been provided in Appendix B. This should be considered preliminary information and subject to change as additional geotechnical data is available and coordination occurs with the watershed. Green infrastructure opportunities have and will continue to be encouraged by the City of Corcoran. The project proposer has considered mature tree preservation in planning the proposed project; however, the number of trees to be removed is unknown at this stage. It is anticipated tree removal will occur near the existing home site and as needed to install water infrastructure (i.e., trunk sewer and trunk water main).

Comment 3: *Section 11, Geology, Soils, and Topography/Land Forms:*

- *On page 15, provide estimated volume and acreage of soil excavation and/or grading.*
- *On page 15, provide erosion/sedimentation control information related to stormwater runoff.*

- *On page 16, Table 7, the hydrologic soil groups are rated as either C/D. Will the poor soils be amenable to the proposed infiltration ponds?*

  Response: As denoted on page 16 of the EAW, the volumes and acreages of soil excavation and grading are unknown at this time. The developer would consider soil suitability for the infiltration ponds. If required, soils would be excavated and replaced or amended. As denoted on page 22 of the EAW, A Stormwater Pollution Prevention Plan (SWPPP) would be prepared as part of the National Pollutant Discharge Elimination System (NPDES) Construction Permit required for the project. The SWPPP would conform to permit requirements and address sediment and erosion control Best Management Practices (BMPs) during construction. Sediment and erosion control BMPs may include bio-rolls, silt fence, rock construction entrances, inlet protection devices, erosion control blankets, erosion stabilization mats, and/or other similar devices to prevent soil erosion and sediment transport. Disturbed areas specified to be revegetated would be restored with final stabilization per permit requirements.

Comment 4: *Section 13, Contamination/Hazardous Materials/Wastes*

- On page 26, consider adding compost disposal.

  Response: Comment noted.

Comment 5: *Section 14, Fish, Wildlife, Plant Communities, and Sensitive Ecological Resources (Rare Features)*

- *On page 28, review the proposed site plan to consider opportunities to add native plants communities, habitat opportunities for the identified species and promote migratory paths.*
- *On page 32, identify timeline for when the potential effects to the monarch butterfly will be revisited.*

  Response: Regarding opportunities to add native plants, this comment has been noted. Potential effects for monarch butterfly will be revisited when construction plans/timeframes are further refined.

Comment 6: *Section 18, Greenhouse gas (GHG) Emissions/ Carbon Footprint:*

- *On page 36, it was assumed that motor vehicles trips are five miles per day, this is too low as average per capita VMT in this area of the county is over 30 miles per day.*

  Response: The five miles per day was an assumed value considering many of the residents will be seniors. If Hennepin County has DOT data to support the 30 miles per day/ per person, the calculation could be rerun.

Comment 7: *Infrastructure Feasibility Study*
Section 2.4, Traffic Forecasts

- *Traffic forecasts need to anticipate traffic twenty years out from the build, should include values for 2048 No-Build and 2048 Build, not 2040.*

Section 2.5, Traffic Analysis

- *Provide Synchro reports to better review traffic impacts. County staff may have additional comments after review.*
- *Table 4 and 5, Weekday A.M. Peak hour level of service and weekday P.M. Peak hour level of service results need to provide mitigation measures to address any LOS E or F*

in the Build scenarios. This includes the eastbound left turn lane, eastbound thru lane, and eastbound right turn lane at County Road 116 and Hunters Ridge/Oswald for the 2040 Build for both A.M. and P.M. peak travel times and the southbound left turn lane at the new access at CSAH 30 for the 2028 and 2040 Build scenarios

- *Provide tables depicting 95 percent queue for each movement and scenario, similar to the LOS tables 4 and 5. Table should include storage lengths and confirmation that 95 percent queue does not exceed storage*

Response: In response to the comment regarding Section 2.4: Traffic forecasts were developed using information from the City of Corcoran's Comprehensive Plan, which includes year 2040 traffic forecasts. Therefore, year 2040 forecasts were deemed most appropriate for this study. In response to bullet 1 of the comment regarding Section 2.5, Synchro reports are attached in Appendix B. In response to bullet 2 of the comment regarding Section 2.5, the operational conditions for the minor street movements are due to the amount of volume on the major street, which results in fewer acceptable gaps in traffic. Review of the 95th percentile vehicle queues for these movements indicates the queues are manageable. These movements will be monitored as the area develops to determine if any modifications are needed in the future. In response to bullet 3 of the comment regarding Section 2.5, the 95th percentile queues are shown in Attachment B, Synchro reports. The 95th percentile maximum queues for all movements are contained within the existing turn lanes.

Letter 2: Minnesota Department of Natural Resources

Comment 1: *Page 11, Permits and Approvals. Please include a DNR Water Appropriation Permit in the list of required permits and approvals. Given the depth to the surficial water table throughout the project area, it is possible that construction dewatering will be needed during development construction and installation of utilities.*

Response: Comment noted.

Comment 2: *Page 19, Groundwater. This section identifies the depth to groundwater as 40 to 85 feet below the surface. The hydrologic soil groups and documented wetlands within the project area indicate there is likely a perched surficial water table present at the site due to the presence of glacial till.*

Response: Comment noted.

Comment 3: *Page 20, Wastewater. The proposed plan to add 738 residential units would presumably add a significant number of residential water softeners due to the water hardness levels of the City of Corcoran municipal water supply. Chloride is one of the components of salt, which is used in forms such as sodium chloride (table salt), calcium chloride and magnesium chloride (road salts). Sodium chloride is commonly used in home water softeners and by water treatment plants to treat "hard water". Minnesota generally has groundwater with high levels of calcium and magnesium that must be removed through softening in order to improve taste and prevent lime scale buildup in appliances, pipes and water fixtures. The majority of home water softeners use sodium chloride (NaCl) in a softening process that replaces calcium and magnesium ions with sodium, while the chloride ions are discharged in the wastewater and eventually end up in the environment.*

Each community needs to determine which tool is appropriate for their situation. This the Minnesota Pollution Control's website provides many great resources for cities to use in addressing their high chloride levels. We suggest that as this development moves forward, the City of Corcoran consider what strategies can be used to minimize chloride use.

Response: Comment noted.

Comment 4: *Page 22, Stormwater. We recommend that BWSR-approved, weed-free, native seed mixes be used to the greatest degree possible in project landscaping and stormwater features in order to provide pollinator habitat.*

Response: Comment noted.

Comment 5: *Page 22, Stormwater. The planned increase in impervious surfaces will also increase the amount of road salt used in the project area. Chloride released into local lakes and streams does not break down, and instead accumulates in the environment, potentially reaching levels that are toxic to aquatic wildlife and plants. Consider promoting local business and city participation in the Smart Salting Training offered through the Minnesota Pollution Control Agency. There are a variety of classes available for road applicators, sidewalk applicators, and property managers. More information and resources can be found at this website. Many winter maintenance staff who have attended the Smart Salting training - both from cities and counties and from private companies - have used their knowledge to reduce salt use and save money for their organizations. We also encourage cities and counties to consider how they may participate in the Statewide Chloride Management Plan and provide public outreach to reduce the overuse of chloride. Here are some educational resources for residents as well as a sample ordinance regarding chloride use.*

Response: Comment noted.

Comment 6: *Page 22, Water Appropriation. This section does not address potential dewatering. Please note that any construction dewatering that is anticipated to exceed 10,000 gallons of water per day or one million gallons per year requires a water use (appropriation) permit from the DNR.*

Response: Comment noted.

Comment 7: *Page 27, Rare Features. The loggerhead shrike (Lanius ludovicianus), a state-listed endangered bird, has been documented in the vicinity of the project site. Loggerhead shrikes use grasslands that contain short grass and scattered perching sites such as hedgerows, shrubs, or small trees. They can be found in native prairie, pastures, shelterbelts, old fields or orchards, cemeteries, grassy roadsides, and farmyards. Minnesota's Endangered Species Statute (Minnesota Statutes, section 84.0895) and associated Rules (Minnesota Rules, part 6212.1800 to 6212.2300 and 6134) prohibit the take of endangered or threatened plants or animals, including their parts or seeds, without a permit. Given the potential for this species to be found in the vicinity of the project, tree and shrub removal is required to be avoided during the breeding season, April through July. If you cannot avoid tree removal during loggerhead shrike breeding period, a qualified surveyor needs to conduct a survey for active nests before any trees or shrubs will be removed. Surveys must follow the standards contained in the Rare Species Survey Process. Survey results should be sent to the NH Review Team at Reports.NHIS@state.mn.us. The list of approved DNR Animal Surveyors is included with this*

comment letter. Project planning should take into account that the survey needs to be conducted during the appropriate time of the year, which may be limited.

Response: Comment noted.

Comment 8: *Page 34, Dust and Odors. If water for dust control is taken from a for dust control is taken from a lake, river, or stream in volumes that exceed 10,000 gallons per day, or one million gallons per year, then a DNR Water Appropriations Permit will be required. Please do not use products containing chloride for dust suppression in areas that drain to public waters.*

Response: Comment noted.

Letter 3: Metropolitan Council

Comment 1: *Item 6. Project Description (Todd Graham, 651-602-1322)*
The development proposal includes 738 housing units (mainly in multifamily buildings) and up to 110,300 square feet of commercial, retail, and medical office space. Council staff advise that a communitywide forecast adjustment may be needed. Council and City staff can discuss this at the time of the next comprehensive plan amendment. Corcoran is forecasted to gain +1,400 households in the current decade. Considering recent project completions and projects underway, half of this expected growth is previously accounted for. The Hope Community Development is likely to advance Corcoran beyond 3,600 households (the 2030 forecast) in advance of 2030.

Also, Traffic Analysis Zone (TAZ) allocations will need to be updated. TAZ allocations have been prepared by City of Corcoran. The Hope Community site is a small part of TAZ #786. Minimal growth was anticipated in this area. The City's 2040 Comprehensive Plan expects TAZ #786 to gain +15 jobs, +12 households and no population during 2020-40. These expectations will need revision to account for the Hope Community Development proposal.

Response: Comment noted.

Comment 2: *Item 10. Land Use (Freya Thamman 651-602-1750, Colin Kelly 651-602-1361)*
The EAW indicates that the project area is guided Public/Institutional and Mixed Use in the City's 2040 Comprehensive Plan. It indicates that the Public/Institutional guiding includes the existing church and cemetery, and the remaining project area is guided Mixed Use. Some of the planned residential areas are located within the areas guided Public/Institution, which would require a comprehensive plan amendment.

The mixed-use neighborhood includes a variety of housing options, including age-restricted housing and two senior apartment buildings providing a continuum of care. When considering units per acre and allowed residential density ranges shown in the comprehensive plan, please refer to the most recent guidelines on senior housing for housing units and group quarters, which reflect the current Census Bureau definitions: https://metrocouncil.org/Handbook/Files/Resources/Fact-Sheet/LAND-USE/Housing-Unit-vs-Group-Quarter.aspx.

Regional Trails
Diamond Lake Regional Trail is planned to traverse the site east to west. The EAW acknowledges the regional trail in the Land Use section, indicating that: "Three Rivers Park District plans show a portion of the proposed Diamond Lake Regional Trail may be located

through the center of the site." In discussing the project's compatibility with nearby land uses, zoning, and plans, the EAW states "the plans may need to be revised to accommodate Three Rivers Park District's adopted plan for the Diamond Lake Regional Trail." Prior to any construction activities, the developer should coordinate with Three Rivers Park District, the Regional Park Implementing Agency that will own and operate the future Diamond Lake Regional Trail. The final design for the mixed-use neighborhood must accommodate the planned regional trail.

Response: Comment noted.

Comment 3: *Item 12. Water Resources – Wastewater (Roger Janzig, 651-602-1119)*
The Metropolitan Disposal System has adequate capacity for this project location.

Response: Comment noted.

Comment 4: *Item 12. Water Resources – Water Supply (John Clark, 651-602-1452)*
The following comments are offered for water supply:

- *At present, the water that will be used to supply this development has not been appropriated by the Minnesota Department of Natural Resources (MN DNR). Water supply treatment and well infrastructure are being developed by the community. Water availability and potential impacts to aquifers, nearby infrastructure, and ecosystems will need to be assessed by the regulating agency to understand if local aquifers will be able to meet the community's water demands.*
- *Specific water demand estimates for the residential and non-residential portions of the development would benefit the project planning, inform the community's local water supply planning, and help to determine potential resource needs and environmental impacts.*
- *Local water supply plans are an essential part of the community's comprehensive plan. If the community's local water supply plan has been updated and approved by the MN DNR as a part of the request for water supply wells and water appropriation permits, please provide that updated plan to the Metropolitan Council as supplemental information or as part of a comprehensive plan amendment.*
- *Wells that have been identified on site, that will no longer be used, should be sealed according to Minnesota Department of Health (MDH) standards and guidance, with appropriate updates to the Minnesota Well Index.*
- *Lawn and landscaping will comprise approximately 20 acres of the new development as proposed. It is likely that much of these 20 acres will be irrigated. Inefficient irrigation of lawns and landscaping using treated municipal water is one of the major drivers of infrastructure expansions for public water supplies, and can unnecessarily stress water resources, particularly during periods of drought. Captured stormwater on site could be used for landscape irrigation as an alternative to treated municipal sources. Additionally, ensuring that installed irrigation systems are using real-time weather data, via "smart" irrigation controllers, include soil moisture sensors, and are regularly audited for leaks and other equipment malfunctions, can help the systems to use only the water necessary for maintaining lawn and landscaped areas. Water efficient turfgrass and landscaping species can also help to lessen water needs on site. The University of Minnesota extension has excellent information that can help developers to choose and install species that require less nutrient and water inputs, lowering maintenance costs, and recover well from drought-stress.*

Response: Comment noted.

Comment 5: *Item 20. Transportation – Transit (Victoria Dan, 651-349-7648)*
The EAW correctly states that there are no transit routes in the project area (Corcoran is outside the Transit Capital Levy District and therefore does not receive fixed route service). However, alternative transportation is available on Transit Link, a general public dial-a-ride service provided by the Metropolitan Council.

Response: Comments noted.

Letter 4: Minnesota Department of Agriculture

Comment 1: *After reviewing the document I have determined that, although there is permanent conversion of agricultural lands, this project converts land that is within the MUSA line and is in keeping with your current comprehensive plan and zoning ordinance. We have no further comments.*

Response: Comment noted.

Letter 5: Department of the Army, US Army Corps of Engineers, St. Paul District

Comment 1: *We have received your submittal described below. You may contact the Project Manager with questions regarding the evaluation process. The Project Manager may request additional information necessary to evaluate your submittal.*

Response: Comment noted.

Letter 6: Minnesota State Historic Preservation Office (SHPO)

Comment 1: *Due to the nature and location of the proposed project, we recommend that a Phase IA literature search and archaeological assessment be completed by a qualified archaeologist to assess the potential for intact archaeological sites in the project area. If, as a result of this assessment, a Phase I archaeological survey is recommended, this survey should be completed. The survey must meet the requirements of the Secretary of the Interior's Standards for Identification and Evaluation and should include an evaluation of National Register eligibility for any properties that are identified.*

Response: Comment noted. The majority of the site has been actively farmed, and portions of the site have been disturbed for the construction of Hope Community Church and the City's first water tower. The City is unaware of any historical information or records at the City that would suggest a Phase I survey is warranted on the Project site. If SHPO has information to suggest the location of the proposed project warrants an investigation, the City would request that information be provided.

Comment 2: *We will reconsider the need for survey if the project area can be documented as previously surveyed or disturbed. Any previous survey work must meet contemporary standards.* ***Note:*** *plowed areas and right-of-way are not automatically considered disturbed. Archaeological sites can remain intact beneath deposited fill, plow zones, and other recent disturbances.*

Response: Comment noted. Based on the available data, the City and Project Proposer do not believe an archaeological survey is necessary. If SHPO has any information that would suggest investigation of the site is warranted, the City would request that the information be provided.

Letter 7: Three Rivers Park District

Comment 1: *As mentioned in the Land Use chapter, (Section 10. a. ii.), a portion of the Three Rivers Park District's Diamond Lake Regional Trail (DLRT) is planned through the site, crossing CSAH 116 at Hunters Ridge and extending west and eventually south, crossing CSAH 30 at a location yet to be determined.*

Response: Comment noted. A proposed trail alignment is shown on the concept plan.

Comment 2: *Development plans should dedicate sufficient right-of-way to accommodate the future trail in accordance with Three Rivers Regional Trail Design Standards. Generally speaking, a minimum 16' to 20' wide corridor is required to accommodate a 10' wide paved bituminous trail, two 3' wide clearzones on either side of the trail and room for trail/road signage. If possible, a wider corridor than this is preferred in order to be able to provide a vegetative buffer between the trail and the surrounding development which will contribute to a more attractive and higher quality user experience.*

Response: Comment noted. The City requires a 20-foot easement for trails and will be required as the project moves forward.

Comment 3: *Though an exact alignment for the DLRT to east of the site is not yet determined, it seems more likely that it will be on the north side of Hunters Ridge. Therefore, locating the trail on the north side of Hope Way is preferred. Consideration should be given to the location of any entrance sign for the development along the north side of Hope Way so it does not interfere with the trail right-of-way area.*

Response: Comment noted. City staff believe the trail is better suited for the south side of Hope Way as shown on the concept plan to minimize the crossing of driveways as well as avoiding an additional road crossing at Hope Way when this road is eventually extended to the west. The project proposer will work with the City and Three Rivers Park District to finalize the trail location.

Comment 4: *Providing a safe crossing of CSAH 116 at Hunters Ridge was identified in the adopted DLRT Master Plan. Given the expected increase of traffic along CSAH 116 in the future, a grade-separated crossing for the trail at this intersection is proposed in the master plan. A trail underpass under CSAH 116 seems more feasible than a trail bridge. Trail development for the DLRT is many years out in the future, but consideration should be made to provide significant right-of-way for a future grade-separated crossing and an accessible approach to an underpass.*

Response: Comment noted. The City looks forward to working with Three Rivers Park District to understand the District's land needs for the grade-separated crossing and to determine the appropriate means to acquire this land.

Appendix A: Comments and Letters

HENNEPIN COUNTY
MINNESOTA

July 5, 2023

Natalie Davis McKeown
City of Corcoran
8200 County Road 116
Corcoran, MN 55340

Re: Hope Community Mixed-Use Development EAW

Ms. Davis McKeown:

Please consider the following county staff comments regarding the EAW for the Hope Community mixed-use development at County State Aid Highway (CSAH) 30 and County Road (CR) 116.

General/Site Plan

- The site plan should be updated to depict proposed turn lanes as part of this development and programmed turn lanes in the area.
- The county requests 130' right-of-way (ROW) for CSAH 30 and 120' ROW for CR 116 to accommodate future trail, drainage and utility needs on these roadways. The final 10' will be accepted in easement to mitigate any setback concerns.
- The county requests 25-by-25-foot triangles at the NW quadrant of the CSAH 30/CR 116 intersection, the NW and SW quadrants of the County Road 116/Hunters Ridge/Oswald Farm Rd intersection, and at the NE and NW quadrants of the CSAH 30/new access intersection to accommodate space for utilities and preserve sight distance.
- Development should consider including trail on both CSAH 30 and CR 116.
- The proposed regional trail should connect to county roadways intersections and be ADA compliant.
- Please note that the turn lane design will need to be reviewed and approved by county staff.
- Storm water and drainage discharge rates are to be less than existing flow rates. The county storm water system will not take water from new drainage areas. Documentation will need to be submitted demonstrating that peak stormwater discharge rates remain less than the existing condition. Additional treatments may be necessary if flow rates cannot match existing.
- Please inform the developer that all construction within county ROW will require an approved Hennepin County permit prior to beginning construction. This includes, but is not limited to, driveway and street access, drainage and utility construction, trail development, and landscaping.

Hennepin County Transportation Project Delivery
Public Works Facility, 1600 Prairie Drive, Medina, MN 55340
612-596-0300 | hennepin.us

Section 8, Cover Types

- On page 10, Table 3 identifies 1.2 acres of wetlands and shallow lakes (<2 meters deep) for before conditions; MPCA will need to review and approve this during the wetland delineation process.
- On page 10, Tables 3 and 4, please review and confirm that there is enough storage for the added impervious surface. NPDES permit requires 1 inch of the runoff from new impervious surface waters to be retained on site using volume and rate reduction. The infiltration sizing calculations and an existing drainage map should be included in the appendix.
- On page 10, Table 4, consider other types of green infrastructure to add to the project.
- On page 11, Table 5, add the approximate number of trees that will be removed.
- On page 11, Table 5, assess whether any mature trees can be retained.

Section 11, Geology, Soils, and Topography/Land Forms

- On page 15, provide estimated volume and acreage of soil excavation and/or grading.
- On page 15, provide erosion/sedimentation control information related to stormwater runoff.
- On page 16, Table 7, the hydrologic soil groups are rated as either C/D. Will the poor soils be amenable to the proposed infiltration ponds?

Section 12, Water Resources

- On page 17, the surface waters section indicates that no county ditches are within the project area. County staff determines that county ditches and pertinent ROW will be impacted.
- On page 18, Table 10, the project will be required to adhere to specific regulations, including limits on TMDL, TSS and TP. A mitigation plan will need to be drafted, which should include a map depicting existing and proposed drainage.
- On page 21, provide additional requirements for special/impaired waters.
- On page 22, review MPCA regulations for discharge into Wetlands 2 and 3.
- On page 22, confirm whether there are any temporary infiltration basins during construction. This may trigger additional MPCA regulations.
- On page 22, review and confirm that 17.3 acres of impervious surface will be added to the project area. After reviewing the site plan (Figure 3, Appendix A), this estimate seems low.

Section 13, Contamination/Hazardous Materials/Wastes

- On page 26, consider adding compost disposal.

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

- On page 28, review the proposed site plan to consider opportunities to add native plants communities, habitat opportunities for the identified species and promote migratory paths.
- On page 32, identify timeline for when the potential effects to the monarch butterfly will be revisited.

Section 18, Greenhouse gas (GHG) Emissions/ Carbon Footprint

- On page 36, it was assumed that motor vehicles trips are five miles per day, this is too low as average per capita VMT in this area of the county is over 30 miles per day.

Infrastructure Feasibility Study

Section 2.4, Traffic Forecasts

- Traffic forecasts need to anticipate traffic twenty years out from the build, should include values for 2048 No-Build and 2048 Build, not 2040.

Section 2.5, Traffic Analysis

- Provide Synchro reports to better review traffic impacts. County staff may have additional comments after review.
- Table 4 and 5, Weekday A.M. Peak hour level of service and weekday P.M. Peak hour level of service results need to provide mitigation measures to address any LOS E or F in the Build scenarios. This includes the eastbound left turn lane, eastbound thru lane, and eastbound right turn lane at County Road 116 and Hunters Ridge/Oswald for the 2040 Build for both A.M. and P.M. peak travel times and the southbound left turn lane at the new access at CSAH 30 for the 2028 and 2040 Build scenarios
- Provide tables depicting 95 percent queue for each movement and scenario, similar to the LOS tables 4 and 5. Table should include storage lengths and confirmation that 95 percent queue does not exceed storage

Please contact me at 612-596-0359, ashley.morello@hennepin.us for any further discussion of these items.

Sincerely,

Ashley Morello
Transportation Planner
Hennepin County Public Works

DEPARTMENT OF NATURAL RESOURCES

Division of Ecological and Water Resources
Region 3 Headquarters
1200 Warner Road
Saint Paul, MN 55106

Transmitted by Email

July 3, 2023

Natalie Davis McKeown, Planner
City of Corcoran
8200 County Road 116
Corcoran, MN 55340

Dear Natalie Davis McKeown,

Thank you for the opportunity to review the Hope Community Development Environmental Assessment Worksheet (EAW) in Hennepin County. The DNR respectfully submits the following comments for your consideration:

1. Page 11, Permits and Approvals. Please include a DNR Water Appropriation Permit in the list of required permits and approvals. Given the depth to the surficial water table throughout the project area, it is possible that construction dewatering will be needed during development construction and installation of utilities.
2. Page 19, Groundwater. This section identifies the depth to groundwater as 40 to 85 feet below the surface. The hydrologic soil groups and documented wetlands within the project area indicate there is likely a perched surficial water table present at the site due to the presence of glacial till.
3. Page 20, Wastewater. The proposed plan to add 738 residential units would presumably add a significant number of residential water softeners due to the water hardness levels of the City of Corcoran municipal water supply. Chloride is one of the components of salt, which is used in forms such as sodium chloride (table salt), calcium chloride and magnesium chloride (road salts). Sodium chloride is commonly used in home water softeners and by water treatment plants to treat “hard” water. Minnesota generally has groundwater with high levels of calcium and magnesium that must be removed through softening in order to improve taste and prevent lime scale buildup in appliances, pipes and water fixtures. The majority of home water softeners use sodium chloride (NaCl) in a softening process that replaces calcium and magnesium ions with sodium, while the chloride ions are discharged in the wastewater and eventually end up in the environment.

   Each community needs to determine which tool is appropriate for their situation. This website suggests ways for homeowners to optimize their water softener salt use, while the Minnesota Pollution Control’s website provides many great resources for cities to use in addressing their

high chloride levels. We suggest that as this development moves forward, the City of Corcoran consider what strategies can be used to minimize chloride use.

4. Page 22, Stormwater. We recommend that BWSR-approved, weed-free, native seed mixes be used to the greatest degree possible in project landscaping and stormwater features in order to provide pollinator habitat.

5. Page 22, Stormwater. The planned increase in impervious surfaces will also increase the amount of road salt used in the project area. Chloride released into local lakes and streams does not break down, and instead accumulates in the environment, potentially reaching levels that are toxic to aquatic wildlife and plants. Consider promoting local business and city participation in the Smart Salting Training offered through the Minnesota Pollution Control Agency. There are a variety of classes available for road applicators, sidewalk applicators, and property managers. More information and resources can be found at this website. Many winter maintenance staff who have attended the Smart Salting training — both from cities and counties and from private companies — have used their knowledge to reduce salt use and save money for their organizations.

   We also encourage cities and counties to consider how they may participate in the Statewide Chloride Management Plan and provide public outreach to reduce the overuse of chloride. Here are some educational resources for residents as well as a sample ordinance regarding chloride use.

6. Page 22, Water Appropriation. This section does not address potential dewatering. Please note that any construction dewatering that is anticipated to exceed 10,000 gallons of water per day or one million gallons per year requires a water use (appropriation) permit from the DNR.

7. Page 27, Rare Features. The loggerhead shrike (*Lanius ludovicianus*), a state-listed endangered bird, has been documented in the vicinity of the project site. Loggerhead shrikes use grasslands that contain short grass and scattered perching sites such as hedgerows, shrubs, or small trees. They can be found in native prairie, pastures, shelterbelts, old fields or orchards, cemeteries, grassy roadsides, and farmyards. Minnesota's Endangered Species Statute (*Minnesota Statutes*, section 84.0895) and associated Rules (*Minnesota Rules*, part 6212.1800 to 6212.2300 and 6134) prohibit the take of endangered or threatened plants or animals, including their parts or seeds, without a permit. **Given the potential for this species to be found in the vicinity of the project, tree and shrub removal is required to be avoided during the breeding season, April through July.** If you cannot avoid tree removal during loggerhead shrike breeding period, a qualified surveyor needs to conduct a survey for active nests before any trees or shrubs will be removed. Surveys must follow the standards contained in the Rare Species Survey Process. Survey results should be sent to the NH Review Team at Reports.NHIS@state.mn.us. The list of approved DNR Animal Surveyors is included with this comment letter. Project planning should take into account that the survey needs to be conducted during the appropriate time of the year, which may be limited.

8. Page 34, Dust and Odors. If water for dust control is taken from a lake, river, or stream in volumes that exceed 10,000 gallons per day, or one million gallons per year, then a DNR Water Appropriations Permit will be required. Please do not use products containing chloride for dust suppression in areas that drain to public waters.

Thank you again for the opportunity to review this document. Please let me know if you have any questions.

Sincerely,

Melissa Collins
Regional Environmental Assessment Ecologist | Ecological and Water Resources
Minnesota Department of Natural Resources
Phone: 651-259-5755
Email: melissa.collins@state.mn.us

CC: Josh McKinney, Project Manager

Equal Opportunity Employer

July 6, 2023

Natalie Davis McKeown, City Planner
City of Corcoran
19951 Oswald Farm Road
Corcoran, MN 55374

RE: City of Corcoran - Environmental Assessment Worksheet (EAW) – Hope Community Mixed Use Development
Metropolitan Council Review 22873-1
Metropolitan Council District 1

Dear Natalie Davis:

The Metropolitan Council received the EAW for the Hope Community Mixed Use Development in Corcoran on May 30, 2023. The proposed development consists of 44.5 acres centering around 12 acres of existing development located on the northwest corner of County Road (CR) 116 and CR 30. The existing development includes Hope Community Church, daycare within the church, cemetery, and the City's first water tower (under development). Hope Community Church proposes a mixed-use neighborhood with housing options, including age-restricted and market rate housing, as well as medical office and retail/commercial uses. The proposed development would create a campus that provides housing, particularly for seniors, and a community center with commercial and medical uses.

The staff review finds that the EAW is complete and accurate with respect to regional concerns and does not raise major issues of consistency with Council policies. An Environmental Impact Statement is not necessary for regional purposes. We offer the following comments for your consideration.

Item 6. Project Description (Todd Graham, 651-602-1322)
The development proposal includes 738 housing units (mainly in multifamily buildings) and up to 110,300 square feet of commercial, retail, and medical office space. Council staff advise that a *communitywide* forecast adjustment may be needed. Council and City staff can discuss this at the time of the next comprehensive plan amendment. Corcoran is forecasted to gain +1,400 households in the current decade. Considering recent project completions and projects underway, half of this expected growth is previously accounted for. The Hope Community Development is likely to advance Corcoran beyond 3,600 households (the 2030 forecast) in advance of 2030.

Also, Traffic Analysis Zone (TAZ) allocations will need to be updated. TAZ allocations have been prepared by City of Corcoran. The Hope Community site is a small part of TAZ #786. Minimal growth was anticipated in this area. The City's 2040 Comprehensive Plan expects TAZ #786 to gain +15 jobs, +12 households and no population during 2020-40. These expectations will need revision to account for the Hope Community Development proposal.

Item 10. Land Use (Freya Thamman 651-602-1750, Colin Kelly 651-602-1361)
The EAW indicates that the project area is guided Public/Institutional and Mixed Use in the City's 2040 Comprehensive Plan. It indicates that the Public/Institutional guiding includes the existing church and cemetery, and the remaining project area is guided Mixed Use. Some of the planned residential areas are located within the areas guided Public/Institution, which would require a comprehensive plan amendment.

The mixed-use neighborhood includes a variety of housing options, including age-restricted housing and two senior apartment buildings providing a continuum of care. When considering units per acre and allowed residential density ranges shown in the comprehensive plan, please refer to the most recent guidelines on senior housing for housing units and group quarters, which reflect the current Census Bureau definitions:
https://metrocouncil.org/Handbook/Files/Resources/Fact-Sheet/LAND-USE/Housing-Unit-vs-Group-Quarter.aspx.

Regional Trails
Diamond Lake Regional Trail is planned to traverse the site east to west. The EAW acknowledges the regional trail in the Land Use section, indicating that: "Three Rivers Park District plans show a portion of the proposed Diamond Lake Regional Trail may be located through the center of the site." In discussing the project's compatibility with nearby land uses, zoning, and plans, the EAW states "the plans may need to be revised to accommodate Three Rivers Park District's adopted plan for the Diamond Lake Regional Trail." Prior to any construction activities, the developer should coordinate with Three Rivers Park District, the Regional Park Implementing Agency that will own and operate the future Diamond Lake Regional Trail. The final design for the mixed-use neighborhood must accommodate the planned regional trail.

Item 12. Water Resources – Wastewater (Roger Janzig, 651-602-1119)
The Metropolitan Disposal System has adequate capacity for this project location.

Item 12. Water Resources – Water Supply (John Clark, 651-602-1452)
The following comments are offered for water supply:

- At present, the water that will be used to supply this development has not been appropriated by the Minnesota Department of Natural Resources (MN DNR). Water supply treatment and well infrastructure are being developed by the community. Water availability and potential impacts to aquifers, nearby infrastructure, and ecosystems will need to be assessed by the regulating agency to understand if local aquifers will be able to meet the community's water demands.
- Specific water demand estimates for the residential and non-residential portions of the development would benefit the project planning, inform the community's local water supply planning, and help to determine potential resource needs and environmental impacts.
- Local water supply plans are an essential part of the community's comprehensive plan. If the community's local water supply plan has been updated and approved by the MN DNR as a part of the request for water supply wells and water appropriation permits, please provide that updated plan to the Metropolitan Council as supplemental information or as part of a comprehensive plan amendment.
- Wells that have been identified on site, that will no longer be used, should be sealed according to Minnesota Department of Health (MDH) standards and guidance, with appropriate updates to the Minnesota Well Index.
- Lawn and landscaping will comprise approximately 20 acres of the new development as proposed. It is likely that much of these 20 acres will be irrigated. Inefficient irrigation of lawns and landscaping using treated municipal water is one of the major drivers of infrastructure expansions for public water supplies, and can unnecessarily stress water resources,

particularly during periods of drought. Captured stormwater on site could be used for landscape irrigation as an alternative to treated municipal sources. Additionally, ensuring that installed irrigation systems are using real-time weather data, via "smart" irrigation controllers, include soil moisture sensors, and are regularly audited for leaks and other equipment malfunctions, can help the systems to use only the water necessary for maintaining lawn and landscaped areas. Water efficient turfgrass and landscaping species can also help to lessen water needs on site. The University of Minnesota extension has excellent information that can help developers to choose and install species that require less nutrient and water inputs, lowering maintenance costs, and recover well from drought-stress.

Item 20. Transportation – Transit (Victoria Dan, 651-349-7648)
The EAW correctly states that there are no transit routes in the project area (Corcoran is outside the Transit Capital Levy District and therefore does not receive fixed route service). However, alternative transportation is available on Transit Link, a general public dial-a-ride service provided by the Metropolitan Council.

This concludes the Council's review of the EAW. The Council will not take formal action on the EAW. If you have any questions or need further information, please contact Freya Thamman, Principal Reviewer, at 651-602-1750 or via email at Freya.Thamman@metc.state.mn.us.

Sincerely,

Angela R. Torres, AICP, Senior Manager
Local Planning Assistance

CC: Tod Sherman, Development Reviews Coordinator, MnDOT - Metro Division
Judy Johnson, Metropolitan Council District 1
Freya Thamman, Sector Representative/Principal Reviewer
Reviews Coordinator

N:\CommDev\LPA\Communities\Corcoran\Letters\Corcoran 2023 Hope Community Church EAW OK w Comments 22873-1_.docx

From: Roos, Stephan (MDA)
To: Natalie Davis
Subject: Hope Community Mixed-Use Development EAW
Date: Thursday, June 1, 2023 4:06:08 PM
Attachments: image001.jpg

Hi Natalie,

Minnesota Department of Agriculture appreciates the opportunity to review and comment on the Hope Community Mixed-Use Development EAW. After reviewing the document I have determined that, although there is permanent conversion of agricultural lands, this project converts land that is within the MUSA line and is in keeping with your current comprehensive plan and zoning ordinance. We have no further comments.

Again, thank you for the opportunity to comment on this EAW,

Steve

Steve Roos
Environmental Planner
Energy and Environment Section
Agricultural Marketing and Development Division
Minnesota Department of Agriculture
625 Robert Street North
Saint Paul, MN 55155-2538
Ph: 651-201-6631 office

www.mda.state.mn.us

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, ST. PAUL DISTRICT
332 MINNESOTA STREET, SUITE E1500
ST. PAUL, MN 55101-1323

06/02/2023

Regulatory File No. MVP-2022-01918-RMH

THIS IS NOT A PERMIT

Natalie Davis McKeown
City of Corcoran
8200 County Road 116
Corcoran, MN 55340

To: Natalie Davis McKeown:

We have received your submittal described below. You may contact the Project Manager with questions regarding the evaluation process. The Project Manager may request additional information necessary to evaluate your submittal.

File Number: MVP-2022-01918-RMH

Applicant: Josh Mckinney

Project Name: Hope Community Mixed-Use Development

Project Location: Section 11 of Township 119 N, Range 23 W, Hennepin County, Minnesota (Latitude: 45.1338228883328; Longitude: -93.5455396670058)

Received Date: 05/31/2023

Project Manager: Raelene Hegge
(651) 290-5355
Raelene.Hegge@usace.army.mil

Additional information about the St. Paul District Regulatory Program can be found on our web site at http://www.mvp.usace.army.mil/missions/regulatory.

Please note that initiating work in waters of the United States prior to receiving Department of the Army authorization could constitute a violation of Federal law. If you have any questions, please contact the Project Manager.

Thank you.

U.S. Army Corps of Engineers
St. Paul District
Regulatory Branch

DEPARTMENT OF ADMINISTRATION
STATE HISTORIC PRESERVATION OFFICE

July 7, 2023

Natalie Davis McKeown
Planner, City of Corcoran
8200 County Road 116
Corcoran, MN 55340

RE: Hope Community Mixed-Use Development Environmental Assessment Worksheet
City of Corcoran, Hennepin County
SHPO Number: 2023-2084

Dear Natalie Davis McKeown:

Thank you for providing this office with a copy of the Environmental Assessment Worksheet (EAW) for the above-referenced project.

Due to the nature and location of the proposed project, we recommend that a Phase IA literature search and archaeological assessment be completed by a qualified archaeologist to assess the potential for intact archaeological sites in the project area. If, as a result of this assessment, a Phase I archaeological survey is recommended, this survey should be completed. The survey must meet the requirements of the Secretary of the Interior's Standards for Identification and Evaluation and should include an evaluation of National Register eligibility for any properties that are identified. For a list of consultants who have expressed an interest in undertaking such surveys, please visit the website **www.mnhs.org/preservation/directory**. To search the directory, use Ctrl + F as a search function and enter "archaeologists" in the text box that pops up. The consultants in these categories will be highlighted; you will need to scroll down to see them all.

We will reconsider the need for survey if the project area can be documented as previously surveyed or disturbed. Any previous survey work must meet contemporary standards. **Note:** plowed areas and right-of-way are not automatically considered disturbed. Archaeological sites can remain intact beneath deposited fill, plow zones, and other recent disturbances.

Please note that this comment letter does not address the requirements of Section 106 of the National Historic Preservation Act of 1966 and 36 CFR § 800. If this project is considered for federal financial assistance, or requires a federal permit or license, then review and consultation with our office will need to be initiated by the lead federal agency. Be advised that comments and recommendations provided by our office for this state-level review may differ from findings and determinations made by the federal agency as part of review and consultation under Section 106.

If you have any questions regarding our review of this project, please contact Kelly Gragg-Johnson, Environmental Review Program Specialist, at 651-201-3285 or kelly.graggjohnson@state.mn.us.

Sincerely,

Sarah J. Beimers
Environmental Review Program Manager

From: Shurson, Stephen <Stephen.Shurson@threeriversparks.org>
Sent: Friday, July 14, 2023 8:47 AM
To: Natalie Davis <ndavis@corcoranmn.gov>
Cc: Rexine, Ann <Ann.Rexine@threeriversparks.org>; Grissman, Kelly <Kelly.Grissman@threeriversparks.org>
Subject: TRPD comments RE: Hope Community Mixed-Use Development EAW (City File 22-074)

Natalie,
Below are Three Rivers comments regarding the EAW for the Hope Community Mixed-Use Development. Again, I apologize for the delay in responding to the 30-day comment period. Thank you for your considerations.

1. As mentioned in the Land Use chapter, (Section 10. a. ii.), a portion of the Three Rivers Park District's Diamond Lake Regional Trail (DLRT) is planned through the site, crossing CSAH 116 at Hunters Ridge and extending west and eventually south, crossing CSAH 30 at a location yet to be determined.
2. Development plans should dedicate sufficient right-of-way to accommodate the future trail in accordance with Three Rivers Regional Trail Design Standards. Generally speaking, a minimum 16' to 20' wide corridor is required to accommodate a 10' wide paved bituminous trail, two 3' wide clearzones on either side of the trail and room for trail/road signage. If possible, a wider corridor than this is preferred in order to be able to provide a vegetative buffer between the trail and the surrounding development which will contribute to a more attractive and higher quality user experience.
3. Though an exact alignment for the DLRT to east of the site is not yet determined, it seems more likely that it will be on the north side of Hunters Ridge. Therefore, locating the trail on the north side of Hope Way is preferred. Consideration should be given to the location of any entrance sign for the development along the north side of Hope Way so it does not interfere with the trail right-of-way area.
4. Providing a safe crossing of CSAH 116 at Hunters Ridge was identified in the adopted DLRT Master Plan. Given the expected increase of traffic along CSAH 116 in the future, a grade-separated crossing for the trail at this intersection is proposed in the master plan. A trail underpass under CSAH 116 seems more feasible than a trail bridge. Trail development for the DLRT is many years out in the future, but consideration should be made to provide significant right-of-way for a future grade-separated crossing and an accessible approach to an underpass.

ThreeRivers PARK DISTRICT

Stephen Shurson
Stef-en Sure•son | he/him
Landscape Architect, Three Rivers Park District
Office: 763-559-6766
Stephen.Shurson@ThreeRiversParks.org

Appendix B: Appendix Materials Referred to in Response to Comments

- Preliminary Infiltration Sizing Calculations and Existing Drainage Map
- Synchro Reports
- Permits Table

Preliminary Infiltration Sizing Calculations and Existing Drainage Map

High Water Level Surface Areas		
Basin	Wet Pond	Filtration
1P	18306	17499
2P	9758	7213
3P	25110	16777
4P	17297	15832
5P	18968	19269
6P	36773	40495

THINGS TO NOTE:

1. All volumes based on Conic Volumes, which means the surfaces were based on assumed perfect circles. Elongated shapes will have less capacity than assumed Volumes

2. NURP ponds will need forebay and 3:1 flow path/dimensions that will increase required area. NURP pond dead storage can also be made up to 10-ft deep to reduce footprints. assumed wash.

3. Filtration basin has a max 1.5' drawdown depth that is driving the required basin sizes. Cannot be undersized or there is a risk of under-performance

4. Surface area given is for the assumed HWL (or near it) to accommodate the additional 1-2 ft for EOF and freeboard, offset outer boundary 4-8 ft from basin sized in table.

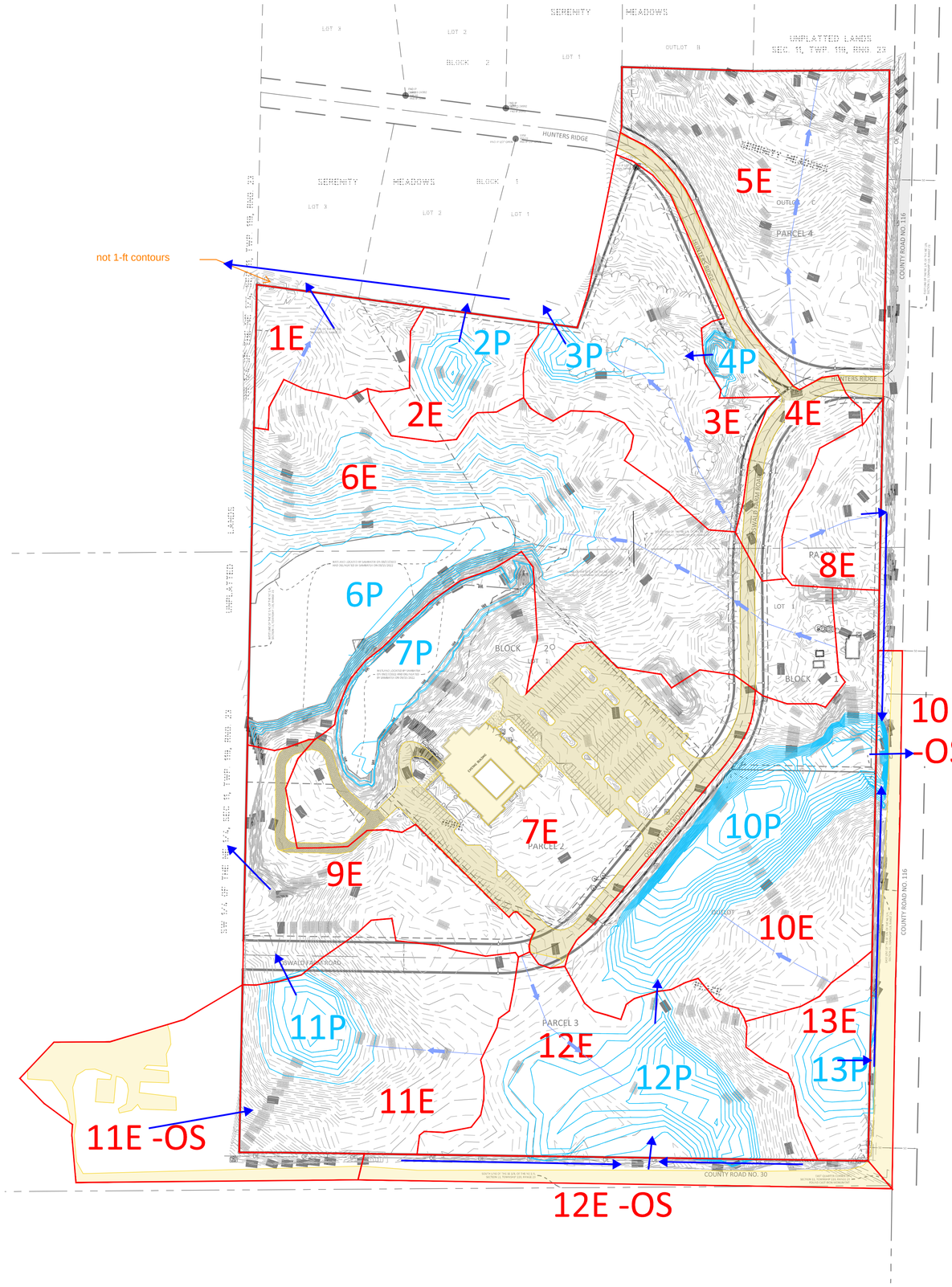
5. Discharge to North, Northwest, and west is over-rate controlled as shown. Discharge to east (6P) is close to allowable discharge rates.

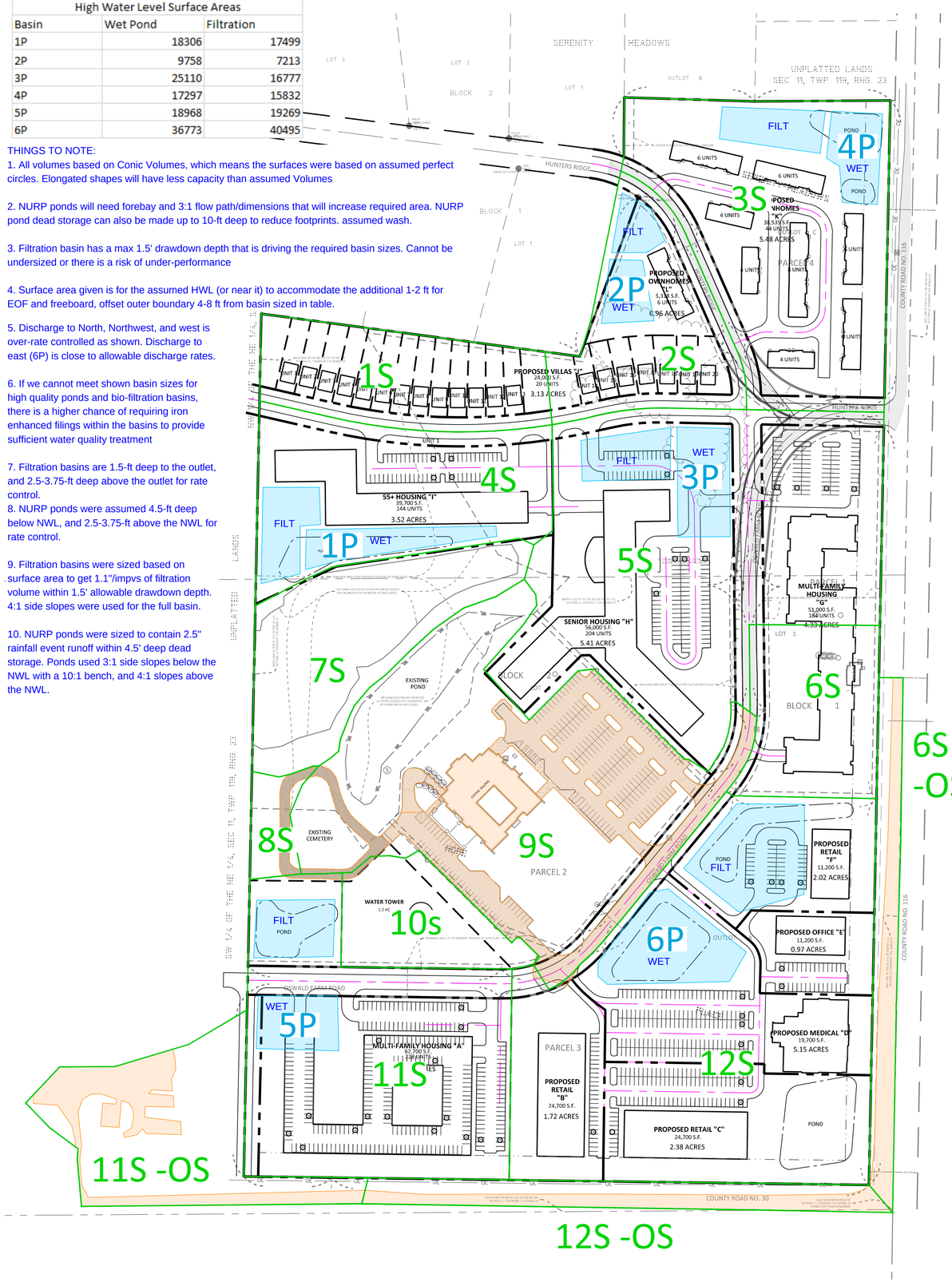
6. If we cannot meet shown basin sizes for high quality ponds and bio-filtration basins, there is a higher chance of requiring iron enhanced filings within the basins to provide sufficient water quality treatment

7. Filtration basins are 1.5-ft deep to the outlet, and 2.5-3.75-ft deep above the outlet for rate control.
8. NURP ponds were assumed 4.5-ft deep below NWL, and 2.5-3.75-ft above the NWL for rate control.

9. Filtration basins were sized based on surface area to get 1.1"/impvs of filtration volume within 1.5' allowable drawdown depth. 4:1 side slopes were used for the full basin.

10. NURP ponds were sized to contain 2.5" rainfall event runoff within 4.5' deep dead storage. Ponds used 3:1 side slopes below the NWL with a 10:1 bench, and 4:1 slopes above the NWL.





Exsiting

Drainage Area	Area	Impv	Water	Prvs
1E	65810	0	0	65810
2E	60447	0	0	60447
3E	182358	0	0	182358
4E	86347	32104	0	54243
5E	254208	3185	0	251023
6E	508312	8217	55178	444917
7E	410065	153287	44975	211803
8E	56129	0	0	56129
9E	136455	7547	0	128908
10E	261168	0	0	261168
11E	206948	0	0	206948
12E	210287	0	0	210287
13E	63949	0	0	63949
10E-OS	136841	43540	0	93301
11E-OS	58308	31281	0	27027
12E-OS	54027	35102	0	18925
	2751659	314263	100153	2337243

Proposed

Drainage Area	Area		% Impv	Impv	Prvs
1S	111255		0.5	55628	55628
2S	120848		0.5	60424	60424
3S	264511		0.65	171932	92579
4S	171519		0.8	137215	34304
5S	402911		0.8	322329	80582
6S	95641		0.8	76513	19128
7S	137797		0	55178	82619
8S	20587	Ex		5504	15083
9S	376608	Ex		198262	178346
10S	66243		0.15	9936	56307
11S	273888		0.8	219110	54778
12S	490625		0.8	392500	98125
6S-OS	136841	Ex		43540	93301
11S-OS	58308	Ex		31281	27027
12S-OS	54027	Ex		35102	18925
	2781609			1814454	967154.7

100-Year Discharge Volumes

	Existing	Proposed	Req. Storage	Provided BMPs	Provided Flood Storage
North	2.209	3.224	1.015	4P	2.016
East	9.68	9.439	-0.241	6P	6.102
Wetland	11.560	14.823	3.263	3P, 5P	5.730
Northwest	3.225	4.481	1.256	1P, 2P	3.137

Filtration Sizing

Basin	DAs Treated	New Impv	WQV (1.1)	(1.5' WQ Depth) Bottom SA	(2.5' Flood Depth*) Top SA	Prd Tot Vol
		sf	cf	sf	sf	cf
1P.F	1S, 4S	192843	17677	10800	17499	56061
2P.F	2S	60424	5539	3200	7213	20289
3P.F	5S	322329	29547	18300	16777	89618
4P.F	3S	171932	15760	9500	15832	50129
5P.F	11S	219110	20085	12200	19269	62402
6P.F	6S, 12S	469013	42993	26900	40495	146124

*6P.F = 3.75' Flood Depth

Pond Sizing

Basin	DAs Treated	2.5" Vol	2.5" Vol	(Botton of Wet) Bottom SA	(4.5' Perm Pool) NWL SA	(2.5' Flood Depth*) HWL SA	Prd Tot Flood Vol
		af	cf	sf	sf	sf	cf
1P.N	1S, 4S	0.923	40206	6600	13824	18306	40032
2P.N	2S	0.336	14636	2000	6570	9758	20279
3P.N	5S	1.441	62770	10900	19807	25110	56016
4P.N	3S	0.857	37331	6000	12949	17297	37677
5P.N	11S	0.979	42645	7000	14400	18968	41580
6P.N*	6S, 12S	2.097	91345	16600	27283	36773	119664

*6P.N = 3.75' Flood Depth

Notes:

NURP ponds need forebays, but dead storage can be up to 10-ft deep

Filt basins have MAX 1.5' drawdown

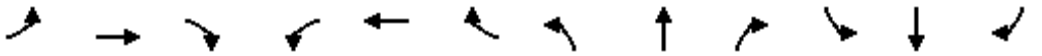
Over rate control for N, W, and NW discharge points, but not much wiggle room to E

Don’t want to undersize basins, or may need to incorporate iron enhancements

High Water Level Surface Areas

Basin	Wet Pond	Filtration
1P	18306	17499
2P	9758	7213
3P	25110	16777
4P	17297	15832
5P	18968	19269
6P	36773	40495

Synchro Reports



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	499	37	88	120	27	7	60	58	87	302	9
Future Volume (veh/h)	6	499	37	88	120	27	7	60	58	87	302	9
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	6	537	40	95	129	0	8	65	62	94	325	10
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	603	683	579	343	797		223	328	278	435	437	371
Arrive On Green	0.01	0.37	0.37	0.07	0.43	0.00	0.01	0.18	0.18	0.07	0.23	0.23
Sat Flow, veh/h	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	6	537	40	95	129	0	8	65	62	94	325	10
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.1	14.3	0.9	1.7	2.4	0.0	0.2	1.7	1.9	2.3	9.0	0.3
Cycle Q Clear(g_c), s	0.1	14.3	0.9	1.7	2.4	0.0	0.2	1.7	1.9	2.3	9.0	0.3
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	603	683	579	343	797		223	328	278	435	437	371
V/C Ratio(X)	0.01	0.79	0.07	0.28	0.16		0.04	0.20	0.22	0.22	0.74	0.03
Avail Cap(c_a), veh/h	764	1855	1572	440	1902		380	1294	1096	501	1307	1108
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.0	15.8	11.6	11.3	9.9	0.0	18.9	19.7	19.8	16.3	19.9	16.5
Incr Delay (d2), s/veh	0.0	2.1	0.0	0.4	0.1	0.0	0.1	0.3	0.4	0.2	2.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	9.6	0.5	1.1	1.5	0.0	0.1	1.3	1.2	1.6	6.9	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.0	17.9	11.6	11.7	10.0	0.0	19.0	20.0	20.2	16.6	22.4	16.6
LnGrp LOS	B	B	B	B	A		B	B	C	B	C	B
Approach Vol, veh/h		583			224			135			429	
Approach Delay, s/veh		17.4			10.7			20.0			21.0	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.3	14.3	8.4	24.9	5.1	17.6	4.9	28.3
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	5.9	38.7	6.9	55.5	5.5	39.1	5.5	56.9
Max Q Clear Time (g_c+I1), s	4.3	3.9	3.7	16.3	2.2	11.0	2.1	4.4
Green Ext Time (p_c), s	0.0	0.5	0.1	4.1	0.0	2.1	0.0	0.8

Intersection Summary	
HCM 6th Ctrl Delay	17.7
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

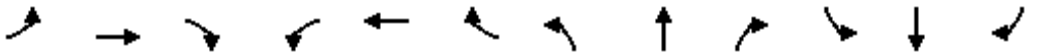
Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	1	14	1	1	1	13	80	1	1	389	13
Future Vol, veh/h	8	1	14	1	1	1	13	80	1	1	389	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	-	300	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	1	15	1	1	1	14	88	1	1	427	14

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	554	553	434	561	560	89	441	0	0	89	0	0
Stage 1	436	436	-	117	117	-	-	-	-	-	-	-
Stage 2	118	117	-	444	443	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	443	441	622	438	437	969	1119	-	-	1506	-	-
Stage 1	599	580	-	888	799	-	-	-	-	-	-	-
Stage 2	887	799	-	593	576	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	437	435	622	422	431	969	1119	-	-	1506	-	-
Mov Cap-2 Maneuver	437	435	-	422	431	-	-	-	-	-	-	-
Stage 1	591	579	-	876	789	-	-	-	-	-	-	-
Stage 2	874	789	-	577	575	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.1	11.9	1.1	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1119	-	-	533	524	1506	-	-
HCM Lane V/C Ratio	0.013	-	-	0.047	0.006	0.001	-	-
HCM Control Delay (s)	8.3	-	-	12.1	11.9	7.4	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	283	13	56	488	78	34	295	131	51	83	17
Future Volume (veh/h)	11	283	13	56	488	78	34	295	131	51	83	17
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	12	308	14	61	530	0	37	321	142	55	90	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	255	602	510	430	677		479	450	381	302	473	401
Arrive On Green	0.02	0.32	0.32	0.06	0.36	0.00	0.04	0.24	0.24	0.05	0.25	0.25
Sat Flow, veh/h	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	12	308	14	61	530	0	37	321	142	55	90	18
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.2	7.3	0.3	1.2	13.7	0.0	0.8	8.6	4.1	1.2	2.1	0.5
Cycle Q Clear(g_c), s	0.2	7.3	0.3	1.2	13.7	0.0	0.8	8.6	4.1	1.2	2.1	0.5
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	255	602	510	430	677		479	450	381	302	473	401
V/C Ratio(X)	0.05	0.51	0.03	0.14	0.78		0.08	0.71	0.37	0.18	0.19	0.04
Avail Cap(c_a), veh/h	408	2249	1906	511	2249		589	1384	1173	396	1390	1178
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.3	15.0	12.6	11.5	15.5	0.0	14.4	19.0	17.3	14.8	16.0	15.4
Incr Delay (d2), s/veh	0.1	0.7	0.0	0.1	2.0	0.0	0.1	2.1	0.6	0.3	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.2	5.1	0.2	0.8	9.2	0.0	0.6	6.5	2.5	0.8	1.5	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.4	15.7	12.7	11.6	17.5	0.0	14.5	21.1	17.9	15.1	16.2	15.4
LnGrp LOS	B	B	B	B	B		B	C	B	B	B	B
Approach Vol, veh/h		334			591			500			163	
Approach Delay, s/veh		15.5			16.9			19.7			15.7	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.3	17.6	7.5	22.0	6.6	18.3	5.3	24.2
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	5.7	40.3	5.5	65.5	5.5	40.5	5.5	65.5
Max Q Clear Time (g_c+I1), s	3.2	10.6	3.2	9.3	2.8	4.1	2.2	15.7
Green Ext Time (p_c), s	0.0	2.5	0.0	2.1	0.0	0.5	0.0	4.0

Intersection Summary	
HCM 6th Ctrl Delay	17.3
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

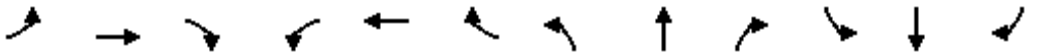
Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↰	↱		↰	↱	
Traffic Vol, veh/h	13	1	15	3	1	1	17	365	2	1	135	10
Future Vol, veh/h	13	1	15	3	1	1	17	365	2	1	135	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	-	300	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	14	1	16	3	1	1	18	384	2	1	142	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	572	572	148	579	576	385	153	0	0	386	0	0
Stage 1	150	150	-	421	421	-	-	-	-	-	-	-
Stage 2	422	422	-	158	155	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	431	430	899	426	428	663	1428	-	-	1172	-	-
Stage 1	853	773	-	610	589	-	-	-	-	-	-	-
Stage 2	609	588	-	844	769	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	425	424	899	414	422	663	1428	-	-	1172	-	-
Mov Cap-2 Maneuver	425	424	-	414	422	-	-	-	-	-	-	-
Stage 1	842	772	-	602	581	-	-	-	-	-	-	-
Stage 2	599	580	-	827	768	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.5	13.1	0.3	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1428	-	-	584	449	1172	-	-
HCM Lane V/C Ratio	0.013	-	-	0.052	0.012	0.001	-	-
HCM Control Delay (s)	7.6	-	-	11.5	13.1	8.1	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0	0	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	540	40	95	130	29	8	65	63	94	327	10
Future Volume (veh/h)	6	540	40	95	130	29	8	65	63	94	327	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	6	581	43	102	140	0	9	70	68	101	352	11
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	611	719	609	322	829		208	354	300	433	457	387
Arrive On Green	0.01	0.38	0.38	0.07	0.44	0.00	0.01	0.19	0.19	0.07	0.24	0.24
Sat Flow, veh/h	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	6	581	43	102	140	0	9	70	68	101	352	11
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.1	17.1	1.1	2.0	2.8	0.0	0.2	1.9	2.2	2.7	10.8	0.3
Cycle Q Clear(g_c), s	0.1	17.1	1.1	2.0	2.8	0.0	0.2	1.9	2.2	2.7	10.8	0.3
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	611	719	609	322	829		208	354	300	433	457	387
V/C Ratio(X)	0.01	0.81	0.07	0.32	0.17		0.04	0.20	0.23	0.23	0.77	0.03
Avail Cap(c_a), veh/h	742	1689	1431	411	1756		332	1166	988	488	1196	1014
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.4	16.9	12.0	12.3	10.3	0.0	20.2	21.0	21.1	17.4	21.6	17.7
Incr Delay (d2), s/veh	0.0	2.2	0.0	0.6	0.1	0.0	0.1	0.3	0.4	0.3	2.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	11.2	0.6	1.3	1.8	0.0	0.2	1.5	1.5	1.9	8.2	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.4	19.1	12.0	12.8	10.4	0.0	20.3	21.3	21.5	17.7	24.4	17.7
LnGrp LOS	B	B	B	B	B		C	C	C	B	C	B
Approach Vol, veh/h		630			242			147			464	
Approach Delay, s/veh		18.6			11.4			21.3			22.8	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.6	16.1	8.6	28.1	5.2	19.5	5.0	31.7
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	6.0	38.3	7.2	55.5	5.0	39.3	5.0	57.7
Max Q Clear Time (g_c+I1), s	4.7	4.2	4.0	19.1	2.2	12.8	2.1	4.8
Green Ext Time (p_c), s	0.0	0.6	0.1	4.6	0.0	2.2	0.0	0.9

Intersection Summary	
HCM 6th Ctrl Delay	19.0
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

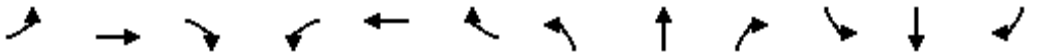
Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	1	15	1	1	1	14	87	1	1	421	14
Future Vol, veh/h	9	1	15	1	1	1	14	87	1	1	421	14
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	300	300	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	1	16	1	1	1	15	96	1	1	463	15

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	593	592	463	607	606	96	478	0	0	97	0	0
Stage 1	465	465	-	126	126	-	-	-	-	-	-	-
Stage 2	128	127	-	481	480	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	417	419	599	408	411	960	1084	-	-	1496	-	-
Stage 1	578	563	-	878	792	-	-	-	-	-	-	-
Stage 2	876	791	-	566	554	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	411	413	599	392	405	960	1084	-	-	1496	-	-
Mov Cap-2 Maneuver	411	413	-	392	405	-	-	-	-	-	-	-
Stage 1	570	562	-	866	781	-	-	-	-	-	-	-
Stage 2	862	780	-	549	553	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.5	12.3	1.1	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1084	-	-	506	495	1496	-	-
HCM Lane V/C Ratio	0.014	-	-	0.054	0.007	0.001	-	-
HCM Control Delay (s)	8.4	-	-	12.5	12.3	7.4	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0	0	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	306	14	61	528	84	37	319	142	55	90	18
Future Volume (veh/h)	12	306	14	61	528	84	37	319	142	55	90	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	13	333	15	66	574	0	40	347	154	60	98	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	239	639	542	425	713		474	468	396	285	490	415
Arrive On Green	0.02	0.34	0.34	0.06	0.38	0.00	0.04	0.25	0.25	0.05	0.26	0.26
Sat Flow, veh/h	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	13	333	15	66	574	0	40	347	154	60	98	20
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.3	8.6	0.4	1.4	16.4	0.0	1.0	10.3	4.8	1.5	2.4	0.6
Cycle Q Clear(g_c), s	0.3	8.6	0.4	1.4	16.4	0.0	1.0	10.3	4.8	1.5	2.4	0.6
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	239	639	542	425	713		474	468	396	285	490	415
V/C Ratio(X)	0.05	0.52	0.03	0.16	0.81		0.08	0.74	0.39	0.21	0.20	0.05
Avail Cap(c_a), veh/h	361	2035	1725	483	2041		559	1262	1070	366	1281	1086
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.1	15.8	13.1	12.0	16.6	0.0	15.5	20.7	18.7	16.0	17.2	16.5
Incr Delay (d2), s/veh	0.1	0.7	0.0	0.2	2.2	0.0	0.1	2.3	0.6	0.4	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.2	6.1	0.2	0.9	10.8	0.0	0.7	7.9	3.1	1.0	1.8	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.2	16.5	13.1	12.1	18.8	0.0	15.6	23.1	19.3	16.4	17.4	16.6
LnGrp LOS	B	B	B	B	B		B	C	B	B	B	B
Approach Vol, veh/h		361			640			541			178	
Approach Delay, s/veh		16.3			18.1			21.4			17.0	
Approach LOS		B			B			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.7	19.5	7.8	25.0	6.9	20.2	5.5	27.4
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	5.9	40.5	5.3	65.3	5.3	41.1	5.1	65.5
Max Q Clear Time (g_c+I1), s	3.5	12.3	3.4	10.6	3.0	4.4	2.3	18.4
Green Ext Time (p_c), s	0.0	2.7	0.0	2.3	0.0	0.6	0.0	4.4

Intersection Summary	
HCM 6th Ctrl Delay	18.6
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

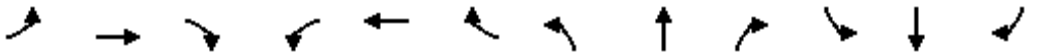
Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	1	16	3	1	1	18	395	2	1	146	11
Future Vol, veh/h	14	1	16	3	1	1	18	395	2	1	146	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	300	300	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	1	17	3	1	1	19	416	2	1	154	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	612	612	154	625	622	416	166	0	0	418	0	0
Stage 1	156	156	-	454	454	-	-	-	-	-	-	-
Stage 2	456	456	-	171	168	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	405	408	892	397	403	637	1412	-	-	1141	-	-
Stage 1	846	769	-	586	569	-	-	-	-	-	-	-
Stage 2	584	568	-	831	759	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	399	402	892	384	397	637	1412	-	-	1141	-	-
Mov Cap-2 Maneuver	399	402	-	384	397	-	-	-	-	-	-	-
Stage 1	835	768	-	578	562	-	-	-	-	-	-	-
Stage 2	574	561	-	813	758	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.9	13.7	0.3	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1412	-	-	558	420	1141	-	-
HCM Lane V/C Ratio	0.013	-	-	0.058	0.013	0.001	-	-
HCM Control Delay (s)	7.6	-	-	11.9	13.7	8.2	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0	0	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	618	47	95	231	160	23	83	63	220	345	10
Future Volume (veh/h)	6	618	47	95	231	160	23	83	63	220	345	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	6	665	51	102	248	0	25	89	68	237	371	11
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	557	788	667	280	885		206	252	213	457	459	389
Arrive On Green	0.01	0.42	0.42	0.06	0.47	0.00	0.03	0.13	0.13	0.14	0.25	0.25
Sat Flow, veh/h	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	6	665	51	102	248	0	25	89	68	237	371	11
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.1	23.3	1.4	2.2	5.9	0.0	0.9	3.2	2.8	7.8	13.6	0.4
Cycle Q Clear(g_c), s	0.1	23.3	1.4	2.2	5.9	0.0	0.9	3.2	2.8	7.8	13.6	0.4
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	557	788	667	280	885		206	252	213	457	459	389
V/C Ratio(X)	0.01	0.84	0.08	0.36	0.28		0.12	0.35	0.32	0.52	0.81	0.03
Avail Cap(c_a), veh/h	665	1474	1249	357	1538		279	695	589	575	948	804
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.0	19.0	12.6	14.5	11.7	0.0	26.2	28.7	28.6	20.9	25.9	20.9
Incr Delay (d2), s/veh	0.0	2.6	0.0	0.8	0.2	0.0	0.3	0.8	0.9	0.9	3.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	14.8	0.9	1.5	4.1	0.0	0.7	2.6	2.0	5.8	10.3	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.0	21.6	12.7	15.3	11.8	0.0	26.5	29.5	29.4	21.8	29.4	21.0
LnGrp LOS	B	C	B	B	B		C	C	C	C	C	C
Approach Vol, veh/h		722			350			182			619	
Approach Delay, s/veh		20.9			12.9			29.1			26.3	
Approach LOS		C			B			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.6	14.3	8.9	35.2	6.5	22.4	5.1	39.0
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	14.9	27.1	7.5	57.5	5.0	37.0	5.0	60.0
Max Q Clear Time (g_c+I1), s	9.8	5.2	4.2	25.3	2.9	15.6	2.1	7.9
Green Ext Time (p_c), s	0.3	0.6	0.1	5.4	0.0	2.3	0.0	1.6

Intersection Summary	
HCM 6th Ctrl Delay	22.0
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	8.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	60	1	180	1	1	1	170	80	1	1	400	87
Future Vol, veh/h	60	1	180	1	1	1	170	80	1	1	400	87
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	300	300	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	66	1	198	1	1	1	187	88	1	1	440	96

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	906	905	440	1052	1000	88	536	0	0	89	0	0
Stage 1	442	442	-	462	462	-	-	-	-	-	-	-
Stage 2	464	463	-	590	538	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	257	276	617	204	243	970	1032	-	-	1506	-	-
Stage 1	594	576	-	580	565	-	-	-	-	-	-	-
Stage 2	578	564	-	494	522	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	220	226	617	119	199	970	1032	-	-	1506	-	-
Mov Cap-2 Maneuver	220	226	-	119	199	-	-	-	-	-	-	-
Stage 1	486	575	-	475	463	-	-	-	-	-	-	-
Stage 2	472	462	-	335	521	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.6	22.7	6.3	0
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1032	-	-	424	207	1506	-	-
HCM Lane V/C Ratio	0.181	-	-	0.625	0.016	0.001	-	-
HCM Control Delay (s)	9.3	-	-	26.6	22.7	7.4	-	-
HCM Lane LOS	A	-	-	D	C	A	-	-
HCM 95th %tile Q(veh)	0.7	-	-	4.1	0	0	-	-

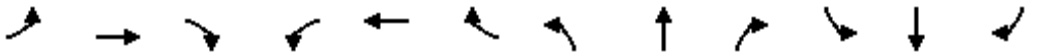
Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	48	555	137	135	121	25
Future Vol, veh/h	48	555	137	135	121	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	300	300	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	52	603	149	147	132	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	296	0	-	0	856	149
Stage 1	-	-	-	-	149	-
Stage 2	-	-	-	-	707	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1265	-	-	-	328	898
Stage 1	-	-	-	-	879	-
Stage 2	-	-	-	-	489	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1265	-	-	-	315	898
Mov Cap-2 Maneuver	-	-	-	-	315	-
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	489	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	21.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1265	-	-	-	315	898
HCM Lane V/C Ratio	0.041	-	-	-	0.418	0.03
HCM Control Delay (s)	8	-	-	-	24.4	9.1
HCM Lane LOS	A	-	-	-	C	A
HCM 95th %tile Q(veh)	0.1	-	-	-	2	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	417	28	61	584	215	45	338	142	203	111	18
Future Volume (veh/h)	12	417	28	61	584	215	45	338	142	203	111	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	13	453	30	66	635	0	49	367	154	221	121	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	191	685	580	327	746		468	452	383	346	589	499
Arrive On Green	0.02	0.37	0.37	0.05	0.40	0.00	0.04	0.24	0.24	0.11	0.31	0.31
Sat Flow, veh/h	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	13	453	30	66	635	0	49	367	154	221	121	20
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.4	15.9	1.0	1.8	24.3	0.0	1.6	14.6	6.4	6.9	3.7	0.7
Cycle Q Clear(g_c), s	0.4	15.9	1.0	1.8	24.3	0.0	1.6	14.6	6.4	6.9	3.7	0.7
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	191	685	580	327	746		468	452	383	346	589	499
V/C Ratio(X)	0.07	0.66	0.05	0.20	0.85		0.10	0.81	0.40	0.64	0.21	0.04
Avail Cap(c_a), veh/h	276	1598	1354	361	1605		509	761	645	425	937	794
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.2	20.9	16.1	15.7	21.5	0.0	20.8	28.1	25.0	19.5	19.7	18.7
Incr Delay (d2), s/veh	0.1	1.1	0.0	0.3	2.9	0.0	0.1	3.5	0.7	2.3	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	11.0	0.6	1.3	15.7	0.0	1.2	10.9	4.3	5.2	2.9	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.3	22.0	16.1	16.0	24.4	0.0	20.8	31.7	25.7	21.7	19.9	18.7
LnGrp LOS	B	C	B	B	C		C	C	C	C	B	B
Approach Vol, veh/h		496			701			570			362	
Approach Delay, s/veh		21.5			23.6			29.1			20.9	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.5	23.5	8.3	33.3	7.8	29.3	5.7	35.9
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	12.5	32.0	5.3	67.2	5.1	39.4	5.0	67.5
Max Q Clear Time (g_c+I1), s	8.9	16.6	3.8	17.9	3.6	5.7	2.4	26.3
Green Ext Time (p_c), s	0.2	2.5	0.0	3.3	0.0	0.7	0.0	5.1

Intersection Summary	
HCM 6th Ctrl Delay	24.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↰	↑	↱	↰	↑	↱
Traffic Vol, veh/h	85	1	190	3	1	1	175	379	2	1	141	60
Future Vol, veh/h	85	1	190	3	1	1	175	379	2	1	141	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	300	300	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	89	1	200	3	1	1	184	399	2	1	148	63

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	919	919	148	1049	980	399	211	0	0	401	0	0
Stage 1	150	150	-	767	767	-	-	-	-	-	-	-
Stage 2	769	769	-	282	213	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	252	271	899	205	250	651	1360	-	-	1158	-	-
Stage 1	853	773	-	395	411	-	-	-	-	-	-	-
Stage 2	394	411	-	725	726	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	225	234	899	142	216	651	1360	-	-	1158	-	-
Mov Cap-2 Maneuver	225	234	-	142	216	-	-	-	-	-	-	-
Stage 1	738	772	-	342	356	-	-	-	-	-	-	-
Stage 2	339	356	-	562	725	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.8	25.3	2.5	0
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1360	-	-	465	183	1158	-	-
HCM Lane V/C Ratio	0.135	-	-	0.625	0.029	0.001	-	-
HCM Control Delay (s)	8.1	-	-	24.8	25.3	8.1	-	-
HCM Lane LOS	A	-	-	C	D	A	-	-
HCM 95th %tile Q(veh)	0.5	-	-	4.2	0.1	0	-	-

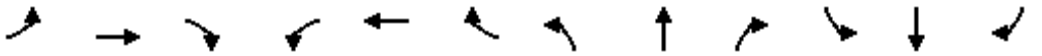
Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	27	321	563	111	138	39
Future Vol, veh/h	27	321	563	111	138	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	300	300	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	349	612	121	150	42

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	733	0	-	0	1019	612
Stage 1	-	-	-	-	612	-
Stage 2	-	-	-	-	407	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	872	-	-	-	263	493
Stage 1	-	-	-	-	541	-
Stage 2	-	-	-	-	672	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	872	-	-	-	254	493
Mov Cap-2 Maneuver	-	-	-	-	254	-
Stage 1	-	-	-	-	523	-
Stage 2	-	-	-	-	672	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	32.3
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	872	-	-	-	254	493
HCM Lane V/C Ratio	0.034	-	-	-	0.591	0.086
HCM Control Delay (s)	9.3	-	-	-	37.7	13
HCM Lane LOS	A	-	-	-	E	B
HCM 95th %tile Q(veh)	0.1	-	-	-	3.4	0.3



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	654	48	115	157	35	9	79	76	114	396	12
Future Volume (veh/h)	8	654	48	115	157	35	9	79	76	114	396	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	9	703	52	124	169	0	10	85	82	123	426	13
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	633	814	690	260	902		165	398	337	429	508	430
Arrive On Green	0.01	0.44	0.44	0.06	0.48	0.00	0.01	0.21	0.21	0.07	0.27	0.27
Sat Flow, veh/h	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	9	703	52	124	169	0	10	85	82	123	426	13
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.2	27.5	1.5	3.0	4.2	0.0	0.4	3.0	3.5	4.1	17.4	0.5
Cycle Q Clear(g_c), s	0.2	27.5	1.5	3.0	4.2	0.0	0.4	3.0	3.5	4.1	17.4	0.5
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	633	814	690	260	902		165	398	337	429	508	430
V/C Ratio(X)	0.01	0.86	0.08	0.48	0.19		0.06	0.21	0.24	0.29	0.84	0.03
Avail Cap(c_a), veh/h	723	1308	1108	322	1366		253	849	720	441	880	745
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.4	20.7	13.3	16.7	11.9	0.0	25.4	26.2	26.4	20.9	27.8	21.6
Incr Delay (d2), s/veh	0.0	3.6	0.0	1.4	0.1	0.0	0.2	0.3	0.4	0.4	3.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.2	17.5	1.0	2.1	3.0	0.0	0.3	2.4	2.4	3.1	12.6	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.5	24.3	13.4	18.0	12.0	0.0	25.6	26.5	26.8	21.3	31.6	21.7
LnGrp LOS	B	C	B	B	B		C	C	C	C	C	C
Approach Vol, veh/h		764			293			177			562	
Approach Delay, s/veh		23.4			14.6			26.6			29.1	
Approach LOS		C			B			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.3	21.7	9.2	39.7	5.5	26.4	5.4	43.5
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	6.3	36.7	7.5	56.5	5.0	38.0	5.0	59.0
Max Q Clear Time (g_c+I1), s	6.1	5.5	5.0	29.5	2.4	19.4	2.2	6.2
Green Ext Time (p_c), s	0.0	0.7	0.1	5.7	0.0	2.6	0.0	1.0

Intersection Summary	
HCM 6th Ctrl Delay	24.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

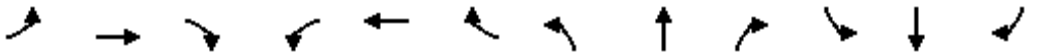
Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	1	18	1	1	1	17	105	1	1	509	17
Future Vol, veh/h	10	1	18	1	1	1	17	105	1	1	509	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	300	300	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	1	20	1	1	1	19	115	1	1	559	19

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	716	715	559	734	733	115	578	0	0	116	0	0
Stage 1	561	561	-	153	153	-	-	-	-	-	-	-
Stage 2	155	154	-	581	580	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	345	356	529	336	348	937	996	-	-	1473	-	-
Stage 1	512	510	-	849	771	-	-	-	-	-	-	-
Stage 2	847	770	-	499	500	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	338	349	529	318	341	937	996	-	-	1473	-	-
Mov Cap-2 Maneuver	338	349	-	318	341	-	-	-	-	-	-	-
Stage 1	502	509	-	833	756	-	-	-	-	-	-	-
Stage 2	829	755	-	479	500	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.9	13.6	1.2	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	996	-	-	436	420	1473	-	-
HCM Lane V/C Ratio	0.019	-	-	0.073	0.008	0.001	-	-
HCM Control Delay (s)	8.7	-	-	13.9	13.6	7.4	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0	0	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	371	17	73	639	102	45	386	172	67	109	22
Future Volume (veh/h)	14	371	17	73	639	102	45	386	172	67	109	22
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	15	403	18	79	695	0	49	420	187	73	118	24
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	194	745	631	407	808		458	515	437	232	531	450
Arrive On Green	0.02	0.40	0.40	0.05	0.43	0.00	0.04	0.28	0.28	0.05	0.28	0.28
Sat Flow, veh/h	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	15	403	18	79	695	0	49	420	187	73	118	24
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.4	13.2	0.6	2.0	26.9	0.0	1.5	16.8	7.8	2.3	3.9	0.9
Cycle Q Clear(g_c), s	0.4	13.2	0.6	2.0	26.9	0.0	1.5	16.8	7.8	2.3	3.9	0.9
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	194	745	631	407	808		458	515	437	232	531	450
V/C Ratio(X)	0.08	0.54	0.03	0.19	0.86		0.11	0.82	0.43	0.31	0.22	0.05
Avail Cap(c_a), veh/h	275	1538	1303	442	1552		497	936	793	261	940	797
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.5	18.5	14.7	13.8	20.6	0.0	19.3	27.1	23.9	21.0	21.9	20.9
Incr Delay (d2), s/veh	0.2	0.6	0.0	0.2	2.8	0.0	0.1	3.2	0.7	0.8	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	9.4	0.3	1.4	17.0	0.0	1.1	12.2	5.2	1.7	3.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.7	19.1	14.7	14.0	23.4	0.0	19.4	30.3	24.5	21.7	22.1	20.9
LnGrp LOS	B	B	B	B	C		B	C	C	C	C	C
Approach Vol, veh/h		436			774			656			215	
Approach Delay, s/veh		18.9			22.4			27.9			21.9	
Approach LOS		B			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.5	26.6	8.6	36.4	7.8	27.3	5.9	39.1
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	5.3	40.1	5.7	65.9	5.1	40.3	5.1	66.5
Max Q Clear Time (g_c+I1), s	4.3	18.8	4.0	15.2	3.5	5.9	2.4	28.9
Green Ext Time (p_c), s	0.0	3.3	0.0	2.9	0.0	0.7	0.0	5.7

Intersection Summary	
HCM 6th Ctrl Delay	23.3
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

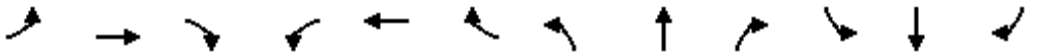
Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	1	20	4	1	1	22	478	3	1	177	13
Future Vol, veh/h	17	1	20	4	1	1	22	478	3	1	177	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	300	300	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	1	21	4	1	1	23	503	3	1	186	14

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	740	740	186	755	751	503	200	0	0	506	0	0
Stage 1	188	188	-	549	549	-	-	-	-	-	-	-
Stage 2	552	552	-	206	202	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	333	345	856	325	340	569	1372	-	-	1059	-	-
Stage 1	814	745	-	520	516	-	-	-	-	-	-	-
Stage 2	518	515	-	796	734	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	327	339	856	312	334	569	1372	-	-	1059	-	-
Mov Cap-2 Maneuver	327	339	-	312	334	-	-	-	-	-	-	-
Stage 1	800	744	-	511	507	-	-	-	-	-	-	-
Stage 2	507	506	-	775	733	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.1	15.8	0.3	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1372	-	-	485	341	1059	-	-
HCM Lane V/C Ratio	0.017	-	-	0.082	0.019	0.001	-	-
HCM Control Delay (s)	7.7	-	-	13.1	15.8	8.4	-	-
HCM Lane LOS	A	-	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.1	0	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	732	59	115	266	166	25	97	76	240	414	12
Future Volume (veh/h)	8	732	59	115	266	166	25	97	76	240	414	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	9	787	63	124	286	0	27	104	82	258	445	13
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	552	873	740	219	952		161	298	253	450	507	429
Arrive On Green	0.01	0.47	0.47	0.05	0.51	0.00	0.03	0.16	0.16	0.14	0.27	0.27
Sat Flow, veh/h	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	9	787	63	124	286	0	27	104	82	258	445	13
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.3	38.2	2.2	3.4	8.7	0.0	1.2	4.9	4.5	11.4	22.5	0.6
Cycle Q Clear(g_c), s	0.3	38.2	2.2	3.4	8.7	0.0	1.2	4.9	4.5	11.4	22.5	0.6
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	552	873	740	219	952		161	298	253	450	507	429
V/C Ratio(X)	0.02	0.90	0.09	0.56	0.30		0.17	0.35	0.32	0.57	0.88	0.03
Avail Cap(c_a), veh/h	623	1109	940	242	1138		204	487	413	499	701	594
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.6	24.2	14.6	21.3	14.0	0.0	33.9	36.9	36.7	27.2	34.4	26.4
Incr Delay (d2), s/veh	0.0	8.6	0.0	2.5	0.2	0.0	0.5	0.7	0.7	1.3	9.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.2	25.0	1.4	2.6	6.5	0.0	1.0	4.1	3.2	8.6	16.8	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.6	32.8	14.7	23.8	14.2	0.0	34.4	37.6	37.5	28.4	43.7	26.5
LnGrp LOS	B	C	B	C	B		C	D	D	C	D	C
Approach Vol, veh/h		859			410			213			716	
Approach Delay, s/veh		31.3			17.1			37.1			37.9	
Approach LOS		C			B			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.1	20.2	9.8	50.5	7.1	31.2	5.6	54.7
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	16.3	25.7	6.5	58.5	5.0	37.0	5.0	60.0
Max Q Clear Time (g_c+I1), s	13.4	6.9	5.4	40.2	3.2	24.5	2.3	10.7
Green Ext Time (p_c), s	0.2	0.7	0.0	5.8	0.0	2.3	0.0	1.9

Intersection Summary	
HCM 6th Ctrl Delay	31.4
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	10.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	61	1	183	1	1	1	173	98	1	1	488	90
Future Vol, veh/h	61	1	183	1	1	1	173	98	1	1	488	90
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	300	300	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	67	1	201	1	1	1	190	108	1	1	536	99

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1028	1027	536	1177	1125	108	635	0	0	109	0	0
Stage 1	538	538	-	488	488	-	-	-	-	-	-	-
Stage 2	490	489	-	689	637	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	212	234	545	168	205	946	948	-	-	1481	-	-
Stage 1	527	522	-	561	550	-	-	-	-	-	-	-
Stage 2	560	549	-	436	471	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	178	187	545	89	164	946	948	-	-	1481	-	-
Mov Cap-2 Maneuver	178	187	-	89	164	-	-	-	-	-	-	-
Stage 1	422	521	-	449	440	-	-	-	-	-	-	-
Stage 2	446	439	-	274	471	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	40	27.5	6.2	0
HCM LOS	E	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	948	-	-	358	163	1481	-	-
HCM Lane V/C Ratio	0.201	-	-	0.752	0.02	0.001	-	-
HCM Control Delay (s)	9.7	-	-	40	27.5	7.4	-	-
HCM Lane LOS	A	-	-	E	D	A	-	-
HCM 95th %tile Q(veh)	0.7	-	-	5.9	0.1	0	-	-

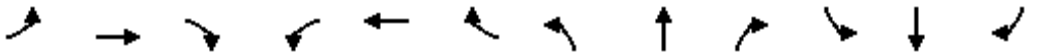
Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	48	678	168	135	121	25
Future Vol, veh/h	48	678	168	135	121	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	300	300	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	52	737	183	147	132	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	330	0	-	0	1024	183
Stage 1	-	-	-	-	183	-
Stage 2	-	-	-	-	841	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1229	-	-	-	261	859
Stage 1	-	-	-	-	848	-
Stage 2	-	-	-	-	423	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1229	-	-	-	250	859
Mov Cap-2 Maneuver	-	-	-	-	250	-
Stage 1	-	-	-	-	812	-
Stage 2	-	-	-	-	423	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	30
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1229	-	-	-	250	859
HCM Lane V/C Ratio	0.042	-	-	-	0.526	0.032
HCM Control Delay (s)	8.1	-	-	-	34.3	9.3
HCM Lane LOS	A	-	-	-	D	A
HCM 95th %tile Q(veh)	0.1	-	-	-	2.8	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	482	33	73	718	233	56	405	172	215	130	22
Future Volume (veh/h)	14	482	33	73	718	233	56	405	172	215	130	22
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	15	524	36	79	780	0	61	440	187	234	141	24
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	145	814	690	321	859		449	484	411	273	606	514
Arrive On Green	0.02	0.44	0.44	0.04	0.46	0.00	0.04	0.26	0.26	0.10	0.32	0.32
Sat Flow, veh/h	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	15	524	36	79	780	0	61	440	187	234	141	24
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	0	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	0.5	24.5	1.5	2.7	43.1	0.0	2.8	25.4	11.0	10.4	6.1	1.2
Cycle Q Clear(g_c), s	0.5	24.5	1.5	2.7	43.1	0.0	2.8	25.4	11.0	10.4	6.1	1.2
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	145	814	690	321	859		449	484	411	273	606	514
V/C Ratio(X)	0.10	0.64	0.05	0.25	0.91		0.14	0.91	0.46	0.86	0.23	0.05
Avail Cap(c_a), veh/h	195	1137	963	340	1150		462	537	455	273	645	546
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.4	24.7	18.2	18.9	27.9	0.0	28.5	40.0	34.7	28.7	27.5	25.8
Incr Delay (d2), s/veh	0.3	0.9	0.0	0.4	8.5	0.0	0.1	18.3	0.8	22.5	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.4	16.2	1.0	2.0	28.0	0.0	2.2	20.1	7.8	10.1	5.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.7	25.5	18.2	19.3	36.4	0.0	28.6	58.2	35.5	51.2	27.7	25.9
LnGrp LOS	C	C	B	B	D		C	E	D	D	C	C
Approach Vol, veh/h		575			859			688			399	
Approach Delay, s/veh		25.1			34.8			49.4			41.4	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.0	33.4	9.1	53.0	8.7	40.6	6.4	55.7
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	11.5	32.0	5.8	67.7	5.1	38.4	5.0	68.5
Max Q Clear Time (g_c+I1), s	12.4	27.4	4.7	26.5	4.8	8.1	2.5	45.1
Green Ext Time (p_c), s	0.0	1.5	0.0	4.0	0.0	0.9	0.0	6.1

Intersection Summary	
HCM 6th Ctrl Delay	37.6
HCM 6th LOS	D

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	10.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	88	1	194	4	1	1	179	462	3	1	172	62
Future Vol, veh/h	88	1	194	4	1	1	179	462	3	1	172	62
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	300	300	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	93	1	204	4	1	1	188	486	3	1	181	65

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1048	1048	181	1180	1110	486	246	0	0	489	0	0
Stage 1	183	183	-	862	862	-	-	-	-	-	-	-
Stage 2	865	865	-	318	248	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	206	228	862	167	209	581	1320	-	-	1074	-	-
Stage 1	819	748	-	350	372	-	-	-	-	-	-	-
Stage 2	348	371	-	693	701	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	182	195	862	113	179	581	1320	-	-	1074	-	-
Mov Cap-2 Maneuver	182	195	-	113	179	-	-	-	-	-	-	-
Stage 1	703	747	-	300	319	-	-	-	-	-	-	-
Stage 2	297	318	-	528	700	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	36.7	31.9	2.3	0
HCM LOS	E	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1320	-	-	397	140	1074	-	-
HCM Lane V/C Ratio	0.143	-	-	0.75	0.045	0.001	-	-
HCM Control Delay (s)	8.2	-	-	36.7	31.9	8.4	-	-
HCM Lane LOS	A	-	-	E	D	A	-	-
HCM 95th %tile Q(veh)	0.5	-	-	6.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	7.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	27	391	685	111	138	39
Future Vol, veh/h	27	391	685	111	138	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	300	300	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	425	745	121	150	42

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	866	0	-	0	1228	745
Stage 1	-	-	-	-	745	-
Stage 2	-	-	-	-	483	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	777	-	-	-	197	414
Stage 1	-	-	-	-	469	-
Stage 2	-	-	-	-	620	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	777	-	-	-	190	414
Mov Cap-2 Maneuver	-	-	-	-	190	-
Stage 1	-	-	-	-	452	-
Stage 2	-	-	-	-	620	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	58.8
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	777	-	-	-	190	414
HCM Lane V/C Ratio	0.038	-	-	-	0.789	0.102
HCM Control Delay (s)	9.8	-	-	-	71.3	14.7
HCM Lane LOS	A	-	-	-	F	B
HCM 95th %tile Q(veh)	0.1	-	-	-	5.4	0.3

Permits and Approvals

Unit of Government	Type of Application	Status
Federal		
-	-	-
State		
Minnesota Pollution Control Agency (MPCA)	National Pollutant Discharge Elimination System (NPDES) Permit	To be completed
MPCA	Sewer Extension Project	To be completed
Minnesota Department of Health	Watermain Extension Permit	To be completed
Minnesota Department of Natural Resources (DNR)	Water Appropriations Permit, if needed	To be completed
County		
Hennepin County	County Road Access Permit	To be completed
Local		
City of Corcoran	EAW / EIS Need Decision	Draft prepared
City of Corcoran	Wetland Conservation Act (Boundary Approval/Replacement Plan)	To be completed
City of Corcoran	Preliminary and Final Plat	To be completed
City of Corcoran	Erosion Control, Grading, and Stormwater Permit	To be completed
City of Corcoran	Building Permits	To be completed
City of Corcoran	Conditional Use Permit Amendment or Use of Planned Use Development (for Cemetery Expansion)	To be completed
Elm Creek Watershed Management Commission	Stormwater, Erosion Control, and Site Plan Approval	To be completed

Appendix C: Resolution Declaring Finding of “No Need”

City of Corcoran
County of Hennepin
State of Minnesota

July 27, 2023

RESOLUTION NO. 2023-63

Motion By: Bottema
Seconded By: Vehrenkamp

RESOLUTION DECLARING A FINDING OF "NO NEED" FOR AN ENVIRONMENTAL IMPACT STATEMENT (EIS) BASED UPON THE REVIEW OF THE ENVIRONMNETAL ASSESSMENT WORKSHEET (EAW) FOR "HOPE COMMUNITY" PROPOSED BY HOPE COMMUNITY CHURCH AT THE NORTHWEST CORNER OF COUNTY ROAD 30 AND COUNTY ROAD 116 (PIDS 11-119-23-14-0005; 11-119-23-14-0003; 11-119-23-14-0004; and 11-119-23-11-0012) (CITY FILE 22-074)

WHEREAS, the City Council reviewed the Environmental Assessment Worksheet (EAW) for a mixed-use development on July 27, 2023; and

WHEREAS, pursuant to Minnesota Environmental Review Program Rules 4410.4300, Subpart 14, the City of Corcoran, as the responsible governmental unit (RGU) submitted an EAW for the proposed project on May 30, 2023; and

WHEREAS, the EAW was published on June 6, 2023, edition of the EQB Monitor, which commenced the required 30-day public comment period that ended on July 6, 2023; and

WHEREAS, the RGU received seven comment letters that are incorporated by reference in the Record of Decision and all comments and recommendations received from reviewing agencies and other interested parties have been considered; and

WHEREAS, responses were prepared for comment letters received and the response to comments are provided in the Record of Decision; and

WHEREAS, it has been determined that the proposed project does not present a potential for environmental impacts of such significance that an EIS would be required; and

WHEREAS, pursuant to the Minnesota Rules, Section 4410.1700, the RGU shall base its decision regarding the need for an EIS on the information gathered during the EAW process, the commenced received on the EAW, and the criteria established by the EQB to determine whether a project has the potential for significant environmental effects as provided in the Record of Decision, and

NOW, THEREFORE, BE IT HEREBY RESOLVED BY THE CITY COUNCIL OF THE CITY OF CORCORAN, MINNESOTA, that it should and hereby does make the Negative Declaration on the need for an EIS for the proposed mixed-use development, based on the Record of Decision, which is hereby approved, adopted, and incorporated herein.

City of Corcoran
County of Hennepin
State of Minnesota

July 27, 2023

RESOLUTION NO. 2023-63

VOTING AYE	VOTING NAY
☒ McKee, Tom	☐ McKee, Tom
☒ Bottema, Jon	☐ Bottema, Jon
☒ Nichols, Jeremy	☐ Nichols, Jeremy
☐ Schultz, Alan	☐ Schultz, Alan
☒ Vehrenkamp, Dean	☐ Vehrenkamp, Dean

Whereupon, said Resolution is hereby declared adopted on this 27th day of July 2023.

Tom McKee - Mayor

ATTEST:

Michelle Friedrich – City Clerk

City Seal

Appendix D: Environmental Assessment Worksheet

Hope Community Development Project

Environmental Assessment Worksheet

May 2023

Prepared for:

City of Corcoran
8200 County Road 116
Corcoran, MN 55340

Prepared by:

Stantec Consulting Services Inc.
One Carlson Parkway, Suite 100
Plymouth, Minnesota 55426

Hope Community Development
Environmental Assessment Worksheet

Proposer:
Hope Community Church, Brian & Jacque Lother & Corcoran Investments, LLC

RGU:
City of Corcoran, Minnesota

May 2023

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December 2022 version

Environmental Assessment Worksheet

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

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

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

1. Project Title

Hope Community Mixed-Use Development, City of Corcoran

2. Proposer

Proposer:	Hope Community Church
Contact person:	Josh McKinney
Title:	Project Manager/Principal
Address:	19951 Oswald Farm Road
City, State, ZIP:	Corcoran, MN 55374
Phone:	612-440-0934
Fax:	N/A
Email:	jmckinney@measuregrp.com

3. Responsible Governmental Unit (RGU)

RGU Agency:	City of Corcoran
Contact person:	Natalie Davis McKeown
Title:	Planner
Address:	8200 County Road 116
City, State, ZIP:	Corcoran, MN 55340
Phone:	763-338-9288
Fax:	N/A
Email:	ndavis@corcoranmn.gov

4. Reason for EAW Preparation

Required:	Discretionary:
☐ EIS Scoping	☐ Citizen petition
X Mandatory EAW	☐ RGU discretion
	☐ Proposer initiated

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

- 4410.4300, Subp. 32: Mixed residential and industrial-commercial projects.
- 4410.4300, Subp. 19 (D): Residential development.
- 4410.4300, Subp. 14(B)(2): Industrial, commercial, and institutional facilities.

5. Project Location

County: Hennepin

City/Township: Corcoran

PLS Location (¼, ¼, Section, Township, Range): east ½ of northeast ¼ of Section 11, Township 119N, Range 23W

Watershed (81 major watershed scale): Mississippi River (Rush Creek sub watershed of the Elm Creek watershed)

GPS Coordinates: 45.132627, -93.546608

Tax Parcel Number: 1111923140004, 1111923140005, 1111923140003, 1111923110012

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

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

6. Project Description

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

Hope Community Church proposes a mixed-use development spanning approximately 44.5 acres at the northwest corner of County Road 30 and County Road 116 in Corcoran, MN. The proposed plan reflects 738 housing units (primarily within multifamily buildings) and up to 110,300 square feet of commercial, retail, and medical office space.

b. Give a complete description of the proposed project and related new construction, including infrastructure needs. If the project is an expansion include a description of the existing facility. Emphasize: 1) construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes, 2) modifications to existing equipment or industrial processes, 3) significant demolition, removal or remodeling of existing structures, and 4) timing and duration of construction activities

Complete Description and Existing Facility

Hope Community Church ("Project Proposer") proposes the Project currently referred to as "Hope

Community." This would be a new mixed-use neighborhood that includes a variety of housing options, including age-restricted and market rate housing, as well as space for medical office and retail/commercial uses. The Project would be located in the City of Corcoran in Hennepin County, Minnesota on the northwest corner of County Road 116 and County Road 30 spanning approximately 44.5 acres centering around roughly 12 acres of existing development. The existing development on the site includes Hope Community Church, an accessory daycare that operates within the church, the cemetery associated with the church, and the City's first water tower (under development).

Agricultural land is present to the west and an existing single-family residential neighborhood exists to the north. The Project Area contains four wetland basins according to the wetland delineation application submitted at the end of 2022 and currently under review with the RGU.

The new development includes two market rate non-age restricted multifamily apartment buildings, two senior apartment buildings providing a continuum of care, 20 senior detached villas, and non-age restricted townhomes (738 residential units total). The project proposes two large medical office buildings and two smaller buildings intended for retail space (up to 110,300 square feet of commercial space total). Additional components of the site include an expansion of the existing cemetery site (an expansion of roughly 0.87 acres) and a playground/tot lot to the east of the senior villas (approximately 0.78 acres).

Construction Activities

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

   Standard construction methods are expected to be used. The Project Area would be graded in phases. It is anticipated that the commercial portion of the site would be mass graded when the first commercial project moves forward. The rest of the sites would be expected to be graded individually. A majority of the existing wetland areas would be protected. There are no known significant natural communities in existence throughout the site today with the majority of the Project Area consisting of cropland. The Project would require the construction of a west/east public street to serve the senior villas and senior multifamily buildings. Oswald Farm Road would be extended to bring the public street to the southwest property line. The City would be completing a utility extension project so that both sewer and water are available at the border of the site. The utilities are being extended for the purpose of the proposed water treatment project and not specifically for the Project, but since the City's water tower is within this site, a portion of the work would be completed within the Project Area. In addition to sanitary sewer and water, development of the site would include installation of other minor utilities (e.g., cable/internet). Offsite improvements are discussed in Appendix H.

2) *Modifications to existing equipment or industrial processes*

   No modifications to existing equipment or industrial processes are anticipated.

3) *Significant demolition, removal or remodeling of existing structures*

   Besides the existing church site within the Project Area, the Project Area is mostly vacant. There is an existing barn and home across from the church near County Road 116. These would be demolished. No remodeling of the existing church and cemetery are proposed.

4) *Timing and duration of construction activities*

   Construction activities would be expected to begin in fall of 2023 and completed by the end of

2028. The Project Proposer's anticipated phasing plan is provided below (see Figure 4, Appendix A):

- Phase 1A: Fall 2023 – Spring 2025
  - Includes the multi-family building along County Road 116.
  - The first phase of the senior living housing apartments and villas (east).
- Phase 1B: Spring 2024 - Spring 2025
  - First phase of commercial and medical buildings.
  - Townhomes along County Road 116.
- Phase 2: Spring 2025 – Fall 2027
  - Multi-family building along County Road 30.
  - Final buildout for the commercial/medical buildings.
- Phase 3: 2026 – 2028
  - 2nd phase of the Senior Living (west).

The expected phasing plan is subject to change and would ultimately be driven by the market.

c. Project magnitude

Table 1 summarizes the project magnitude.

Table 1. Project Magnitude

Description	Number
Total Project Acreage	44.5 acres
Linear project length	N/A
Number and type of residential units	738 total - 340 multifamily units - 324 senior multifamily units - 20 senior single-family units - 54 townhome units
Residential building area (in square feet)	Market rate multifamily estimate – 376K sq. ft. - MF A – 43,000 SF x 4 stories = 172,000 - MF F – 51,000 SF x 4 stories = 204,000 Senior housing multifamily estimate – 356,400 sq. ft. - SH G – 56,000 SF x 4 stories = 224,000 - SH H – 33,100 SF x 4 stories = 132,400 Townhouses – 38,535 sq. ft. (footprint) Villas – 2,400 sq. ft. (footprint)
Commercial building area (in square feet)	Estimated total commercial building area – 110, 300 sq. ft.
Industrial building area (in square feet)	0 sq. ft.
Institutional building area (in square feet)	0 sq. ft.

Other uses – specify (in square feet)	Park/Playground Space – 37,880 sq. ft. (estimated) Cemetery expansion – 33,792 sq. ft. (estimated)
Structure height(s)	Commercial maximum – 3 stories. Multifamily maximum – 4 stories.

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

The Project is proposed by entities associated with Hope Community Church and would be carried out by a private party. The Project Proposer hopes to create a campus that provides housing, particularly for seniors, and creates a community center with commercial and medical users. The proposed plan would provide beneficial places for multiple age groups to live, work, dine, and worship.

e. Are future stages of this development including development on any other property planned or likely to happen? ☐ **Yes** **X No**
If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review.

f. Is this project a subsequent stage of an earlier project? **X Yes** ☐ **No**
If yes, briefly describe the past development, timeline and any past environmental review.

Hope Community Church was approved in 2001, and the final plat for Hope Place was completed in 2002. A daycare was approved at Hope Community Church in 2005 and is still in operation as an accessory use. The cemetery was approved in 2012. A plat to carve out a property for the City's water tower was processed in 2022 and earlier this year. Construction of the water tower would begin this year and is expected to be completed at the end of 2024. Past phases did not trigger environmental reviews, so there is no record of an environmental review completed in the past.

7. Climate Adaptation and Resilience

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

In general, Minnesota is anticipated to experience an increase in temperature, precipitation, and more frequent extreme precipitation events resulting from climate change. In Minnesota, annual average temperatures have risen three degrees over the past century and up to three degrees in the northern part of the state. The highest average temperature increases have occurred during the winter. Since 1895, temperatures during the winter have increased at a rate two to three times higher than during the summer. In particular, winter warming rates have risen more sharply in recent decades. [1] Current climate warming trends, most notably during the winter, are anticipated to continue.[2]

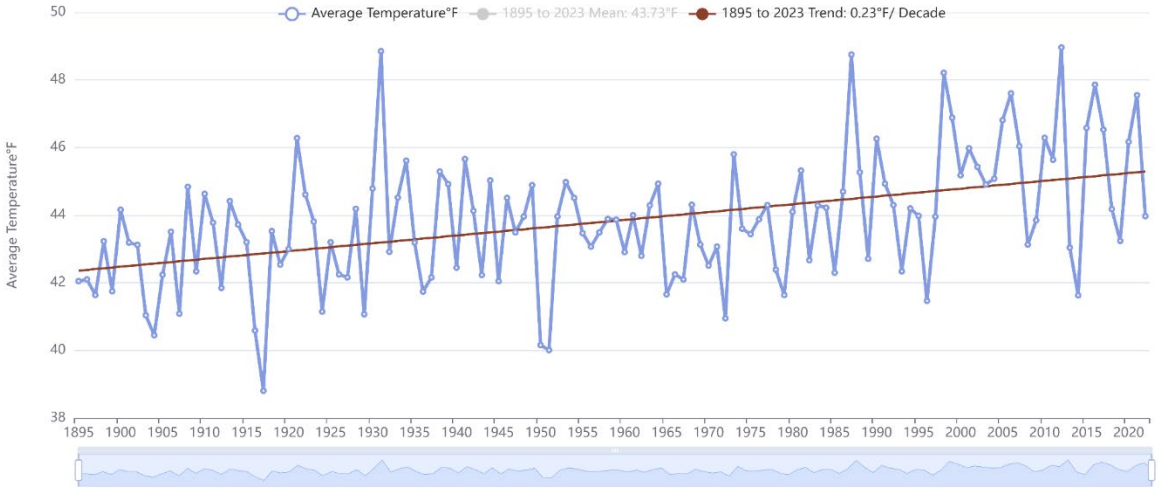
Heavy rain events have become more frequent in Minnesota and more intense. From 1973 to 2021, Minnesota experienced 16 mega-rain events[3] with a notable increase since 2000. Of these 16 events, three occurred in the 1970s, one in the 1980s, one in the 1990s, six mega-rain events occurred in the 2000s,

[1] MNDNR. Climate Trends. https://www.dnr.state.mn.us/climate/climate_change_info/climate-trends.html
[2] MnDOT. Minnesota Go Climate Change Report. 2021. https://www.minnesotago.org/trends/climate-change
[3] Mega-rain events are defined as events in which six inches of rain covers more than 1,000 square miles and the core of the event tops eight inches.

four in the 2010s, and one in 2020. Thus, in the past 21 years (2000 to 2020), almost two times as many mega rain events occurred compared to the prior 27 years (1973 to 1999).[4]

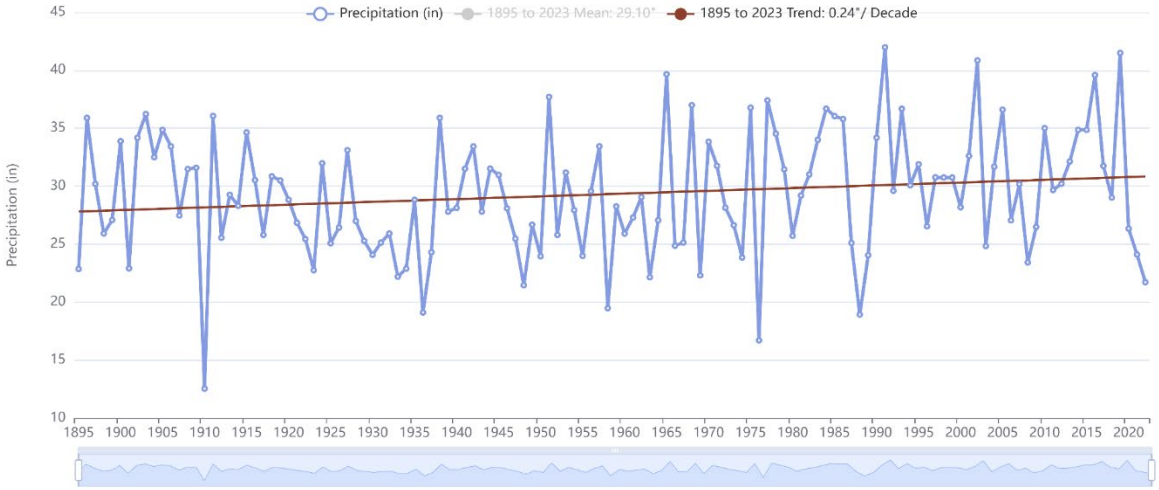
Climate trends for Hennepin County parallel the overall statewide trends, indicating Minnesota's climate is becoming warmer and wetter. Exhibits 1 and 2 illustrate historical average annual temperature and precipitation trends from 1895 to 2023. During this time period, the County experienced an average annual temperature increase of 0.23 degrees Fahrenheit (°F) per decade and annual precipitation increase of 0.24 inches per decade.

Exhibit 1. Historical Annual Average Temperature in Hennepin County (1895 – 2023)



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

Exhibit 2. Historical Annual Average Precipitation in Hennepin County (1895 – 2023)



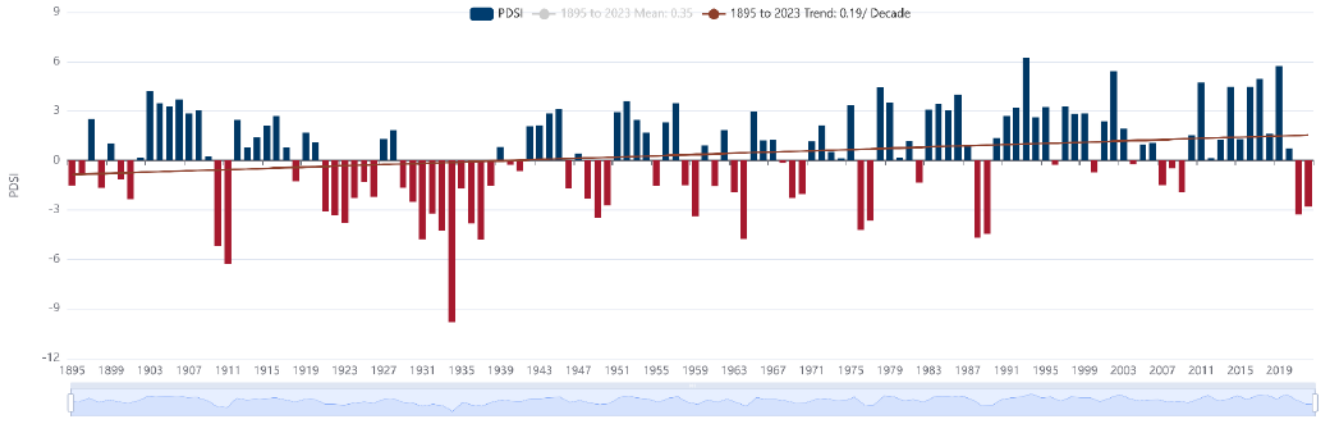
Source: Minnesota Department of Natural Resources.

[4] Minnesota Department of Natural Resources. Historic Mega-Rain Events in Minnesota. https://www.dnr.state.mn.us/climate/summaries_and_publications/mega_rain_events.html

https://arcgis.dnr.state.mn.us/ewr/climateexplorer/main/historical

The Palmer Drought Severity Index (PDSI) utilizes temperature and precipitation data to estimate relative soil moisture conditions and serve as an indicator of long-term drought conditions. The index ranges from -5 to +5 indicating dry and wet conditions, respectively. PDSI values are reported on a monthly basis. Exhibit 3 shows historic PDSI values for the month of August from 1895 to 2023 for Hennepin County, which indicates an increase of 0.19 per decade. Generally, the PSDI historical data indicates that the region is experiencing a wetter climate.

Exhibit 3. Historical PDSI Values for Hennepin County (1895 – 2023)

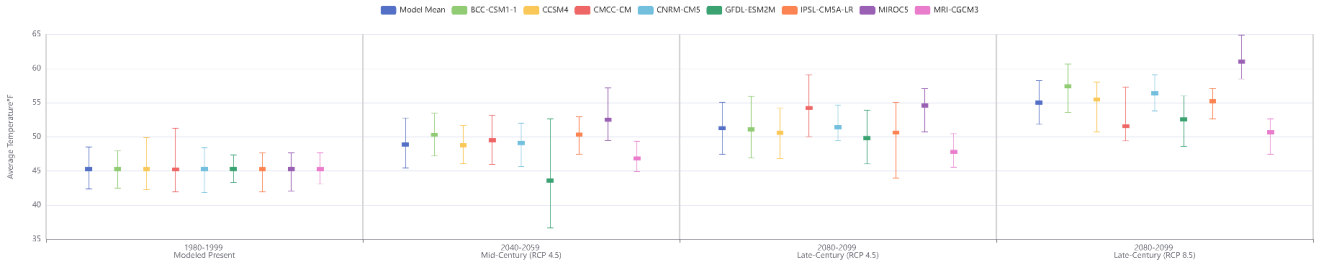


Source: Minnesota Department of Natural Resources.
https://arcgis.dnr.state.mn.us/ewr/climateexplorer/main/historical

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

Under the RCP 4.5 scenario, the annual temperature is anticipated to increase within the County from a modeled present mean of 45.28°F (1980-1999) to a mid-century (2040-2059) model mean of 48.87°F and a late-century (2080-2099) model mean of 51.27°F. Under the RCP 8.5 worst-case scenario, the County would experience a late-century (2080-2099) model mean temperature of 55.03°F.

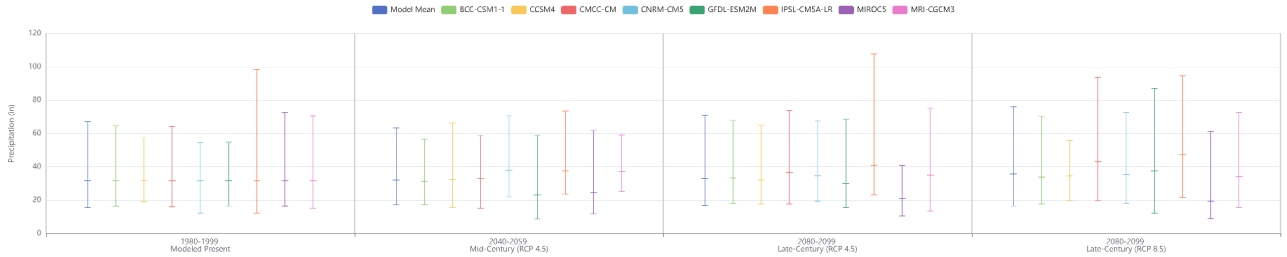
Exhibit 4. Projected Temperatures in Hennepin County



Source: Minnesota Department of Natural Resources. Minnesota Climate Explorer (state.mn.us). Definitions of the models included in this analysis can be found at Climate Explorer Metadata | Minnesota DNR (state.mn.us).

Exhibit 5 presents projected average annual precipitation for Hennepin County. Under the RCP 4.5 scenario, the annual precipitation is anticipated to increase within the County from a modeled present mean of 31.61 inches (1980-1999) to a mid-century (2040-2059) model mean of 32.12 inches and a late-century (2080-2099) model mean of 32.94 inches. Under the RCP 8.5 worst-case scenario, the County would experience a late-century (2080-2099) model mean precipitation of 35.70 inches. In comparison to the modeled present mean (1980-1999), the late-century (2080-2099) modeled mean annual precipitation would increase by approximately 1.3 percent under the RCP 4.5 scenario and increase by approximately 4.1 percent under the RCP 8.5 scenario.

Exhibit 5. Projected Precipitation in Hennepin County



Source: Minnesota Department of Natural Resources. Minnesota Climate Explorer (state.mn.us). Definitions of the models included in this analysis can be found at Climate Explorer Metadata | Minnesota DNR (state.mn.us).

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

Table 2 summarizes climate considerations related to the project and adaptation considerations.

Table 2. Climate Considerations and Adaptations

ResourceCategory	Climate Considerations	Project Information	Adaptations
Project Design	Increased heavy rainfall and flooding.	The Project would replace pervious surface area with impervious surface area (structures and pavement).	Stormwater would be directed to several stormwater ponds and filtration basins in the Project Area to provide treatment and rate control, in compliance with local and state standards including Elm Creek Watershed requirements. Increase in rainfall frequency and intensity (as described in Item 7.a.) would be factored into the stormwater design for the Project.
Land Use	Heavier rainfall expected to increase risk of localized flooding.	The Project is not located within a Federal Emergency Management Area (FEMA) defined floodplain or floodway.	Increase in rainfall frequency and intensity (as described in Item 7.a.) would be factored into the stormwater design for the Project, referenced in Table 2, Project Design, Adaptations.
Water Resources	Address in item 12		
Contamination/ Hazardous Materials/ Wastes	Protection of water resources and soil from contamination.	The Project would not introduce hazardous materials or waste to the Project Area.	Not applicable (NA). The Project would not include the storage or generation of hazardous materials or waste.
Fish, wildlife, plant communities, and sensitive ecological resources (rare features)	Address in item 14.		

8. Cover Types

Estimate the acreage of the site with each of the following cover types before and after development.

Table 3. Cover Types

Cover Types	Before(acres)	After (acres)
Wetlands and shallow lakes (<2 meters deep)	1.2	0
Deep lakes (>2 meters deep)	0	0
Wooded/forest	6.0	1.4
Rivers/streams	0	0
Grass/Shrub	19.8*	0
Cropland	15.8	0
Livestock rangeland/pastureland	0	0
Lawn/landscaping	0	20.6
Green infrastructure TOTAL (from table below*)	0	2.4
Impervious surface	1.7	17.3
Stormwater Pond (wet sedimentation basin)	0	2.7
Other (describe)	0	0
TOTAL	44.5	44.5

Acreages are approximate and based on DNR MLCCS land cover geospatial data.
**Based on visual observations in the field, the "brush/grassland" quantified for the "Before" condition (including that reflected in Figure 5, Appendix A) would likely be better categorized as "cropland" (agricultural use).*

Table 4. Green Infrastructure

Green Infrastructure*	Before (acreage)	After (acreage)
Constructed infiltration systems (infiltration basins/infiltration trenches/ rainwater gardens/bioretention areas without underdrains/swales with impermeable check dams)	0	2.4
Constructed tree trenches and tree boxes	0	0
Constructed wetlands	0	0
Constructed green roofs	0	0
Constructed permeable pavements	0	0
Other (describe) Landfill-based geothermal system	0	0
TOTAL*	0	2.4

Table 5. Tree Canopy

Trees	Percent	Number
Percent tree canopy removed or number of mature trees removed during development	77	
Number of new trees planted		Roughly 886 overstory trees; 399 understory trees/shrubs*

*The number and type of trees would be negotiated during the Planned Unit Development process.

9. Permits and Approvals Required

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

Table 6. Permits and Approvals

Unit of Government	Type of Application	Status
Federal		
-	-	-
State		
Minnesota Pollution Control Agency (MPCA)	National Pollutant Discharge Elimination System (NPDES) Permit	To be completed
MPCA	Sewer Extension Permit	To be completed
Minnesota Department of Health	Watermain Extension Permit	To be completed
County		
Hennepin County	County Road Access Permit	To be completed
Local		
City of Corcoran	EAW / EIS Need Decision	Draft prepared
City of Corcoran	Wetland Conservation Act (Boundary Approval/Replacement Plan)	To be completed
City of Corcoran	Preliminary and Final Plat	To be completed
City of Corcoran	Erosion Control, Grading, and Stormwater Permit	To be completed
City of Corcoran	Building Permits	To be completed
City of Corcoran	Conditional Use Permit Amendment or Use of Planned Use Development (for Cemetery Expansion)	To be completed
Elm Creek Watershed Management Commission	Stormwater, Erosion Control, and Site Plan Approval	To be completed

Cumulative potential effects may be considered and addressed in response to individual EAW Item Nos.10-20, or the RGU can address all cumulative potential effects in response to EAW Item No.22. If addressing cumulative effect under individual items, make sure to include information requested in EAW Item No. 21.

10. Land use

a. Describe:

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

Existing land use includes a church with an accessory daycare, cemetery, agricultural, a barn, and a single-family home. Areas of the site are vacant. The surrounding uses of the Project include a single-family residential neighborhood to the north and farmland or vacant land to the south, east, and west.

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

The Project Area has two land use designations shown in the City's 2040 Comprehensive Plan. The parcel that includes the existing church and cemetery is designated as Public/Institutional. The remaining parcels that comprise the Project Area are designated as mixed use.

The City purchased roughly one acre of the site to construct the City's first water tower.

Three Rivers Park District plans show a portion of the proposed Diamond Lake Regional Trail may be located through the center of the site.

The City's Northeast District Plan shows a public street located along the west property line in the southwest portion of the site.

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

The parcel that includes the church, daycare, and cemetery is zoned Public/Institution. The remaining parcels are zoned General Mixed Use. Wetlands on the site would be subject to a Wetland Overlay district.

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

There are no regulated floodways or floodplains located in the Project Area. Refer to Item 12.a.

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

The Project appears to be compatible overall with nearby land uses, zoning, and most of the plans listed in Item 9.a. However, the plans may need to be revised to accommodate Three Rivers Park District's adopted plan for the Diamond Lake Regional Trail.

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

It is understood that the Project Proposer's intent is to maintain and enhance existing vegetative buffers between neighboring uses. This would provide a compatible transition to surrounding uses and mitigate the risk to the existing natural community. Further, the intensity of the Project is intentionally minimized along the Project Area boundaries and includes residential uses. The commercial uses are located in the far southeast corner of the Project Area. For example, a step down in intensity is shown from the senior living apartment buildings to the one-story senior villas up against a significant tree line along the northern property line (which would be preserved with the Project). This provides a compatible transition to the existing single-family neighborhood to the north while preserving desirable natural features of the site. The property to the west of the Project Area is guided as "Mixed Residential" which accommodates the multi-family building located in the southwest corner of the Project as an appropriate use for the long-term, given that a similar use on the neighboring property is expected in the future. Additionally, the Project Proposer has indicated their intent to utilize biofiltration as a primary means of stormwater treatment.

11. Geology, Soils and Topography/Land Forms

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

The surficial geology in the Project Area has been mapped by the Minnesota Geological Survey's (MGS) Geologic Atlas of Hennepin County as being sediments consisting of glacial till. Specifically, the Project Area contains loam till and may also contain clay loam till. These sediments are characterized as being calcareous and oxidized olive brown above unoxidized very dark gray. The surface expression is generally rolling and hummocky with numerous ice-walled stagnation plains and ice-block melt-out depressions indicative of ice stagnation. Silt loam deposited in ponded water is thin, patchy, and locally present on the tops of ice-walled stagnation plains. Organic detritus comprised of plant material in post-glacial land surface depressions may exist in areas currently or formerly beneath the water table. (Steenberg et al. 2018a)[5].

The bedrock geology across the Project Area has been mapped in the MGS Geologic Atlas of Hennepin County as consisting of Jordan Sandstone, the St. Lawrence Formation, and the Mazomanie Formation of the Tunnel City Group, all of which are from the late Cambrian Period. The Jordan Sandstone unit is characterized by medium- to coarse-grained, friable quartzose sandstone. The underlying St. Lawrence Formation is characterized by dolomitic siltstone and shale with interbedded very fine-grained sandstone and shale, while the Mazomanie Formation of the Tunnel City Group is characterized by fine- to medium-grained quartzose sandstone with interbedded dolomitic sandstone. (Steenberg et al. 2018b)[6]. The bedrock topography within the Project Area is mapped to be approximately 800 to 825 feet above mean

[5] Steenberg, Julia R.; Bauer, Emily J.; Chandler, V.W.; Retzler, Andrew J.; Berthold, Angela J.; Lively, Richard S. 2018a. Minnesota Geological Survey. County Atlas Series. Atlas C-45, Hennepin County. Plate 3 – Surficial Geology. Available at: https://conservancy.umn.edu/bitstream/handle/11299/58491/plate3_surficial.pdf?sequence=99&isAllowed=y. C-45, Geologic Atlas of Hennepin County, Minnesota (umn.edu). Accessed March 2023.

[6] Steenberg, Julia R.; Bauer, Emily J.; Chandler, V.W.;Retzler, Andrew J.; Berthold, Angela J.; Lively, Richard S. 2018b. Minnesota Geological Survey. County Atlas Series. Atlas C-45, Hennepin County. Plate 2 – Bedrock Geology. Available at: https://conservancy.umn.edu/bitstream/handle/11299/58491/plate2_bedrock.pdf?sequence=100&isAllowed=y. Accessed March 2023.

sea level (amsl) (Steenberg et al. 2018c)[7]. Given the approximate land surface topography of approximately 940 to 956 feet amsl, the depth to bedrock within the Project Area can be placed between approximately 140 feet and 156 feet (DNR undated (a))[8]. No wells were identified within the Project Area according to the Minnesota Department of Health (MDH) Minnesota Well Index (MWI), but two wells located within one-quarter mile of the Project Area to the north along Hillside Drive support these findings: two domestic wells (Unique Wells 140169 and 126438) had available well log and stratigraphic reports that identified the presence of Jordan Sandstone bedrock at 141 feet and 148 feet, respectively (MDH 2021)[9]. The well log reports and stratigraphic reports are available in Appendix C.

According to the Minnesota Department of Natural Resources (DNR), Karst Feature Inventory, there are no known karst or sinkhole features within the Project Area or within the vicinity of the Project Area. The nearest feature is a sinkhole approximately 12 miles to the northeast of the Project Area in Andover, Minnesota (field verified 2017). (DNR undated (b))[10]. The first encountered bedrock is the Jordan Sandstone which is not known for karst features and is located at a depth greater than 100 feet below grade. The underlying St. Lawrence Formation is a siliciclastic-dominated bedrock that does contain minor dolostone layers with abundant macropores but is not considered karst because the secondary porosity is unlikely from dissolution (Runkel et al. 2014)[11]. Static water levels for the wells just north of the Project Area (Unique Wells 140169 and 126438) were reported at 55 feet and 100 feet, respectively. Given that these wells were reported to be completed in the Jordan Sandstone bedrock layer, which is above the St. Lawrence Formation layer in question, and the depth to bedrock is estimated to be 140 to 156 feet, this indicates that the Jordan Sandstone is fully saturated at these locations. Similar conditions are anticipated for the Project Area, therefore, the formation of karst there is unlikely.

[7] Steenberg, Julia R.; Bauer, Emily J.; Chandler, V.W.;Retzler, Andrew J.; Berthold, Angela J.; Lively, Richard S. 2018c. Minnesota Geological Survey. County Atlas Series. Atlas C-45, Hennepin County. Plate 6 – Depth to Bedrock and Bedrock Topography. Available at: https://conservancy.umn.edu/bitstream/handle/11299/58491/plate4_d2bdrk.pdf?sequence=98&isAllowed=y. Accessed March 2023.
[8] DNR. undated (a). MnTOPO. Available at: http://arcgis.dnr.state.mn.us/maps/mntopo/. Accessed March 2023.
[9] MDH. 2021. Minnesota Well Index. Available at: https://www.health.state.mn.us/communities/environment/water/mwi/index.html. Accessed March 2023.
[10] DNR. undated (b). Karst Feature Inventory. Available at: https://arcgis.dnr.state.mn.us/portal/apps/webappviewer/index.html?id=9df792d8f86546f2aafc98b3e31adb62. Accessed March 2023.
[11] Runkel, Anthony C.; Tipping, Robert R.; Green, J.A.; Jones, Perry M.; Meyer, Jessica R.; Parker, Beth L.; Steenberg, Julia R.; Retzler, Andrew J. 2014. Minnesota Geological Survey Open File Report 14-04, Hydrogeologic Properties of the St. Lawrence Aquitard, Southeastern Minnesota. Available at: https://conservancy.umn.edu/handle/11299/165299. Accessed March 2023.

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

Table 7 includes hydrologic soil groups found in the Project Area. The four hydrologic soil groups are:

- **Group A:** Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
- **Group B:** Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained, or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
- **Group C:** Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
- **Group D:** Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high-water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Table 7. Soils within the Project Area

Map Symbol	Name	Percent Slopes	Hydrologic Soil Group	Approx. Acres	Approx. Percent of Project Area
L37B	Angus loam	2 to 6	C	21.0	47.3
L44A	Nessel loam	1 to 3	C	6.2	13.8
L23A	Cordova loam	0 to 2	C/D	7.1	16.1
L22C2	Lester loam, moderately eroded	6 to 10	C	3.2	7.2
L24A	Glencoe clay loam	0 to 1	C/D	0.2	0.3
L36A	Hamel, overwash-Hamel complex	0 to 3	C/D	4.0	9.0
L45A	Dundas-Cordova complex	0 to 3	C/D	2.2	5.0
L21A	Canisteo clay loam	0 to 2	C/D	0.6	1.3
Total				**44.5**	**100.0**

Source: USDA NRCS Hennepin County Soil Survey

The Project Area is generally flat with no slopes greater than ten percent. According to the DNR MnTOPO map, the Project Area ranges from approximately 940 to 956 feet amsl with high and low points scattered throughout the Project Area (DNR undated (a))[12].

Based on the soils report for Hennepin County from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) (Appendix D), there is one soil type within the Project Area that is moderately eroded: Lester loam, six to ten percent slopes (L22C2). This soil type makes up approximately seven acres (13 percent) of the Project Area and is located primarily in the southern half of the Project Area. (USDA NRCS 2023)[13].

The USDA NRCS soils report for Hennepin County also reports on hydrologic soil groups. Soils within the Project Area have slow to very slow infiltration rates, indicating a high runoff potential (USDA NRCS 2023)[8]. The volumes and acreages of soil excavation and grading are unknown at this time. Hope Community intends to reuse any soil on site and has committed to vegetating soils at risk for erosion.

12. Water Resources

[12] DNR. undated (a). MnTOPO. Available at: http://arcgis.dnr.state.mn.us/maps/mntopo/. Accessed March 2023.
[13] USDA NRCS. 2023. Web Soil Survey. Available at: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed March 2023.

a. Describe surface water and groundwater features on or near the site in a.i. and a.ii. below.

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

Surface Waters

The Project Area is located within the Rush Creek subwatershed of the Elm Creek watershed and is part of the larger upper Mississippi River watershed. No lakes, streams or county ditches are located within the Project Area. No trout streams, wildlife lakes, migratory waterfowl feeding/resting lakes or outstanding resource value waters are located within one mile of the Project Area. No aquatic invasive species are known to be present within one mile of the Project Area.

DNR Public Waters

No DNR Public Waters are located within the Project Area. Two Public Water Watercourses and five Public Water Wetlands are located within one mile of the Project Area (Table 8, Figure 8). Rush Creek is located northwest of the Project Area, and an unnamed tributary to Rush Creek is located southwest of the Project Area. The unnamed tributary flows through a large Public Water Wetland before flowing into Rush Creek. Additionally, four Public Water Wetlands are located southeast of the Project Area.

Table 8. DNR Public Waters within One Mile of the Site

Waterway	Public Water ID	Type
Rush Creek	M-062-004	Public Water Watercourse, Public Ditch/Altered Natural Watercourse
Unnamed creek	M-062-004-006	Public Water Watercourse
Unnamed wetland	27016300	Public Water Wetland
Unnamed wetland	27031600	Public Water Wetland
Unnamed wetland	27031400	Public Water Wetland
Unnamed wetland	27031500	Public Water Wetland
Unnamed wetland	27044000	Public Water Wetland

Wetland Resources

A wetland delineation has been completed for the Project Area. The delineation has been submitted to the Local Government Unit (LGU), undergone Technical Evaluation Panel (TEP) review, and revised with supplemental information. LGU approval was provided in May 2023. The U.S. Army Corps of Engineers conducted a preliminary review of the delineation but has not been requested to prepare a jurisdictional determination thus far.

A total of six wetlands were delineated and are summarized in Table 9 and Figure 9. Note: Only Wetlands 1, 4, 5 and 6 are located within the Project Area. Of these, Wetlands 1 and 6 are farmed wetlands that were identified utilizing the offsite determination guidance, and Wetland 2 is functioning as a stormwater pond.

Wetlands 2, 3, and 4 are indicated on the National Wetlands Inventory (NWI) with Wetland 4 occuring within the Project Area. Wetland types present in the Project Area include seasonally flooded basin, fresh meadow, and shallow open water wetlands.

Table 9. Wetlands Delineated within and adjacent to the Project Area

Wetland ID	Circular* 39	Cowardin	Dominant Vegetation	Acres* (within Project Area)
Wetland 1	Type 1	PEM1Af	Yellow nut sedge, farmed wetland	0.89 acres
Wetland 2	Type 5	PUB1Hx	Cattail	0 acres
Wetland 3	Type 2	PEM1B	Reed canary grass	0 acres
Wetland 4	Type 1	PEM1A	Reed canary grass	0.08 acres
Wetland 5	Type 1	PEM1A	None	0.03 acres
Wetland 6	Type 1	PEM1Af	Farmed wetland	0.23 acres

**Area of Wetlands 1 & 6 are approximate, as final approval of the level 1 delineation offsite review is still pending.*

MPCA 303d Impaired Waters List

Based on a review of the MPCA's 2022 Impaired Waters List[14], no MPCA 303d Impaired Waters are located within the Project Area. Rush Creek is located less than one mile northwest of the Project Area and is listed as impaired for aquatic life and aquatic recreation as a result of impairments for dissolved oxygen, *E. coli*, fish bioassessments, and benthic macroinvertebrates bioassessments (Table 10, Figure 8).

Table 10. Impaired Waters within One Mile of the Site

Water Body Name	Section	AUID*	Affected Designated Use	Pollutant or Stressor	TMDL** ID
Rush Creek	T119, R23W, S11	07010206-528	Aquatic life, Aquatic recreation	Dissolved oxygen, E. coli, fish bioassessments, benthic macroinvertebrates bioassessments	No approved TMDL

**Assessment Unit Identification (AUID)*

***Total Maximum Daily Load (TMDL)*

[14] MPCA. Minnesota's Impaired Waters List. Accessed May 2023. https://www.pca.state.mn.us/air-water-land-climate/minnesotas-impaired-waters-list

Floodway/Floodplain

There are no regulated floodways or floodplains located in the Project Area. Several regulated 100-year floodplain areas (one percent annual chance of flooding) and a floodway are located within one mile of the Project Area (Appendix B). The floodway is associated with Rush Creek and is located 0.75 miles northwest of the Project Area. A floodplain associated with Rush Creek and the Public Water Wetland is located a third of a mile west of the Project Area; this floodplain has a small fringe area located in the 500-year floodplain (0.2 percent annual flood hazard zone). Additionally, there is a floodplain located a tenth of a mile to the north, one 0.6 miles to the east, and one 0.3 miles to the southeast of the Project Area. The Project would not encroach into or result in fill within regulated floodplain and floodway areas.

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

There are no known springs, seeps or karst features present in the Project Area.

1) **Depth to groundwater**: In the vicinity of the Project Area, the depth to groundwater ranges from approximately 40 to 85 feet. Wells in the area primarily utilize the Jordan aquifer or groundwater from the sand and gravel till layers above the Jordan aquifer.

2) **MDH Wellhead Protection Area**: The Project is not located within an MDH Wellhead Protection Area. The Project Area is an area with low groundwater sensitivity.

3) **Onsite or Nearby Wells**: No wells were identified within the Project Area according to the Minnesota Department of Health (MDH) Minnesota Well Index (MWI). Per MDH MWI, there are 11 domestic wells located within 500 feet of the Project Area (Table 11); six wells are located to the north, one well is east, two wells are southeast, and two wells are located southwest of the Project Area (Source: Minnesota Department of Health, Minnesota Well Index, accessed March 16, 2023). Two additional wells have been described by the developer. One associated with the church near the northwest corner of the building. The other associated with the existing home (at Oswald Farm Road/CR 116) located near the southeast corner of the home. A second well associated with this home and located 25 feet south of the existing well was previously capped in recent years.

Table 11. Verified Wells within 500 feet of the Site

Well ID	Use Type	Location from Site	Status	Depth (ft.)	Static Water Level (ft.)
665817	Domestic	North	Active	125	85
696183	Domestic	North	Active	125	55
661568	Domestic	North	Active	125	55
678242	Domestic	North	Active	125	59
691852	Domestic	North	Active	127	60
709877	Domestic	North	Active	80	40
660563	Domestic	East	Active	185	52
152502	Domestic	Southeast	Active	138	60
772680	Domestic	Southeast	Active	135	37
698097	Domestic	Southwest	Active	158	70
635280	Domestic	Southwest	Active	145	66

Source: MDH Minnesota Well Index (MWI), https://www.health.state.mn.us/communities/environment/water/mwi

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

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

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

Wastewater from the Project would not be pretreated prior to entering the system and would be conveyed by a gravity sanitary sewer system to the Elm Creek Interceptor trunk line where it would eventually be discharged to a publicly owned treatment facility (the Metropolitan wastewater treatment plant, St. Paul, Minnesota). Wastewater would be generated by domestic and municipal uses from the proposed residential, retail, medical development, as well as the existing church on site.

To adequately serve the Project, the City would extend the existing sewer trunk link that is connected to a Metropolitan Council Environmental Services location and conveys wastewater to the Elm Creek Interceptor at the municipal boundary northeast of the Project site. The capacity of the main sanitary pipe, as planned for within the City's Comprehensive Plan, was designed to accommodate the planned land uses that included a mix of residential, industrial and commercial uses within the northeast planning area. The 2040 Comprehensive Sanitary Sewer Plan accountas for other smaller lines to be connected to this main. Internal to the Project Area, each lot would be

served by a sanitary sewer designed and installed by the developer and permitted by the MPCA. The Project would increase sanitary wastewater flows compared to existing conditions; however, this increase is consistent with the 2040 Comprehensive Sanitary Sewer Plan.

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

   There are two subsurface sewage treatment systems (SSTS) adjacent to the Project Area - one for the church and one for the existing residence (at Oswald Farm Road/CR 116). Both septic systems would be decommissioned, as the church would be connected to the sanitary sewer system and the single-family residence would be removed. MPCA requirements for removing abandoned SSTS would be followed during the decommissioning of the systems.

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

   The wastewater discharge from the Project Area would not discharge to a surface water.

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

The majority of the Project Area is currently farmland, grassland, and forest which allows stormwater to infiltrate directly into the ground or run into the wetlands onsite. There is one stormwater pond to the northwest of the church facility that provides volume and rate control for runoff from the church buildings and parking lots. The existing residence does not have specialized stormwater treatment; stormwater runs off overland and infiltrates into the ground.

The Project would increase the amount of impervious surface present in the Project Area and the volume of stormwater. Approximately 43 acres (total Project Area minus trees that would be preserved) would be disturbed during the construction of the Project and 17.3 acres of impervious surface would be added to the Project Area, based on the current site plan (Figure 3, Appendix A). The stormwater would be directed to several stormwater ponds and biofiltration basins in the Project Area; these would provide treatment to remove pollutants from the stormwater and control the rate of stormwater runoff being discharged to comply with local and state standards, including Elm Creek Watershed requirements. After stormwater runs through the stormwater ponds and biofiltration basins and has been treated, it would be directed into onsite Wetlands 2 and 3. Currently, Minnesota climate trends are projecting an increase in rainfall frequency and intensity which would be factored into the stormwater design for the site.

A Stormwater Pollution Prevention Plan (SWPPP) would be prepared as part of the National Pollutant Discharge Elimination System (NPDES) Construction Permit required for the project. The SWPPP would conform to permit requirements and address sediment and erosion control Best Management Practices (BMPs) during construction. Sediment and erosion control BMPs may include bio-rolls, silt fence, rock construction entrances, inlet protection devices, erosion control blankets, erosion stabilization mats, and/or other similar devices to prevent soil erosion and sediment transport. Disturbed areas specified to be revegetated would be restored with final stabilization per permit requirements.

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

The Project Area would be connected to the public water supply, though the site is not currently publicly serviced. The City of Corcoran is constructing a new Water Treatment Plant (WTP) to serve the growing community. A new City-owned water tower would be constructed in the Project Area (the water tower project would in part be financed with federal funds and a federal environmental review would be completed for that separate project).

Climate Change and Resilience

Climate change trends may affect surface water and groundwater interactions that may lead to long-term uncertainty regarding surface and groundwater levels, resulting in impacts to groundwater supply availability, quality, and quantity. Surface and groundwater quantity is driven by the balance of atmospheric input from precipitation and losses due to evapotranspiration.[15] The City has undertaken an extensive water supply planning process as part

[15] DNR. *Climate's Impact on Water Availability*. Updated October 19, 2021 https://www.dnr.state.mn.us/climate/water_availability.html

of the proposed WTP. The City has completed a Northeast Water Supply Feasibility Study and is closely coordinating with regulatory agencies on the development of the proposed WTP. The City would be subject to the conditions of the DNR Water Appropriation Permit.

iv. Surface Waters

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

Wetland impacts are anticipated as part of the proposed development. The Project design sought to avoid and minimize wetland impacts and mitigate for unavoidable wetland impacts.
The Project Area excludes the adjacent property where Wetlands 2 and 3 are located, the largest wetlands in the immediate area. Direct or indirect impacts are expected to Wetlands 1, 4, 5, & 6 because of grading which would either fill the wetlands or alter the hydrology to the wetlands. Impacts to these wetlands are difficult to avoid due to the size and nature of the wetlands. Wetlands 1 and 6 are farmed wetlands with marginal hydrology. Alterations to the surrounding landscape are likely to adversely impact the hydrology of these wetlands. Similarly, Wetlands 4 and 5 are small and also vulnerable to surrounding landscape alterations. Anticipated wetland impacts could total 1.2 acres.

All necessary wetland permitting would be obtained prior to any wetland impacts occurring. Impacts would be regulated under the Wetland Conservation Act (WCA) as administered by the City of Corcoran as WCA LGU. Additionally, the U.S Army Corps of Engineers would regulate impacts to jurisdictional wetlands under Section 404 of the Clean Water Act.
Any wetland impacts requiring mitigation would be mitigated at a 2:1 ratio through the purchase of wetland bank credits. Credits would be purchased from the same Major Watershed and Bank Service Area, as credit availability permits, and would be purchased using the siting prioritization in the WCA.

The City of Corcoran must approve the proposed wetland impacts and plan for replacement before any impacts occur. Additionally, the Corps of Engineers must issue a jurisdictional determination. If any of the impacted wetlands are Corps jurisdictional, a permit would be required.

The wetland impacts are expected to have minimal effect on the host watershed, as the total impact area is not large, and the existing wetlands are low quality farmed wetlands or small seasonally flooded basins. The replacement wetlands in the wetland bank would be much higher quality wetlands and better able to provide ecosystem services than the existing, low-quality wetlands.

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

There are not any anticipated impacts or alterations to surface water features as a result of the Project. Appropriate BMPs such as silt fences, inlet protection, and other sediment and erosion control measures would be taken to avoid and minimize sedimentation in downstream waterbodies. The Project would not change the number or type of watercraft on any local waterbodies.

13. Contamination/Hazardous Materials/Wastes

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

A review of Minnesota Pollution Control Agency's (MPCA) *What's in My Neighborhood* (WIMN) database[16] was conducted to identify documented potentially contaminated sites within or in the vicinity of the Project Area. One site was identified within the Project Area and two sites were identified within one-half mile of the Project Area. Table 12 summarizes MPCA potentially contaminated sites within the Project Area and within a one-half mile buffer of the Project Area. Figure 11, Appendix A illustrates the location of potentially contaminated sites within and in close proximity to the Project.

Table 12. MPCA Potentially Contaminated Sites within a One-Half Mile of the Project Area

Site Name	Site ID	MPCA Program	Status	Approx. Distance from Project Area (ft.)	Direction in Relation to Project Area
Within the Project Area					
Kiphuth Residence	187436	Petroleum Remediation, Leak Site	Inactive (Leak Report 1995, site closed 1997)	650	North

[16] MPCA. Undated. What's in My Neighborhood. Available at: What's in My Neighborhood | Minnesota Pollution Control Agency (state.mn.us). Accessed. April 2022.

Site Name	Site ID	MPCA Program	Status	Approx. Distance from Project Area (ft.)	Direction in Relation to Project Area
Within One-Half Mile of the Project Area					
Hope Community Church Cemetery	135487	Construction Stormwater (C00033395)	Active (coverage issuance 2012-2023)	0	NA
Lithgow Automotive Inc	95746	Hazardous Waste (MNR000118828)	Inactive (registered 2003-2020)	400	North

An additional review of the Minnesota Department of Agriculture (MDA) WIMN database[17] was conducted to identify documented potentially contaminated sites within or in the vicinity of the Project Area. No records were identified with the Project Area or within a half-mile buffer.

The MPCA identified the Hope Community Church Cemetery (135487) within the Project Area. During the construction of the Project, this site would be fenced off, contractors would be verbally informed of its existence and the site would be clearly identified in contractors materials including plan sheets, so that the site would not be exposed or exacerbated by the construction of the Project. In the event that potentially contaminated soils or other potentially hazardous materials are encountered during construction, plans would be developed to properly handle and treat contaminated soil and/or groundwater. Any contaminated soils or other potentially hazardous materials encountered during construction would be handled and disposed of in accordance with MPCA and any other applicable requirements.

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

Construction Waste

Construction wastes would be typical of multifamily housing, senior living, commercial/retail, and medical office developments. Construction wastes would be primarily non-hazardous and would be managed as municipal solid waste (MSW) or construction/ demolition debris. Hazardous wastes in the form of used oils/lubricants, waste paints, or other materials may be generated during construction. The contractor would be required to manage and dispose of all construction-generated waste in accordance with MPCA requirements and all other applicable regulatory requirements. Construction wastes would either be recycled or stored in approved containers and disposed of in the proper facilities. Any excess soil material that is not suitable for use onsite would become the property of the contractor and would be disposed of properly. All solid waste would be managed according to MPCA and other regulatory requirements.

Operational Waste

The Project would generate solid waste during operation of the development, which is anticipated to include retail, medical, multifamily housing, and single-family housing. Solid waste generated during

[17] MDA. 2022. What's in My Neighborhood? - Agricultural. Available at: https://app.gisdata.mn.gov/mda-agchem/. Accessed. April 2022.

operation of the development would be typical of waste generated by these type of land uses and would be primarily managed as mixed MSW. The California Department of Resources Recycling and Recovery (CalRecycle) provides a list of estimated solid waste generate rates for office, industrial, service, and other establishments for general planning purposes[18]. For the residential land uses, the following estimated solid waste generation 12 lbs/housing unit/day. This along with an estimated office/warehouse solid waste generation rate of 1.42 lbs/100 square feet/day results in an estimated 2,806 tons of MSW per year. The collection of MSW would be managed by a waste hauler licensed by the City of Corcoran. The Project would adhere to all MPCA requirements and other regulations pertaining to the use, handling, and disposal of solid waste. Recycling areas would be provided in compliance with the Minnesota State Building code.

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

The Project is not anticipated to include permanent chemicals/hazardous materials storage or use during its operation. No above- or below-ground storage tanks are planned for permanent use within the Project Area. If this changes, a Spill Prevention, Control, and Countermeasures plan would be prepared by a licensed Minnesota Professional Engineer pursuant to federal regulations.

Construction equipment may require the limited use of potentially hazardous materials, such as gasoline or diesel fuels, engine motor oils, hydraulic fluids, and other lubricants. Vehicles responsible for the transportation of hazardous materials would be equipped with spill kits for rapid response to any spills and refueling procedures would be implemented to eliminate leakage. Additionally, all fuels, oils, and lubricants would be stored in containment apparatuses while not in use or when being stored. Construction staff would be trained to spot and appropriately respond to potential spills. In the event that a leak or spill incident occurs, the contractor would be required to respond in accordance with MPCA containment and remedial action procedures. A Spill Prevention, Control, and Countermeasures plan would be prepared by a Minnesota Professional Engineer pursuant to federal regulations.

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

It is not anticipated that the Project would generate or require storage of hazardous wastes during its construction or operation. Item12.c describes the potential storage and use of hazardous materials during construction and operation of the Project.

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

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

[18] CalRecycle. 2019. Estimated Solid Waste Generation Rates. Available at: https://www2.calrecycle.ca.gov/WasteCharacterization/General/Rates. Accessed April 2022.

The Project resides within Hennepin County and is within an ecological area classified as the Eastern Broadleaf Forest Province, Minnesota and Northeast Iowa Morainal Section, and Big Woods Subsection. Most of the Big Woods Subsection (approximately 75 percent) is cropland, with the remaining land consisting of pasture, upland forest, and wetlands. Historically, oak woodland and maple-basswood forest were common throughout the Big Woods Subsection. Vegetation consisted primarily of deciduous forest species, such as elm (*Ulmus* spp.), American basswood (*Tilia americana*), sugar maple (*Acer saccharum*), ironwood (*Ostrya virginiana*), bur oak (*Quercus macrocarpa*), northern red oak (*Q. rubra*), white oak (*Q. alba*), and aspen (*Populus* spp.). (DNR 2000)[19].

The Project Area and immediately adjacent properties consist of developed land associated with the Hope Community Church, a farmstead, agricultural fields, grass/shrubs, forested areas, wetlands, and ponds (Figure 3, Appendix A). Low density residential areas and a golf course are also nearby. These features could provide habitat for wildlife species, such as deer, raccoons, foxes, coyotes, rabbits, squirrels, mice, passerines and other common birds, raptors, various reptiles, amphibians, and fish.

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

State Listed Species and Significant Communities

Under Stantec's Limited License to Use Copyrighted Material (LA-2022-23) related to Rare Features Data, the DNR Natural Heritage Information System (NHIS) was searched in March 2023 to identify species and significant ecological communities within the Project Area and within a one-mile radius of the Project Area. No species records were identified within the Project Area. One species record was identified immediately south of the Project Area: the loggerhead shrike (*Lanius ludovicianus*; endangered).

Loggerhead shrike

The loggerhead shrike is associated with open landscapes, such as native upland grasslands, and is mostly restricted to areas that were historically prairie or oak savanna in the state of Minnesota. Other potential habitats include pastures, old fields, shelterbelts, farmyards, and cemeteries. This bird can be seen perching at a variety of sites, including hedgerows, shrubs, and small trees. Sites with thorned vegetation, such as honey locust (*Gleditsia triacanthos*), black locust (*Robinia pseudoacacia*), and hawthorns (*Crataegus* spp.), or barbed wire are useful as this species is carnivorous and impales prey. Finally, this species can occur in agricultural areas and non-native grasslands where there is short grass vegetation and perching sites available. (DNR 2022a)[20].

The Project Area contains grass/shrub habitat that may support the loggerhead shrike. Minimal tree removal is anticipated to be required as part of the Project. Therefore, the Project ***may impact*** the loggerhead shrike. Coordination with the DNR may be needed to avoid impacts to this species. It is unknown whether the loggerhead shrike has used the subject properties for nesting in the past, or whether it would find the present conditions suitable. Post construction, the Project would include an extensive landscape and planting plan to revegetate the site. Care would be taken to select plant species that are native to the area including approved native seed mixes, or that are hardy and would withstand the

[19] DNR. 2000. Ecological Classification System. Available at: https://www.dnr.state.mn.us/ecs/index.html. Accessed March 2023.
[20] DNR. 2022a. Rare Species Guide. Available at: https://www.dnr.state.mn.us/rsg/index.html. Accessed March 2023.

climate.

Native plant communities and sites of biodiversity and ecological significance

No native plant communities, sites of biodiversity significance, or regionally significant ecological areas (RSEA) were identified within the Project Area. Three RSEA were identified within a one-mile radius of the Project Area. These sites are ranked as either moderate, high, or outstanding in significance. A highly ranked site and a moderately ranked site are located approximately 0.35 miles and 0.75 miles west of the Project Area, respectively, and one outstanding site is located approximately one mile south of the Project Area. None of these sites are anticipated to be impacted as part of the proposed Project.

Federally Listed Species

The United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool (USFWS 2023)[21] was reviewed in April 2023 to identify federally listed species that have the potential to occur within the Project Area. Four species were identified from this review: the northern long-eared bat (*Myotis septentrionalis*; endangered), the tricolored bat (*Perimyotis subflavus;* proposed endangered), the whooping crane (*Grus americana*; non-essential experimental population), and the monarch butterfly (*Danaus plexippus*; candidate). The IPaC results are included in Appendix E (IPaC).

Northern long-eared bat

Suitable roosting, forage, and travel habitat for northern long-eared bat (NLEB) in the summer consists of a wide variety of contiguous forested and wooded habitats with varying tree density and amounts of canopy closure. While roosting, NLEB is generally found in deep crevices in areas such as forests and woodlots (i.e., live trees and/or snags greater than or equal to three inches in diameter at breast height that have exfoliating bark, cracks, crevices, and/or cavities) as well as linear features such as fence rows, riparian forests, and other wooded corridors. NLEB roosts in both live trees and snags. (Sasse and Perkins 1996[22]; Foster and Kurta 1999[23]; Owen et al. 2003[24]). Additional summer habitat for the NLEB consists of areas adjacent to wooded areas, namely emergent wetlands and edges of agricultural fields, old fields, and pastures. The NLEB has also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses. (USFWS 2022a)[25]. During winter months, NLEB hibernate in caves or abandoned mines (Foster and Kurta 1999)[17].

Hennepin County is listed as a county with documented white-nose syndrome (WNS) (WNS Response Team 2023[26] and DNR 2020[27]). According to the DNR NHIS database, no known roost trees or hibernacula are in the Project Area or within a one-mile radius of the Project Area. The DNR and USFWS maintain a list of townships containing documented NLEB maternity roost trees and/or hibernacula entrances. Based on a review of this list, occupied hibernacula are absent within 0.25 miles and no known

[21] USFWS. 2023. Information for Planning and Consultation. Available at: https://ipac.ecosphere.fws.gov/. Accessed March 2023.
[22] Sasse, D.B., and P.J. Pekins. 1996. Summer roosting ecology of northern long-eared bats (*Myotis septentrionalis*) in the White Mountain National Forest. Bats and forests symposium. British Columbia Ministry of Forests Working Paper 23:91-101.
[23] Foster, R.W. and A. Kurta. 1999. Roosting ecology of the northern bat. (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). Journal of Mammalogy 80:659-672.
[24] Owen et al. 2003. Homerange size and habitat use by the northern Myotis (*Myotis septentrionalis*). American Midland Naturalist 150: 352-359.
[25] USFWS. 2022a. Rangewide-Wide Indiana Bat & Northern Long-Eared Bat Survey Guidelines. Available at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines. Accessed March 2023.
[26] WNS Response Team. 2023. Where is WNS Now? Available at: https://www.whitenosesyndrome.org/where-is-wns. Accessed March 2023.
[27] DNR. 2020. White-nose Syndrome and Minnesota's Bats. Available at: https://www.dnr.state.mn.us/wns/index.html. Accessed April 2023.

occupied maternity roost trees occur with 150 feet of the Project (DNR and USFWS 2021)[28].

Suitable habitat (contiguous forested area) is absent within the Project Area. The Project Area contains some wind break trees but is primarily shrubs that would not provide suitable roosting habitat. The Project Area also contains emergent wetlands, ponds, agricultural edges, and structures that could be used for foraging or roosting but given the growth of residential and developed areas in and around the Project Area, the use of these areas by the NLEB is unlikely. Tree clearing is anticipated to be required as part of the Project. Hope Community Church intends to complete tree/shrub removal during the inactive season (November 15 to March 31) to avoid the NLEB active season (April 1 to November 15) and NLEB pupping season (June 1 to July 31). In the event any tree clearing occurs during the active season, the Project Proposer commits to hiring a qualified party to determine the presence or absence of the species prior to such activity. Therefore, the Project would have ***no effect*** on the NLEB.

The reclassification of the NLEB from threatened to endangered and the nullification of the Final 4(d) Rule took effect on March 31, 2023 (USFWS 2023b)[29].

Tricolored bat

During the non-hibernating seasons, tricolored bats will roost in live and dead leaf clusters of live or dead deciduous hardwood trees. Tricolored bats have also been observed roosting in artificial structures such as barns, bridges, roofs, and other concrete structures. During the winter, tricolored bats hibernate in caves and mines. If mines or caves are not present within the region, they have been observed hibernating in road-associated culverts, tree cavities, and abandoned water wells. (USFWS 2022b)[30].

Suitable habitat in the form of deciduous hardwood trees is present within the Project Area. Minor tree clearing is anticipated for the Project during the bat inactive season. Therefore, the Project may impact this species, but it is recommended that the Project be reassessed for potential effects when a final listing status is determined. If tree clearing during the active season cannot be avoided, the developer would hire a qualified party to determine the presence or absence of the species.

Whooping crane

The whooping crane is a migratory bird species that once nested in northern prairies, but now breeds in remote northern forests in Canada as well as in an experimental population in Wisconsin, preferably within coniferous habitat containing swamps and nearby lakes or ponds. Winter habitat consists of coastal marshes (e.g., Texas, Louisiana, and Florida). The diet of the whooping crane is not well known in summer months, but it is thought to be similar to their wintering diet of shellfish, frogs, snakes, insects, small fish, and plant matter like roots and berries. (National Audubon Society undated)[31].

The Project is within the range of a known, non-essential experimental population of whooping cranes. If this species is found within Minnesota, it is highly likely to be from this experimental population from Wisconsin that is non-migratory. Whether part of a natural or experimental population, Minnesota is out of the Central Flyway used by this species, so there is no concern for stopover sites within the Project Area. Additionally, Minnesota is not located within a known wintering or breeding ground for this

[28] DNR and USFWS. 2021. Townships containing documented northern long-eared bat (NLEB) maternity roost trees and/or hibernacula entrances in Minnesota. Available at: http://files.dnr.state.mn.us/eco/ereview/minnesota_nleb_township_list_and_map.pdf. Accessed March 2023.
[29] USFWS. 2023b. Effective date to reclassify northern long-eared bat as endangered extended. Available at: https://www.fws.gov/press-release/2023-01/effective-date-reclassify-northern-long-eared-bat-endangered-extended. Accessed January 2023.
[30] USFWS. 2022b. Tricolored Bat (*Perimyotis subflavus*). U.S. Fish & Wildlife Service. Available: Tricolored Bat (Perimyotis subflavus) | U.S. Fish & Wildlife Service (fws.gov). Accessed January 2023.
[31] National Audubon Society. undated. Guide to North American Birds: Whooping Crane. Available at: https://www.audubon.org/field-guide/bird/whooping-crane. Accessed April 2023.

species. Suitable habitat (prairies, coniferous swamps, lakes, ponds, or coastal marshes) is not present within the Project Area. Wetland features and a small pond are present within the Project Area, but these areas are isolated within an area dominated by active agriculture and development with minimal coniferous tree canopy. Finally, the Project does not overlap any USFWS or National Park Service lands. As such, impacts are not anticipated for this species.

Monarch butterfly

The monarch butterfly is a migratory butterfly that exists in two main populations within the United States divided by the Rocky Mountains: the eastern population that overwinters in the mountains of Mexico, and the western population that overwinters along the southern pacific coast of California (United States Department of Agriculture [USDA] Forest Service undated)[32]. Monarch butterflies are a widespread species found in fields, prairies, savannahs, and most places where their host plant, milkweeds (*Asclepias* spp.), occur throughout the United States and southern Canada. This species generally occurs in areas with high densities of nectar sources. During late summer and during migration, adults use nectar species such as black-eyed Susan (*Rudbeckia hirta*), narrow-leaved coneflower (*Echinacea angustifolia*), and rough blazing star (*Liatris aspera*) (DNR 2022b)[33]. However, the presence of milkweeds is required for breeding habitat as it is the only plant on which the larvae can feed (National Wildlife Federation undated)[34].

Given the level of disturbance from active agriculture and development, suitable habitat (nectar sources and milkweed) for the monarch butterfly is likely not present or highly limited within the Project Area. Canada goldenrod (*Solidago canadensis*), a nectar source, was identified in the Project Area during the wetland delineation (Fall 2022). Undocumented nectar sources and/or milkweed may also be present in the grassland areas found within the Project Area. Therefore, impacts to the monarch butterfly may occur within the Project Area. It is recommended that the effects be reassessed when a listing status is revisited for this species.

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

State Listed Species and Significant Communities

Loggerhead shrike

Suitable habitat for the loggerhead shrike (grass/shrub) is located within the Project Area. Therefore, the proposed Project may impact this species if it exists on the site.

According to the 2010 State of the Birds Report on Climate Change conducted by the North American Bird Conservation Initiative (NABCI), the effects of warming temperatures on the loggerhead shrike have not been thoroughly investigated, but their assessment indicated a low vulnerability (NABCI 2010)[35]. However, given the carnivorous diet of this species, it could be impacted by prey availability given the

[32] United States Department of Agriculture [USDA] Forest Service. undated. Migration and Overwintering. Available at: https://www.fs.fed.us/wildflowers/pollinators/Monarch_Butterfly/migration/. Accessed November 2021.
[33] DNR. 2022b. Butterfly Gardens. Available at: https://www.dnr.state.mn.us/gardens/butterfly/index.html. Accessed March 2022.
[34] National Wildlife Federation. undated. Monarch Butterfly. Available at: https://www.nwf.org/Educational-Resources/Wildlife-Guide/Invertebrates/Monarch-Butterfly. Accessed December 2021.
[35] NABCI, U.S. Committee. 2010. The State of the Birds 2010 Report on Climate Change, United States of America. Washington, DC: U.S. Department of the Interior. http://www.stateofthebirds.org/2010/pdf_files/State of the Birds_FINAL.pdf. Accessed January 2023.

various vulnerabilities of other bird, reptile, insect, and small mammal species to climate change (The Cornell Lab of Ornithology 2023)[36].

Native plant communities and sites of biodiversity and ecological significance

No native plant communities, sites of biodiversity significance, or RSEA are located within the Project Area, and no impacts are anticipated for the three RSEA located within one mile of the Project Area.

While no impacts are anticipated on the Project level, as discussed in Section 7 Climate Adaptation and Resilience, the warmer and wetter conditions expected in Minnesota as a result of climate change are expected to impact these communities. These diverse communities are made up of many species, with some having higher tolerances to heat and moisture than others. If the habitat becomes unsuitable for some species, it could change the dynamics within the entire community.

Federally Listed Species

Northern long-eared bat

Contiguous forested habitat is not present within the Project Area, as such, the Project is anticipated to have no effect on the NLEB. The Project Area is over 0.25 miles from a known, occupied hibernaculum. No known maternity roosts occur within 150 feet of the Project and Hope Community Church intends to conduct minimal tree clearing during the NLEB inactive season (November 15 to March 31). If tree clearing during the active season cannot be avoided, the developer would hire a qualified party to determine the presence or absence of the species.

As discussed in Section 7, Minnesota's climate is trending warmer with more extreme precipitation events. Changes in temperature and precipitation may influence the NLEB's available suitable roosting and foraging habitat, as well as prey availability (USFWS 2022c)[37]. Although a less significant stressor compared to white-nose syndrome, climate change variables may negatively affect the NLEB (USFWS 2022d)[38].

Tricolored bat

The Project may impact the tricolored bat due to the presence of suitable habitat (deciduous hardwood trees) within the Project Area and the plan to clear minimal trees. This species is proposed as federally endangered, so impacts should be reassessed when a listing status is finalized.

The tricolored bat is susceptible to climate change. For instance, areas that are experiencing more intense rainfall, such as Minnesota, may also see decreased foraging behavior from the tricolored bat along with decreased insect availability (USFWS 2021)[39].

Whooping crane

The Project Area does not contain suitable habitat (prairies, coniferous swamps, lakes, ponds, or coastal marshes) that could support the whooping crane and it is located outside of the Central Flyway used by

[36] The Cornell Lab of Ornithology. 2023. All About Birds – Loggerhead Shrike Life History. Available at: https://www.allaboutbirds.org/guide/Loggerhead_Shrike/lifehistory. Accessed January 2023.
[37] USFWS. 2022c. Northern Long-Eared Bat Overview. Available at: https://www.fws.gov/species/northern-long-eared-bat-myotis-septentrionalis. Accessed September 2022.
[38] USFWS 2022d. Proposed Rule 87 FR 16442: Endangered and Threatened Wildlife and Plants; Endangered Species Status for Northern Long-Eared Bat. Available at: https://www.federalregister.gov/d/2022-06168. Accessed January 2023.
[39] USFWS. 2021. Species Status Assessment Report for the Tricolored Bat (*Perimyotis subflavus*). Version 1.1. Page iii. USFWS Northeast Region. Hadley, MA. Available at: https://fws.gov/species/tricolored-bat-perimyotis-subflavus. Accessed February 2023.

this species. Wetland features and a small pond are located in the Project Area, but these areas are isolated in an area dominated by active agriculture and development with minimal coniferous tree canopy. Individuals found in Minnesota would be from a non-essential experimental population in Wisconsin that is non-migratory. Therefore, impacts are not anticipated for the whooping crane as a result of the Project.

According to Audubon, this already rare species is highly vulnerable to climate change; given an imminent 1.5-degree Celsius increase in average global temperature if no action is taken, this species would be on track to lose 86 percent of its breeding range and 19 percent of its wintering range (National Audubon Society undated)[40].

Monarch butterfly

Impacts to the monarch butterfly may occur within the Project Area due to the presence of Canada goldenrod and additional grassland that may hold undocumented nectar sources and/or milkweed. This species is a candidate for federal listing; therefore, effects should be reconsidered when a listing status is revisited.

As discussed in Section 7, climate change is anticipated to result in increasing temperatures in Minnesota, which may increase the number of days and the area in which monarch butterfly populations will be exposed to unsuitably high temperatures. This can result in them using up fat stores too quickly at their overwintering sites and may result in them incorrectly judging when to enter and exit states of dormancy (diapause). (Kobilinksy 2019)[41].

Invasive Species

Noxious weeds and invasive species in Minnesota are managed through the MDA under Minnesota Statutes Section 18.78, the DNR, and local ordinances. Best management practices (BMPs) during construction activities and operation within the Project Area should be implemented to minimize the introduction or spread of noxious weeds and invasive species. These practices include cleaning vehicles and equipment of mud and dirt from other construction areas, removing seeds that attach to clothing or equipment, minimizing soil disturbance, not moving potentially contaminated materials between sites, and staying on designated roads/trails. (USDA undated[42] and DNR 2023[43]).

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

Sightings of any rare species during construction or operation of the Project would be reported to the DNR Nongame Wildlife specialist. Hope Community Church would follow the guidance that is received to avoid impacts.

Hope Community Church understands restrictions related to the NLEB and intends to conduct tree clearing during the inactive season (November 15 to March 31) to avoid the NLEB active season (April 1 to November 15) and the NLEB bat pupping season (June 1 to July 31). If tree clearing during the active season cannot be avoided, the developer would hire a qualified party to determine the presence or absence

[40] National Audubon Society. undated. Guide to North American Birds: Whooping Crane. Available at: https://www.audubon.org/field-guide/bird/whooping-crane. Accessed April 2023.
[41] Kobilinksy, Dana. 2019. Watch: Temperature Drives Internal Clock for Monarchs. The Wildlife Society. Available at: https://wildlife.org/watch-temperature-drives-internal-clock-for-monarchs/. Accessed September 2022.
[42] USDA National Invasive Species Information Center. Undated. Best Management Practices. Available at: https://www.invasivespeciesinfo.gov/subject/best-management-practices. Accessed January 2023.
[43] DNR. 2023. Terrestrial Invasive Species. Available at: https://www.dnr.state.mn.us/invasives/terrestrial/index.html. Accessed January 2023.

of the species.

Hope Community Church plans to utilize native seed mixes to buffer wetlands and ponds as part of their landscaping efforts.

15. Historic Properties

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

The Minnesota State Historic Preservation Office (SHPO) was contacted regarding the presence of architectural or archaeological resources. Cultural and archaeological resource are not present within the proposed expansion site.

16. Visual

Describe any scenic views or vistas on or near the project site. Describe any project related visual effects such as vapor plumes or glare from intense lights. Discuss the potential visual effects from the project. Identify any measures to avoid, minimize, or mitigate visual effects.

The Project Area and adjacent properties currently consists of a church, cemetery, agriculture, a barn, and a single-family home. The Project Area itself is vacant. No designated scenic views or vistas are present in the vicinity of the Project. The landscape immediately surrounding the site consists of a single-family residential neighborhood to the north and farmland or vacant land to the south, east, and west. The primary visual impact would the transition of views from undeveloped, agricultural and large lot rural residential to buildings, parking lots, and stormwater basins. The Project is not expected to include industries that would emit vapor plumes. The Project Area is zoned by the City of Corcoran as General Mixed Use and Public/Institutional. The Project would be required to adhere to the City of Corcoran's ordinance requirements including building height and form, landscape screening, and lighting. The existing tree lines and vegetation along sections of the Project Area would partially serve as a buffer for nearby residents. Tree removal and wetland impacts would be minimized to the extent possible primarily around the edges of the Project Area. Additional vegetative screening may be added, where appropriate.

17. Air

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

The Project is not anticipated to include any stationary sources emissions.

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

The Project Area is located in a Carbon Monoxide (CO) maintenance area. The Project is expected to generate increased vehicular traffic, which would result in a relatively small increase in CO emissions and other vehicle related emissions. The Minnesota Department of Transportation (MnDOT) developed a CO hot spot screening method designed to identify intersections that may result in CO emissions that exceed air quality standards. MnDOT's screening method assumes that intersections with a total daily traffic volume exceeding 82,300 vehicles per day may result in potential CO impacts that exceed air quality standards. A traffic impact study was completed for the Project, which is discussed in Item 20 of this EAW. Based on this study, the roadways in and surrounding the Project Area would not experience traffic volumes exceeding 82,300 vehicles per day. Therefore, it is not anticipated that vehicle emissions generated by the project would have the potential to significantly impact CO air pollution.

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

The Project is not anticipated to produce dust or odors during its operation, but it may generate temporary dust and odors during construction. Sensitive receptors to these dusts and odors would include residents surrounding the Project Area. Potential odors would likely be associated with exhaust from diesel engines and fuel storage. Dust generated during construction would be minimized through standard dust control measures such as applying water to exposed soils and limiting the duration of exposed soils to the extent possible. Dust levels after construction is complete would be minimal as all surfaces would be paved or revegetated. With these mitigations in place, the quality of life for nearby residences is not anticipated to be affected.

18. Greenhouse Gas (GHG) Emissions/Carbon Footprint

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

The GHG emissions for the Project are calculated using the Simplified Greenhouse Gas Emissions Calculator (SGEC) tool and are based on the methodologies for developing a carbon footprint described in Minnesota Environmental Quality Board's (EQB's) Revised EAW Guidance (January 2022). Table 13 shows the emission categories for project carbon footprint calculations, as provided in the EQB Guidance.

Table 13. Emission Categories for Carbon Footprint

Category	Scope	Project Phase	Type of Emissions
Direct Emissions	Scope 1	Operations	Combustion (Stationary, Area, Mobile Sources)
	Scope 1	Operations	Non-Combustion Processes
	Scope 1	Construction	Combustion (Mobile Sources)
	Scope 1	Construction	Land-Use
Indirect Emissions	Scope 2	Operations	Off-site Electricity/Steam Production (Market-Based and Location-Based)
	Scope 3	Operations	Off-site Waste Management
Atmospheric Removal of GHGs	Scope 1 (Sinks)	Construction/Operations	Land-Use (CO2 removals to terrestrial storage)

A description of the carbon footprint associated with the Project is provided below.

Construction Emissions

GHG emissions from construction are associated with fuel combustion in the mobile construction equipment and on-road vehicles. The assumed construction schedule is five (5) years to complete the Project. For on-road vehicles (commuting construction workers, dump trucks and semi-trucks), emissions are calculated by estimating the number of vehicles, miles traveled, gallons of fuel used (using default mileage rates), and emission factors from the U.S. EPA's Emission Factors Hub (https://www.epa.gov/climateleadership/ghg-emission-factors-hub, updated April 2022).

For off-road vehicles, the quantity and horsepower of cranes, backhoes, loaders, bulldozers, excavators, and skid steers was estimated based on similar projects. The default fuel consumption rate of 0.05 gallons per horsepower-hour[44] is used to determine the fuel usage for all equipment. Similar to the on-road vehicles, emission factors from the Emission Factors Hub are used to calculate GHG emissions.

Per EQB's Revised EAW Guidance, total construction emissions to construct the Project are divided by the lifetime of the project, estimated to be 50 years.

Operational Emissions – Mobile Sources

Average daily trips associated with the proposed Project are provided in Table 14.

Table 14. Average Trips per Day

Activity	Trips/Day
Multi-Family Unit Residents	1,543
Senior Living Residents (includes 55+ housing, senior	1,628

[44] Based on South Coast Air Quality Management District CEQA Air Quality Handbook, Table A9-3E.

housing, senior villas, and row townhomes)	
Retail Facilities (two coffee shops, two fast-casual restaurants, and strip retail)	2,794
Medical Facilities	3,181
Deliveries (assumes heavy duty diesel trucks)	15
Total	9,161

It is conservatively assumed that these trips are five (5) miles each and take place for 365 days per year. Gas mileage for light duty vehicles (residents, retail and medical) is estimated based on the U.S. Department of Transportation's Bureau of Transportation Average Fuel Efficiency for Light Duty Vehicles. Delivery trucks are assumed to be heavy-duty diesel trucks. Gas mileage for the diesel trucks are based on U.S. Department of Transportation, Federal Highway Administration data from 2019. GHG emissions associated with these trips are calculated using the Emission Factors Hub.

Operational Emissions – Stationary Combustion

The projected natural gas usage for the buildings associated with the Project is estimated using the U.S. Energy Information Administration's Commercial Buildings Energy Consumption Survey (CBECS, 2012 – released May 2016). The CBECS provides natural gas intensities in standard cubic feet per square foot per year for several different building activity categories.

Natural gas combustion GHG emissions are calculated using emission factors from the Emission Factors Hub.

Operational Emissions – Offsite Electricity Production

Similar to natural gas usage, electricity needs for the proposed buildings are estimated using the CBECS, which provides electricity usage intensity in kilowatt-hours per square foot of building space. GHG emissions occur offsite (Scope 2) when the electricity is generated. The SGEC tool calculates GHG emissions from electricity generation on a regional basis (defined by U.S. EPA using data from the EIA and the North American Electric Reliability Corporation (NERC))[45], using average emission factors based on the mix of fuels used to generate the electricity in each region. For this project, the Midwest Reliability Organization West (MROW) region is used. The electricity generation in MROW is comprised of approximately 50 percent fossil fuels (coal and natural gas), nine percent nuclear and approximately 40 percent renewables (hydro, wind, and solar).

Operational Emissions - Waste Management

GHG emissions from waste management are associated with the waste generation, transportation to landfill, equipment use at landfill and fugitive landfill methane emissions (based on typical landfill gas collection practices and average landfill moisture conditions). For this Project, emissions are provided for residential waste only. The waste generation for the medical and retail facilities are not included as no reliable waste data source was identified.

Estimates were made for the number of residents per unit for each of the housing types: multi-family housing – four residents, senior housing and 55+ housing – one resident, and villas and row townhomes – two residents. The total number or residents was estimated to be 1,832.

[45] https://www.epa.gov/egrid

A default waste generation rate of 4.9 pounds per person per day was obtained from the *U.S. EPA's Fact Sheet, 2018 – Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2018*. Conservatively applying this rate to the number of residents yields a waste generation rate of 1,638 tons per year.

GHG emissions are estimated based on emission factors from the U.S. EPA's Waste Reduction Model (WARM).

Carbon Sequestration Associated with Land Use Changes

As prescribed by the EQB's Draft EAW Guidance, GHG emissions associated with changes in land use are quantified using the Chapter 6: Land Use, Land-Use Change and Forestry, of the U.S. EPA's Inventory of Sources and Sinks of Greenhouse Gases[46], which provides an assessment of greenhouse gas fluxes resulting from land use and land use change in the U.S. The term "flux" describes the exchange of carbon dioxide to and from the atmosphere. A negative flux is a removal of carbon dioxide from the atmosphere, or carbon sequestration.

For this Project, GHG emissions were calculated for the following proposed land use changes: Wetland to Settlement (developed areas consisting of a mix of lawns and other grassy areas, trees, landscaping and impervious surfaces), Forest to Settlement, Cropland to Wetland (i.e. stormwater pond), and Cropland to Settlement. The net increase in CO_2e associated with the losses of carbon sinks is estimated at 355 tons per year.

Summary

A summary of GHG emissions are provided in Table 15. Emissions are presented in tons per year of carbon dioxide equivalent, which takes into account each GHG's global warming potential (GWP). Detailed emission calculations are provided in Appendix G Greenhouse Gas Analysis Calculations.

Table 15. GHG Emissions Summary (CO2e in short tons per year)

Scope	Source	GHG Emissions (ton/yr of CO2e)
Direct Emissions		
Scope 1	Construction – Mobile Sources	683
Scope 1	Operations – Stationary Combustion (Natural Gas)	1,325
Scope 1	Operations – Mobile Sources	7,138
Indirect Emissions		
Scope 2	Operations – Purchased Electricity	3,358
Scope 2	Operations – Waste Management	954

[46] https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

Atmospheric Removal of GHGs		
Scope 1 – Sinks	Land Use*	355
	Total	13,813

** Positive number reflects net gain in emissions due to loss of carbon sequestration from the land.*

b. GHG Assessment

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

Mitigation Considerations

The following possible activities may be considered to help mitigate the project's GHG emissions:

- Minimize grading, incorporating existing topography into the site design.
- Elimination of invasive species and replacing with native grasses and plants.
- Keeping as many existing trees as possible.
- Re-using surface water collected in ponds for irrigation.
- Utilizing best management practices (BMPs) to conserve water, preserve water quality, limit pesticide and fertilizer applications and habitat management.
- Energy efficient lighting in buildings and parking lots.
- Use of energy efficient building materials.
- Installation of energy efficient appliances, windows and heating, ventilation and air conditioning (HVAC) units.
- Use of renewable energy sources

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

Reductions from Selected Mitigation

The mitigation measures above may help offset the GHG emissions from the Project, but were not explicitly quantified in this analysis. The Project's GHG emissions (without mitigation) are conservatively estimated to be those presented in Table 15.

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

Net Lifetime GHG Emissions and Effect on State and Local Emissions Goals

The project lifetime is estimated at 50 years. Thus, the lifetime emissions associated with the project are approximately 690,648 tons of CO_2e. This conservative total may be offset by the mitigation measures noted above. The project's GHG emissions would have minimal effect on the State of Minnesota's or the local area's GHG reduction goals.

19. Noise

Describe sources, characteristics, duration, quantities, and intensity of noise generated during project

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

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

   Existing noise sources include vehicle traffic along CSAH 30 and County Road (CR) 116, agricultural land use, and activities associated with Hope Community Church, which is generally situated in the center of the Project Area.

2) *Nearby sensitive receptors*

   The noise receptors nearest to the Project Area include the residential areas immediately north of the Project Area on the south side of Hunters Ridge and the residential areas immediately east of the existing Hope Community Church, across CR 116. The closest residential homes are approximately 100-200 feet from the Project Area, along the northern boundary of the Project Area.

3) *Conformance to State noise standards*

   The Project would minimize noise disturbances caused by the construction of the Project to the extent possible and would adhere to the noise regulations outlined in Minnesota State Statute 7030.0030 and Corcoran City Ordinances 1060.090 and 82.03 subpart 5 (MPCA 2015 and City of Corcoran Municipal Code 2022)[16,47]. The regulations state that construction activities are prohibited between 7:00 p.m. and 7:00 a.m. on weekdays and 4:00 p.m. and 8:00 a.m. on weekends and federal holidays. (MPCA 2015)[6].

4) *Quality of life*

   The Project would consist of multifamily housing, senior living, commercial/retail, and medical office uses that would not emit noise levels exceeding state noise standards. Construction of the Project would temporarily result in elevated noise levels. Construction noise would be temporary and would adhere to local ordinance requirements. No construction or operation hours would occur during nighttime hours. Construction equipment would be properly muffled and maintained in working order. This Project is not anticipated to affect the quality of life for nearby residents. The Project would be required to adhere to State and city noise regulations.

20. Transportation

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

1) Existing parking spaces: 224
   Proposed parking spaces: Approximately 1,786

2) Total average daily traffic generated: 8,231 trips per day

[47] MPCA 2015. Noise rules in Minnesota. Available at: A Guide to Noise Control in Minnesota (state.mn.us). Accessed March 2022.

3) Maximum peak hour traffic generated and time of occurrence: 774 trips during p.m. peak hour (4:30-5:30 p.m.)

4) Source of trip generation rates: Trip Generation, Eleventh Edition, published by the Institute of Transportation Engineers

5) Availability of transit and/or other alternative transportation modes: There are no transit routes or pedestrian facilities in the Project area.

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

A complete Traffic Impact Study with existing and future volumes is included in the Appendix H. This appendix includes relevant figures including existing traffic volumes, future peak traffic volumes, proposed development layout, and access locations.

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

The following mitigation measures are recommended at each intersection:

- CSAH 30/CR 116
  - Short term – Construct dedicated westbound right lane 300 feet in length.
  - Long term – No additional improvements needed.

- CR 116/Hunters Ridge
  - Short term – Construct planned northbound and southbound left and right turn lanes on CR 116. Widen eastbound and westbound Hunters Ridge approaches to provide a 200-foot left turn lane and a through/right turn lane.
  - Long term – No additional improvements needed.

- CSAH 30/access
  - Short term – Construct 300-foot eastbound left turn and westbound right turn lanes on CSAH 30. Construct southbound approach with 200-foot left turn and right turn lanes.
  - Long term – No additional improvements needed.

21. Cumulative Potential Effects

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

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

While the market would ultimately drive the phasing of the Project, it is anticipated that multifamily and senior housing would ultimately lead this development due to current market conditions, and

utility availability. From that point, it is anticipated that the retail and commercial spaces would begin to develop, followed by/or along with subsequent housing phases. There are no other projects in the surrounding area that are known to be in construction, operation, or planned; and therefore, could not be considered in the cumulative potential effects.

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

As referenced in Item 12.b.iii., the City of Corcoran is constructing a new Water Treatment Plant to serve the growing community. The new City-owned water tower would be constructed in southern portion of the Hope Community Development Project Area. Note: the water tower project would in part be financed with federal funds and a separate (federal) environmental review would be completed for that project. It is the City of Corcoran's intent to have the water tower in operation by year end 2024.

There is one other development that we considered as a part of this response and that is the Amberley and Bellwether developments approximately 0.25-mile to the northeast (north of Hunters Ridge and east of CR 116). This will be a residential development with approximately 400 homes. A majority of the homes are within the Bellwether portion of the developments, which is an age-restricted community. Construction of the development is underway and full build-out is anticipated for 2024. An Environmental Assessment Worksheet was completed for this project when it was known as "Encore" in 2018.

In discussions with City of Corcoran, no other reasonably foreseeable future projects were identified in the Project Area (as described in Item 21.a.).

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

In reviewing the Hope Community Development Project and the new City-owned water tower project, the cumulative potential effect would be limited to the conversion of agricultural land to non-agricultural land. The water tower project would impact 1.2 acres of agricultural land, that along with the Hope Community Development Project's 16.8 acres of conversion (refer to Table 3 Cover Types) would account for a total conversion of approximately 18 acres in Corcoran, Minnesota.

Similar to the cumulative potential effects of the Hope Community Development Project and the City-water tower project, the previously approved Amberly and Bellwether developments will also result in a conversion of agricultural land. These previously approved developments were part of the Encore EAW completed prior to construction. Agricultural land will be replaced with impervious surface area (i.e., rooftops and paved surfaces). Both developments will manage stormwater per local and state requirements. Additionally, the City worked with the developers to consider landscaping for the built condition. The developments will introduce new traffic to the local roadway system, and their independent traffic analysis, study and recommendations were used to plan for any necessary safety or operation improvements.

22. Other Potential Environmental Effects

If the project may cause any additional environmental effects not addressed by items 1 to 19, describe the effects here, discuss the how the environmentwill be affected, and identify measures that

will be taken to minimize and mitigate these effects.

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

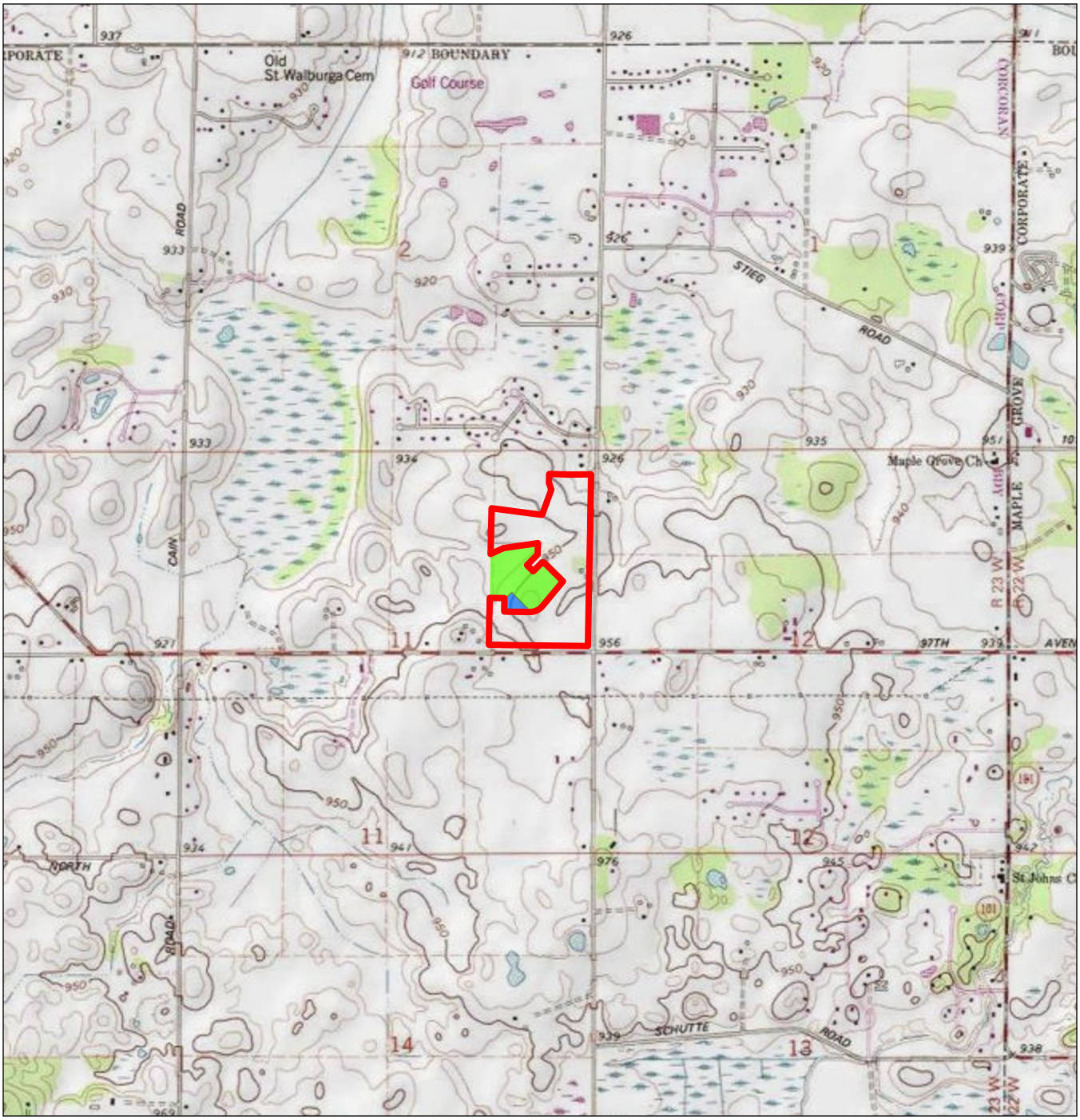
RGU CERTIFICATION
*(The Environmental Quality Board will only accept **SIGNED** EnvironmentalAssessment Worksheets for public notice in the EQB Monitor.)*

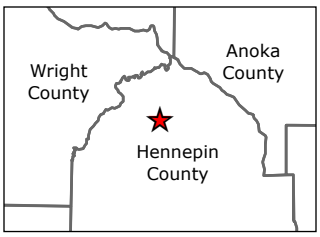
I hereby certify that:

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

Signature Natalie Davis McKeown Date 5/30/2023

Title Planner





Legend

- Project Area
- Existing Development
- Under Seperate Review

0 1,000 2,000 Feet

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N

Stantec

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by KJM on 2023-05-16

Client/Project
City of Corcoran, MN
Hope Church Development
EAW

193806102

Figure No.
1

Title
Project Location USGS Topo Map

Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Stantec
3. Background: USGS Rodgers 7.5 Minute Quadrangle

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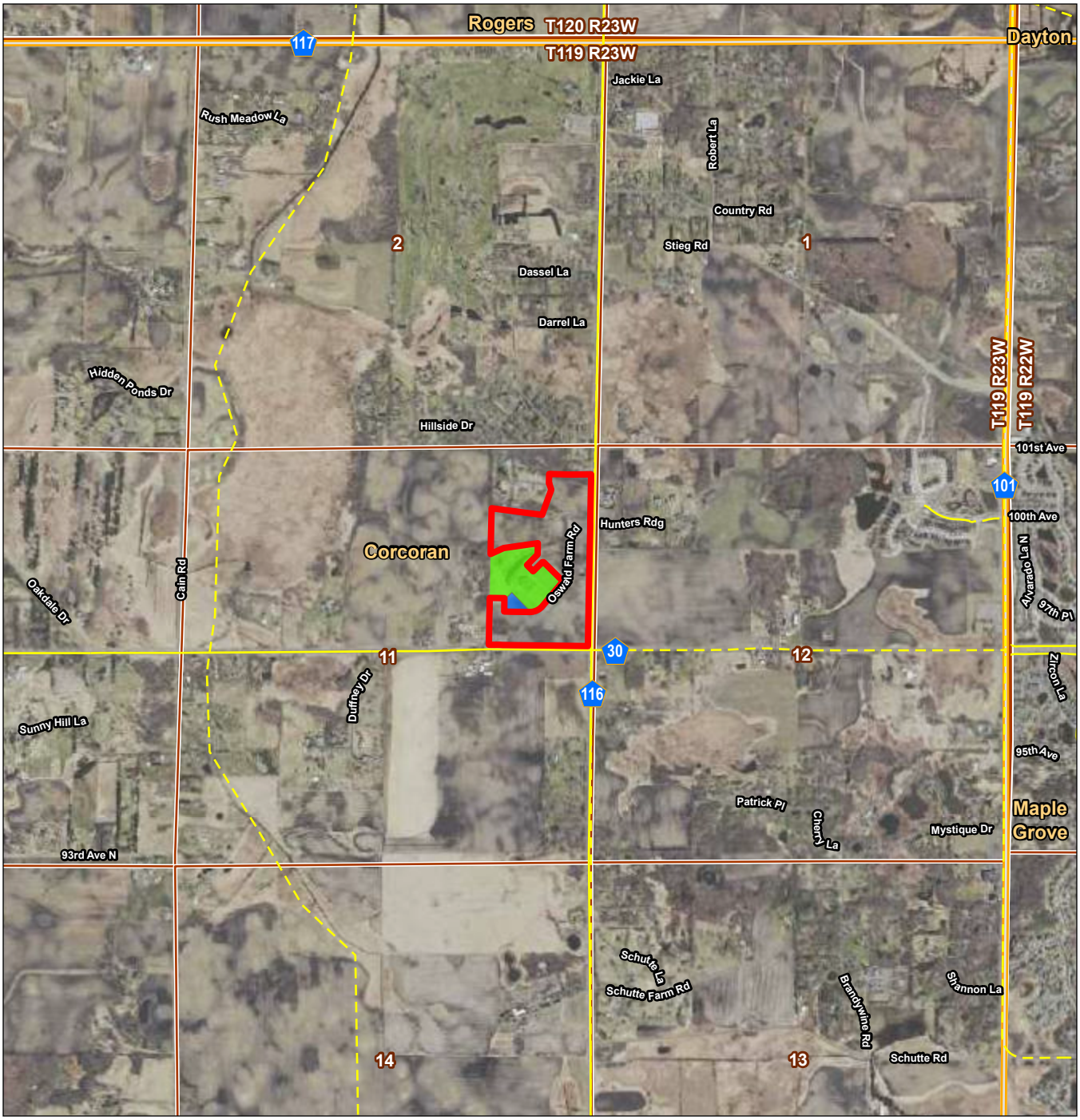

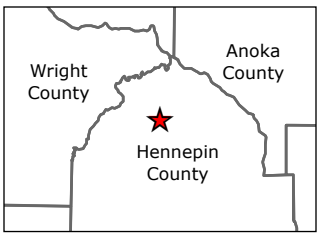

Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Stantec, MnGeo, MnDNR, MnDOT
3. Background: 2020 color 7-county

Legend
- Project Area
- Existing Development
- Under Seperate Review
- Municipal Boundary
- PLSS Boundary

Metro Region Trails/Bikeways

Trail Status
- Planned
- Existing

0 1,000 2,000 Feet
(At original document size of 8.5x11)
1:24,000

N

Stantec

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by KJM on 2023-05-16

Client/Project
City of Corcoran, MN
Hope Church Development
EAW

193806102

Figure No.
2

Title
Project Location Aerial Map

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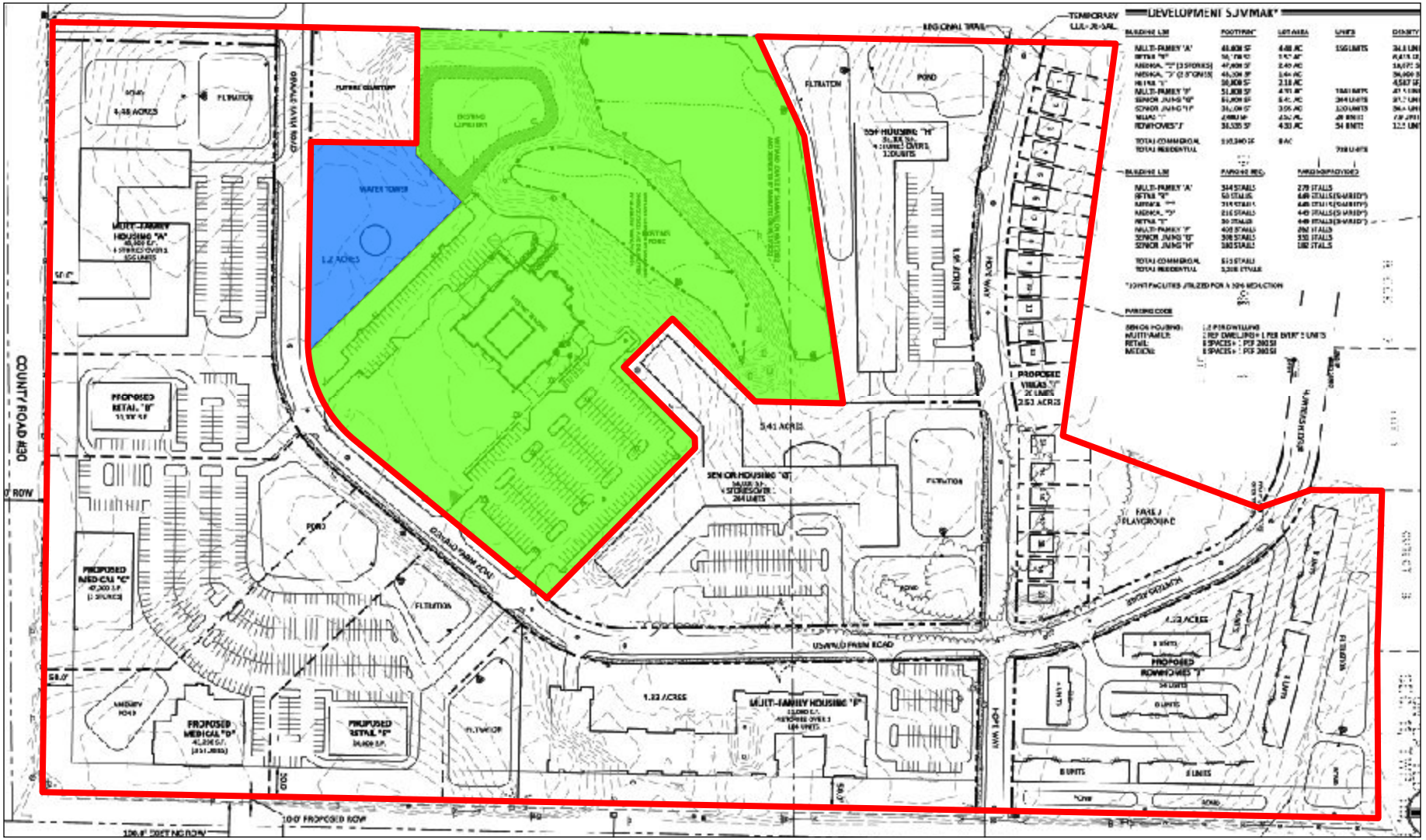

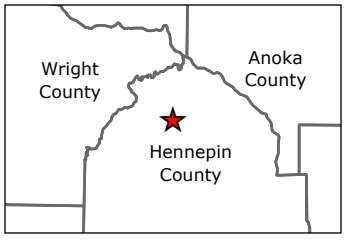

- Project Area
- Existing Development
- Under Seperate Review

N

0 125 250 Feet

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1:3,000

Notes

1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Stantec, MnGeo
3. Background: Sambatek

Stantec

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by KJM on 2023-05-16

Client/Project
City of Corcoran, MN
Hope Church Development
EAW

193806102

Figure No.
3

Title
Site Plan Concept

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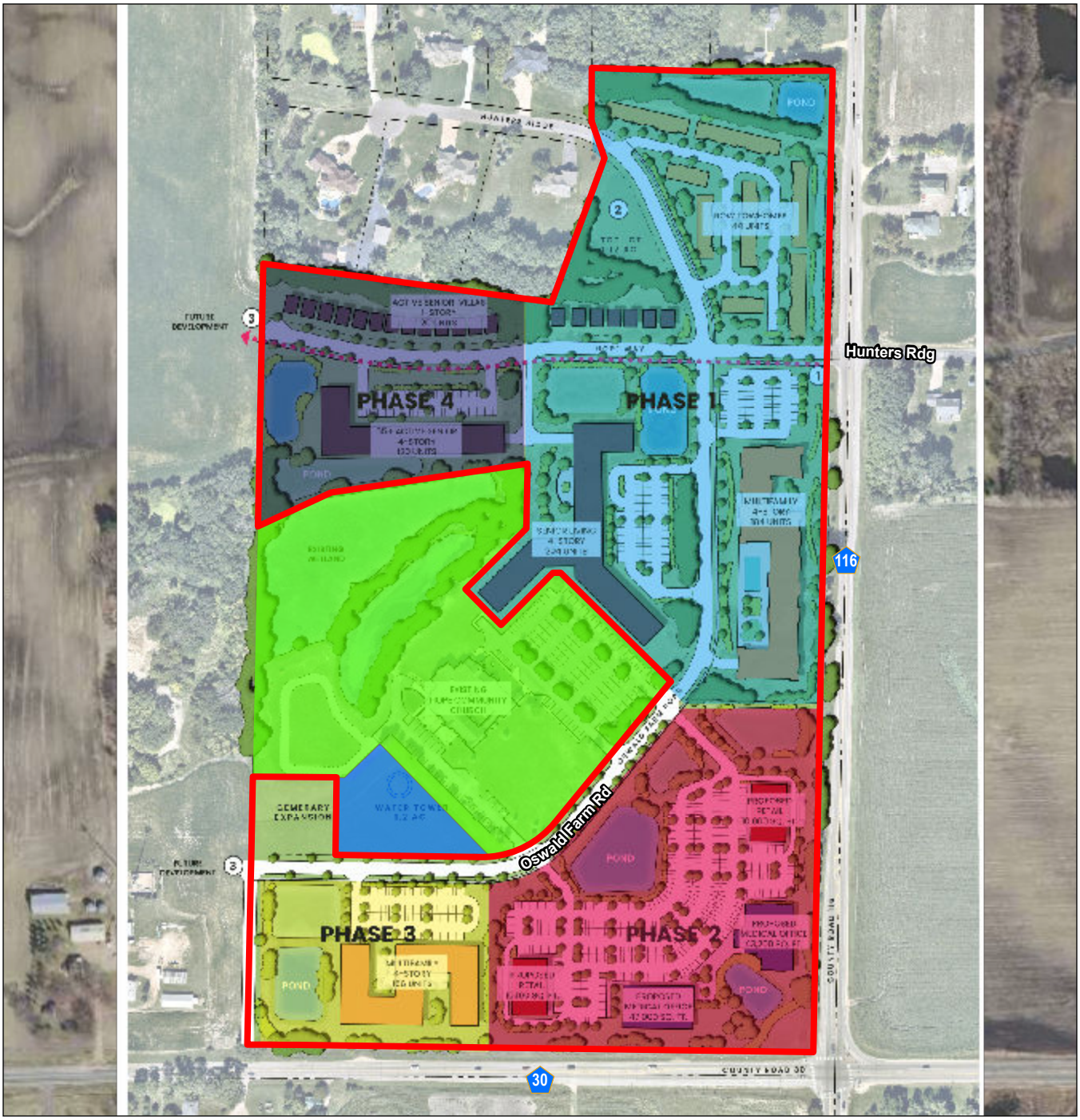

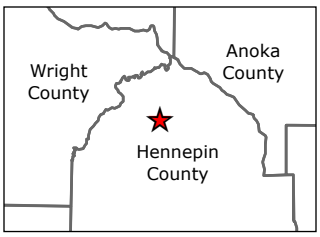

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<bol>1. </bol>Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
<bol>2. </bol>Data Sources: Stantec, Hennepin Co., Sambatek
<bol>3. </bol>Background: Sambatek & 2020 color 7-county

Legend
- Project Area
- Existing Development
- Under Seperate Review

0 175 350 Feet
(At original document size of 8.5x11)
1:4,200

N

Stantec

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by KJM on 2023-05-16

Client/Project
City of Corcoran, MN
Hope Church Development
EAW

193806102

Figure No.
4

Title
Phasing Plan

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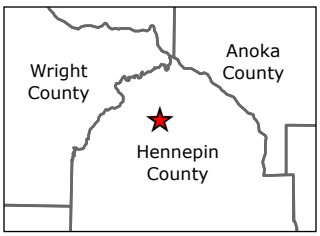

Legend

- Project Area

TCMA Land Cover 2016

- Grass/Shrub
- Buildings
- Roads/Paved Surfaces
- Lakes/Ponds
- Deciduous Tree Canopy
- Coniferous Tree Canopy
- Agriculture
- Emergent Wetland

0 175 350 Feet

(At original document size of 8.5x11)
1:4,200

N

Notes

1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Stantec, Hennepin Co., MnGeo, MnDOT, UMN - Twin Cities 1-Meter Land Cover (2016)
3. Background: 2020 color 7-county

Stantec

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by KJM on 2023-05-16

Client/Project
City of Corcoran, MN
Hope Church Development
EAW

193806102

Figure No.
5

Title
Land Cover

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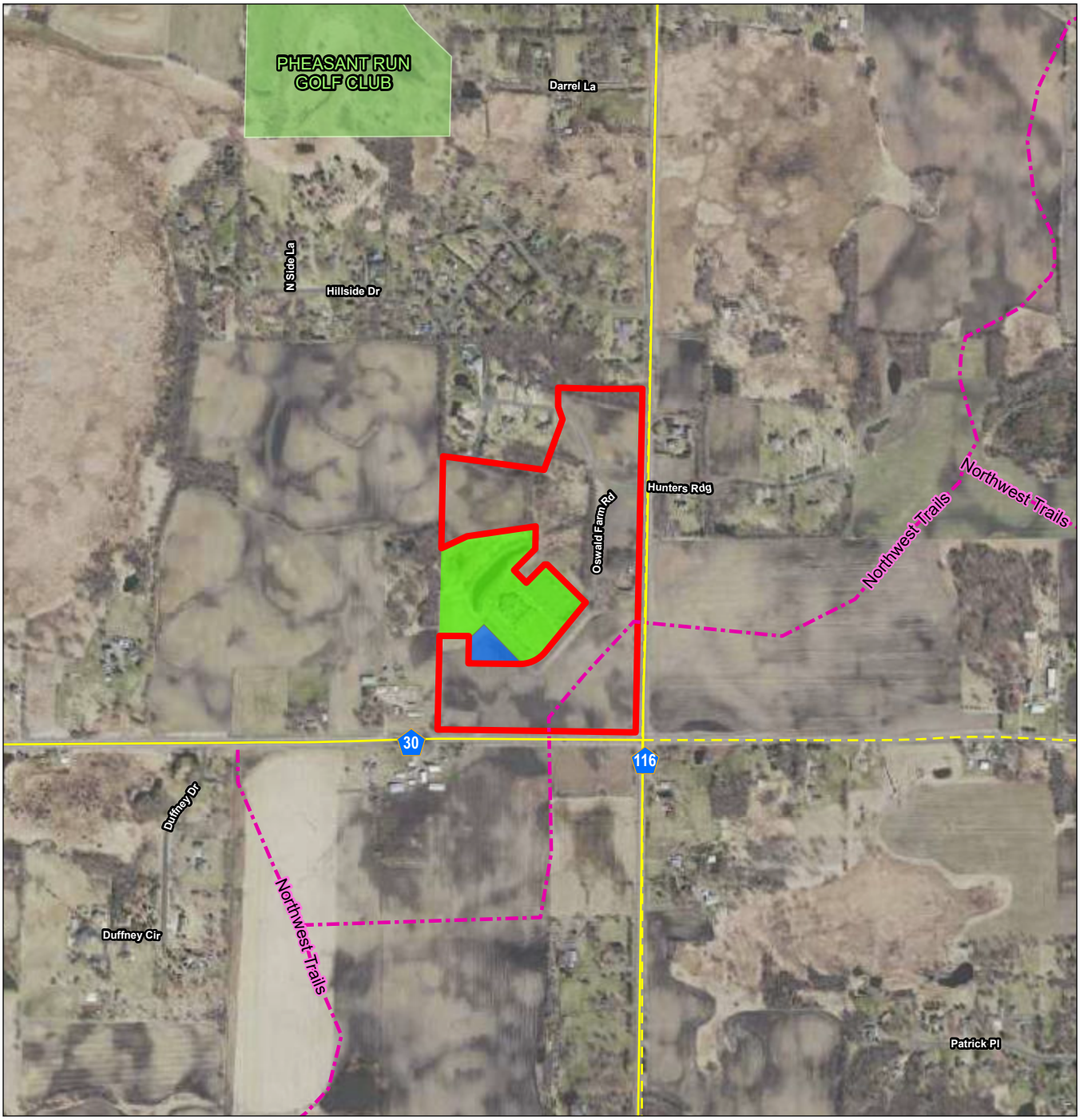

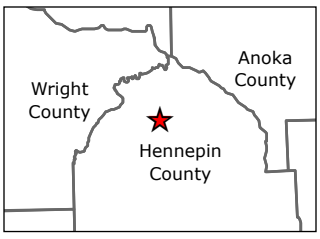

Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Stantec, MnGeo, MnDOT, MnDNR
3. Background: 2020 color 7-county

Legend
- Project Area
- Existing Development
- Under Seperate Review
- Golf Course
- Snowmobile Trail

Metro Region Trails/Bikeways

Trail Status
- Planned
- Existing

0 500 1,000 Feet
(At original document size of 8.5x11)
1:12,000

N

Stantec

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by KJM on 2023-05-16

Client/Project
City of Corcoran, MN
Hope Church Development
EAW

193806102

Figure No.
6

Title
Parks Trails and Other Recreational Areas

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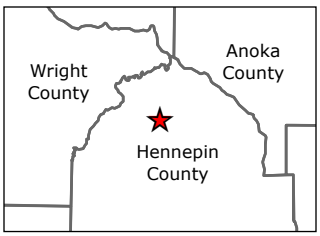


Legend

- Project Area

Farmland Class

- All areas are prime farmland
- Farmland of statewide importance
- Not prime farmland
- Prime farmland if drained

0 200 400 Feet

(At original document size of 8.5x11)
1:4,800

N

Notes

1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Stantec, MnGeo, MnDOT, NRCS
3. Background: 2020 color 7-county

Stantec

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by KJM on 2023-05-16

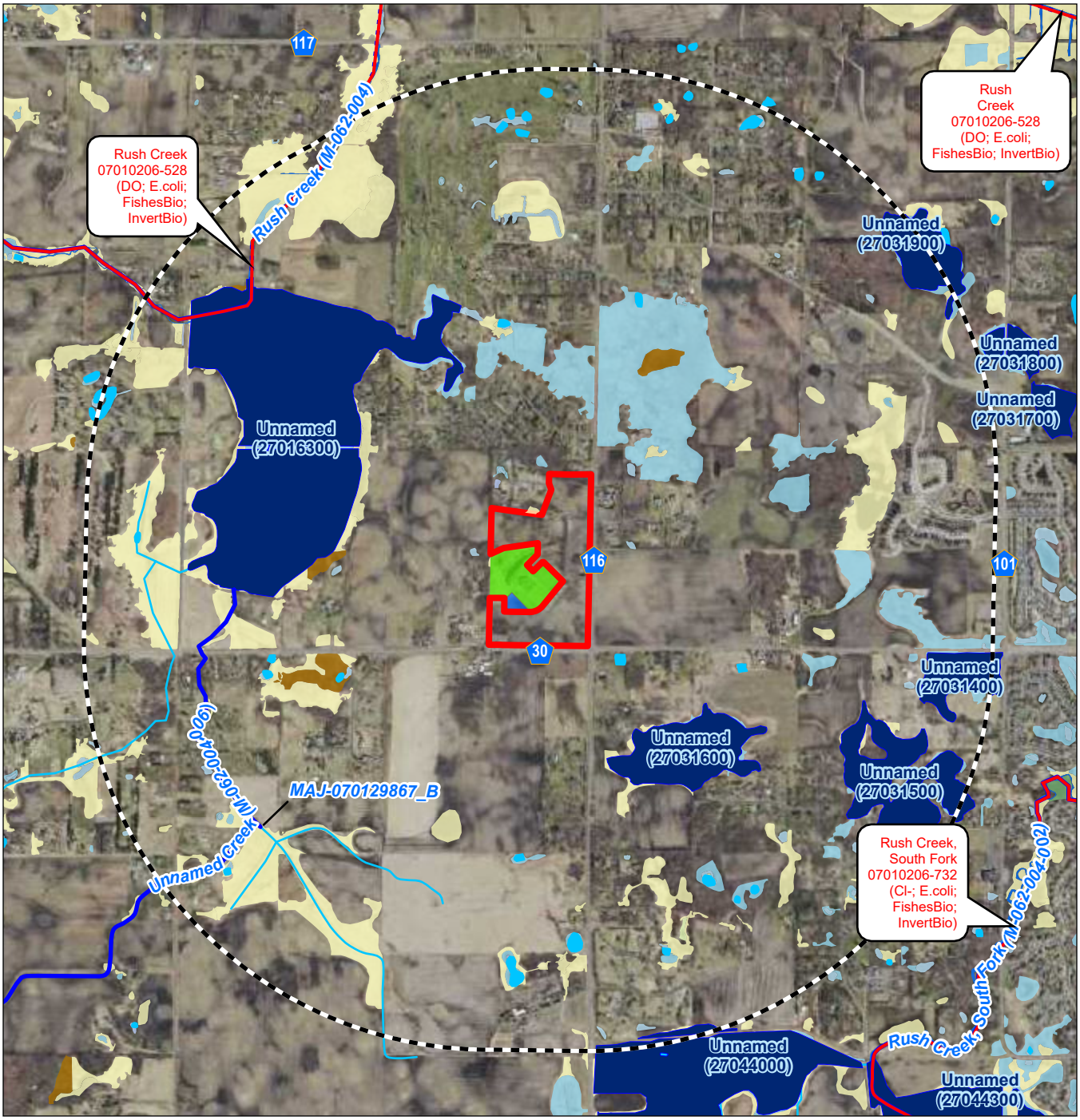
Client/Project
City of Corcoran, MN
Hope Church Development
EAW

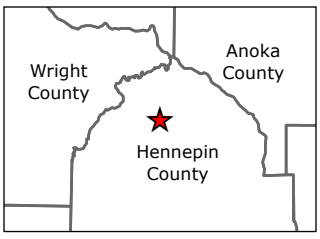
193806102

Figure No.
7

Title
Farmland and Soils Classification

V:\1938\Active\193806102\03_data\gis_cad\gis\proj\eaw\eaw.aprx Revised: 2023-05-16 By: kjmueller





Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Stantec, MnGeo, MnDNR, MnDOT
3. Background: MnGeo 2020 7-county

Legend

- 1 Mile Radius
- Project Area
- Existing Development
- Under Seperate Review
- 2022 MPCA Impaired Streams (Draft)

Minnesota Public Waters Delineations

- Public Water Watercourse
- Public Ditch/Altered Natural Watercourse
- Public Waters Basins
- NHD - Flowline
- NHD - Waterbody

NWI Circular 39 Class

- 1 - Seasonally Flooded Basin or Flat
- 2 - Wet Meadow
- 3 - Shallow Marsh
- 4 - Deep Marsh
- 5 - Shallow Open Water
- 6 - Shrub Swamp
- 7 - Wooded Swamp
- Riverine Systems

0 1,000 2,000 Feet
(At original document size of 8.5x11)
1:24,000

N

Stantec

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by KJM on 2023-05-16

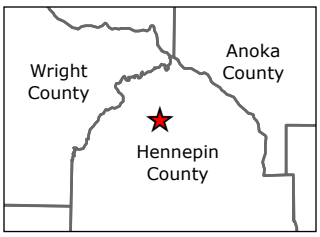
Client/Project
City of Corcoran, MN
Hope Church Development
EAW

193806102

Figure No.
8

Title
Water Resources Map

V:\1938\Active\193806102\03_data\gis_cad\gis\proj\eaw\eaw.aprx Revised: 2023-05-16 By: kjmueller



Legend

- Wetland Delineations Pending LGU Review
- Project Area

0 175 350 Feet

(At original document size of 8.5x11)
1:4,200

N

Stantec

Notes

1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Stantec, MnGeo, MnDNR, MnDOT, Sambatek
3. Background: 2020 color 7-county

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by KJM on 2023-05-16

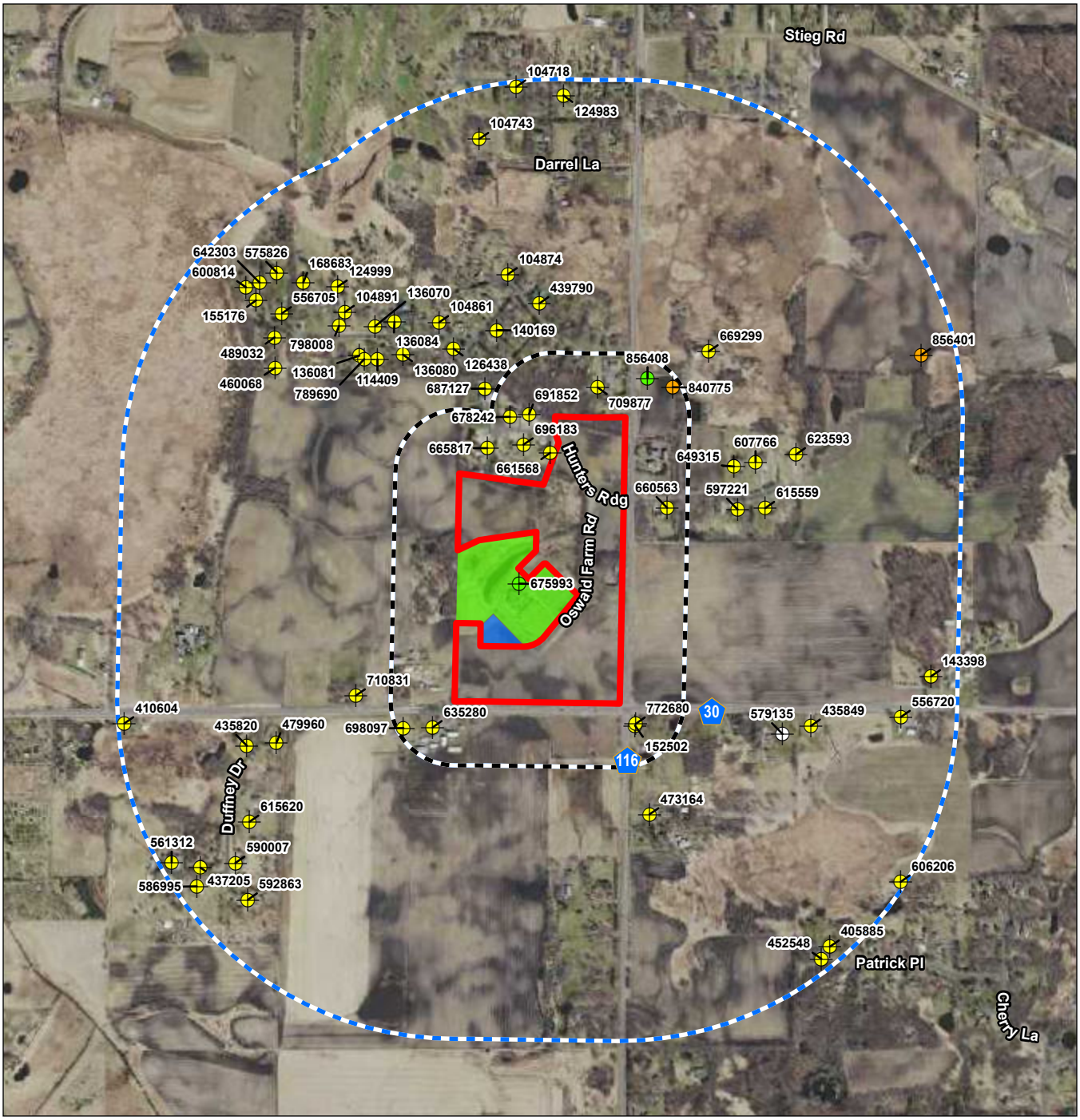
Client/Project
City of Corcoran, MN
Hope Church Development
EAW

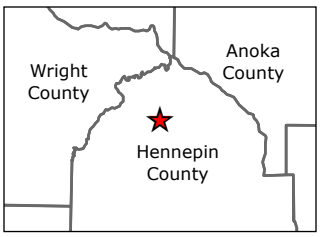
193806102

Figure No.
9

Title
Water Resources within the Project Area

V:\1938\Active\193806102\03_data\gis_cad\gis\proj\eaw\eaw.aprx Revised: 2023-05-16 By: kjmueller





Notes

1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: City of Corcoran, NRCS, MNDOT, MNDOH
3. Background: MnGeo 2020 7-county

Legend

- 500 ft Radius
- 1/2 mi Radius
- Project Area
- Existing Development
- Under Seperate Review

Minnesota Well Index

- Domestic
- Public Supply
- Test Well
- Other

0 600 1,200 Feet

(At original document size of 8.5x11)
1:14,400

N

Stantec

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by KJM on 2023-05-16

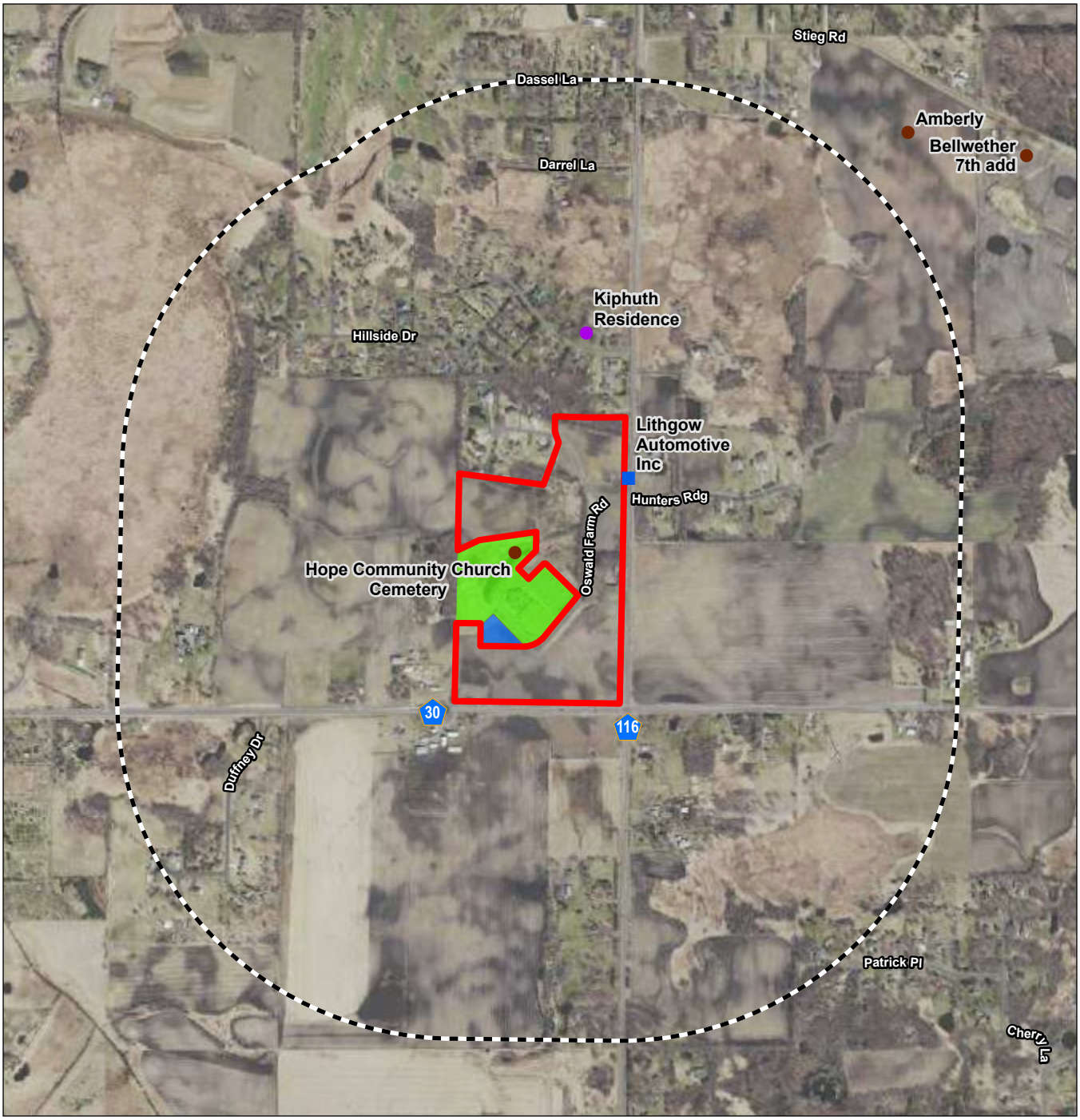
Client/Project
City of Corcoran, MN
Hope Church Development
EAW

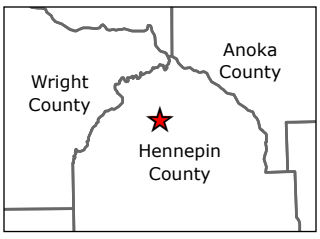
193806102

Figure No.
10

Title
Minnesota Well Index

V:\1938\Active\193806102\03_data\gis_cad\gis\proj\eaw\eaw.aprx Revised: 2023-05-16 By: kjmueller





Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Stantec, MnGeo, MnDOT, MPCA
3. Background: MnGeo 2020 7-county

Legend
- Project Area
- Existing Development
- Under Seperate Review
- 1/2 mi Radius

MPCA Sites

Program Name
- Hazardous Waste
- Investigation and Cleanup
- Stormwater

0 600 1,200 Feet
(At original document size of 8.5x11)
1:14,400

N

Stantec

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by KJM on 2023-05-16

Client/Project
City of Corcoran, MN
Hope Church Development
EAW

193806102

Figure No.
11

Title
MPCA WIMN Potentially Contaminated Sites

V:\1938\Active\193806102\03_data\gis_cad\gis\proj\eaw\eaw.aprx Revised: 2023-05-16 By: kjmueller

National Flood Hazard Layer FIRMette

93°32'59"W 45°8'13"N

93°32'22"W 45°7'48"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/15/2023 at 5:01 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

93°33'45.46"W 45°9'29.12"N

93°31'52.1"W 45°7'23.44"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **3/15/2023 5:03 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NGVD29
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

0 50 100 200 300 400 Meters

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL **43** OF **479**

Panel Contains:

COMMUNITY	NUMBER	PANEL
CITY OF CORCORAN	270155	0043
CITY OF ROGERS	270775	0043

MAP NUMBER
27053C0043F
EFFECTIVE DATE
November 04, 2016

Minnesota Unique Well No.

126438

County Hennepin
Quad Rogers
Quad ID 121A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 08/24/1991
Update
Received Date 11/03/2015

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
FULTON, AL	119	23	W	2	DCDDAC	domestic	A	188 ft.	188 ft.	09/28/1977	27056

Elevation 945 ft. **Elev. Method** 7.5 minute topographic map (+/- 5 feet) **Aquifer** Jordan **Depth to Bedrock** 148 ft **Open Hole** - ft **Static Water Level** 100 ft

Field Located By Minnesota Geological Survey
Unique No. Verified Information from neighbor
Geological Interpretation Andrew Retzler
Agency (Interpretation)

Locate Method Digitized - scale 1:24,000 or larger (Digitizing
Input Source Minnesota Geological Survey
Input Date 01/01/1990

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 456893
UTM Northing (Y) 499851
Interpretaion Method Geologic study 1:24k to 1:100k

			Depth (ft.)			Elevation (ft.)					
Geological Material	**Color**	**Hardness**	**From**	**To**	**Thickness**	**From**	**To**	**Stratigraphy**	**Primary Lithology**	**Secondary**	**Minor Lithology**
CLAY			0	57	57	945	888	clay	clay		
SAND			57	110	53	888	835	sand	sand		
CLAY			110	148	38	835	797	clay	clay		
SHALE			148	165	17	797	780	Jordan Sandstone	siltstone		
SANDROCK			165	188	23	780	757	Jordan Sandstone	sandstone		

Minnesota Well Index - Stratigraphy Report **126438** Printed on 03/17/2023

Minnesota Unique Well Number

126438

County Hennepin
Quad Rogers
Quad ID 121A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 08/24/1991
Update Date 11/03/2015
Received Date

Well Name	Township	Range	Dir	Section	Subsection
FULTON, AL	119	23	W	2	DCDDAC

Elevation 945 ft. **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

C/W 20042 HILLSIDE DR CORCORAN MN 55374

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
CLAY	0	57		
SAND	57	110		
CLAY	110	148		
SHALE	148	165		
SANDROCK	165	188		

Remarks

Well Depth 188 ft. **Depth Completed** 188 ft. **Date Well Completed** 09/28/1977

Drill Method Non-specified Rotary **Drill Fluid**

Use domestic **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint** Threaded

Drive Shoe? Yes ☐ No ☐ **Above/Below**

Casing Diameter **Weight**

4 in. To 181 ft. lbs./ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** stainless **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set	
2 in.		ft.	181 ft.	188 ft.

Static Water Level

100 ft. land surface Measure 09/28/1977

Pumping Level (below land surface)

110 ft. 3 hrs. Pumping at 20 g.p.m.

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
bentonite		ft.	ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☒ Yes ☐ No

Pump ☐ Not Installed Date Installed 10/13/1977

Manufacturer's name AERMOTOR

Model Number HP 0.5 Volt

Length of drop pipe 126 ft Capacity g.p. Typ Submersible

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock Jordan Sandstone Aquifer Jordan

Last Strat Jordan Sandstone Depth to Bedrock 148 ft

Located by Minnesota Geological Survey

Locate Method Digitized - scale 1:24,000 or larger (Digitizing Table)

System UTM - NAD83, Zone 15, Meters X 456893 Y 4998517

Unique Number Verification Information from Input Date 01/01/1990

Angled Drill Hole

Well Contractor

Torgerson Well Co. 27056

Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well No.

140169

County Hennepin
Quad Rogers
Quad ID 121A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 08/24/1991
Update
Received Date 11/03/2015

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
FELIX, D.E.	119	23	W	2	DDCBDD	domestic	A	167 ft.	167 ft.	05/03/1978	27086

Elevation 935 ft. **Elev. Method** 7.5 minute topographic map (+/- 5 feet) **Aquifer** Jordan **Depth to Bedrock** 141 ft **Open Hole** - ft **Static Water Level** 55 ft

Field Located By Minnesota Geological Survey
Unique No. Verified
Geological Interpretation Andrew Retzler
Agency (Interpretation)

Locate Method Digitized - scale 1:24,000 or larger (Digitizing
Input Source Minnesota Geological Survey
Input Date 01/01/1990

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 456996
UTM Northing (Y) 499856
Interpretaion Method Geologic study 1:24k to 1:100k

			Depth (ft.)			Elevation (ft.)					
Geological Material	**Color**	**Hardness**	**From**	**To**	**Thickness**	**From**	**To**	**Stratigraphy**	**Primary Lithology**	**Secondary**	**Minor Lithology**
CLAY	YELLOW	MEDIUM	0	30	30	935	905	clay-yellow	clay		
CLAY	BLUE	MEDIUM	30	60	30	905	875	clay-gray	clay		
SAND	BROWN	SOFT	60	72	12	875	863	sand-brown	sand		
CLAY W/ ROCK	RED	MEDIUM	72	141	69	863	794	pebbly sand/silt/clay-	clay	gravel	
SHALE	RED/BLU	MEDIUM	141	155	14	794	780	Jordan Sandstone	siltstone		
SANDROCK	LT. BRN	SOFT	155	167	12	780	768	Jordan Sandstone	sandstone		

Minnesota Well Index - Stratigraphy Report **140169** Printed on 03/17/2023

Minnesota Unique Well Number

140169

County Hennepin
Quad Rogers
Quad ID 121A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 08/24/1991
Update Date 11/03/2015
Received Date

Well Name	Township	Range	Dir	Section	Subsection
FELIX, D.E.	119	23	W	2	DDCBDD

Elevation 935 ft. **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

C/W 20039 HILLSIDE AV CORCORAN MN 55374

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
CLAY	0	30	YELLOW	MEDIUM
CLAY	30	60	BLUE	MEDIUM
SAND	60	72	BROWN	SOFT
CLAY W/ ROCK	72	141	RED	MEDIUM
SHALE	141	155	RED/BLU	MEDIUM
SANDROCK	155	167	LT. BRN	SOFT

Remarks

Well Depth	Depth Completed	Date Well Completed
167 ft.	167 ft.	05/03/1978

Drill Method Non-specified Rotary **Drill Fluid**

Use domestic **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint** Threaded
Drive Shoe? Yes ☒ No ☐ **Above/Below** 1 ft.

Casing Diameter	Weight	Hole Diameter
4 in. To 162 ft.	11 lbs./ft.	6.7 in. To 162 ft.
		4 in. To 167 ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** stainless **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set	
3 in.	12	5 ft.	162 ft.	167 ft.

Static Water Level
55 ft. land surface Measure 05/03/1978

Pumping Level (below land surface)
60 ft. 3 hrs. Pumping at 35 g.p.m.

Wellhead Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☒ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
bentonite		0 ft.	162 ft.
cuttings		ft.	ft.

Nearest Known Source of Contamination
50 feet East Direction Septic tank/drain field Type
Well disinfected upon completion? ☒ Yes ☐ No

Pump ☐ Not Installed Date Installed 05/04/1978
Manufacturer's name FLINT & WALLING
Model Number 12 BA8 HP 0.5 Volt 230
Length of drop pipe 90 ft Capacity g.p. Typ Submersible

Abandoned
Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance
Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous
First Bedrock Jordan Sandstone Aquifer Jordan
Last Strat Jordan Sandstone Depth to Bedrock 141 ft
Located by Minnesota Geological Survey
Locate Method Digitized - scale 1:24,000 or larger (Digitizing Table)
System UTM - NAD83, Zone 15, Meters X 456996 Y 4998561
Unique Number Verification Input Date 01/01/1990

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Ruppert & Son	27086	RUPPERT, G.

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Project information

NAME

Hope Community EAW

LOCATION

Hennepin County, Minnesota

DESCRIPTION

None

Local office

Minnesota-Wisconsin Ecological Services Field Office

(952) 858-0793
(952) 646-2873

3815 American Blvd East
Bloomington, MN 55425-1659

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. 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.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat Perimyotis subflavus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Whooping Crane Grus americana No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/758	EXPN

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON

Bald Eagle Haliaeetus leucocephalus 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.	Breeds Dec 1 to Aug 31
Bobolink Dolichonyx oryzivorus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Chimney Swift Chaetura pelagica This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Rusty Blackbird Euphagus carolinus This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere

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 and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted

Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

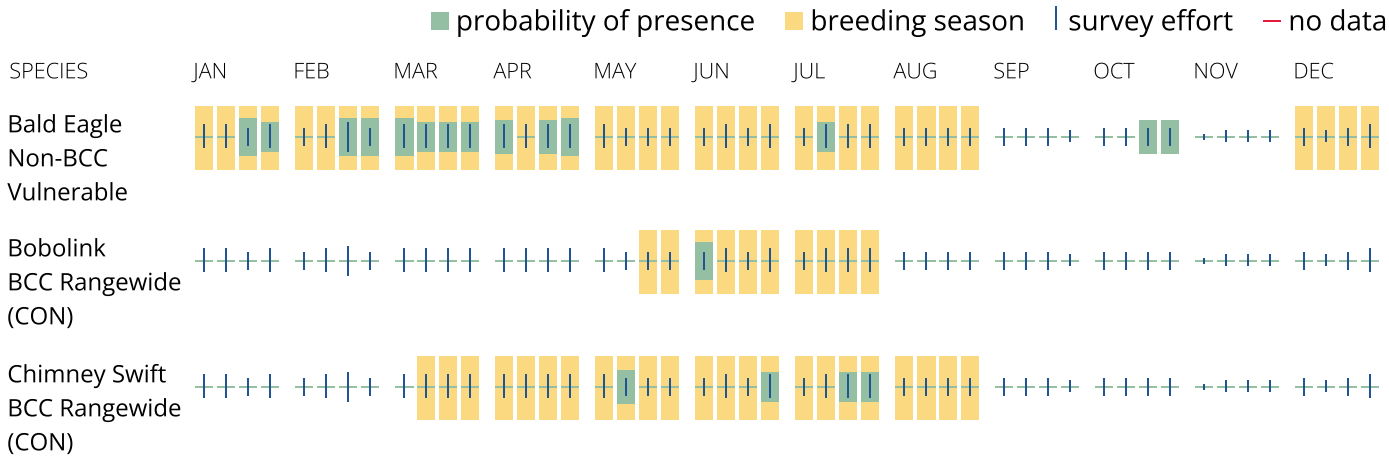
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

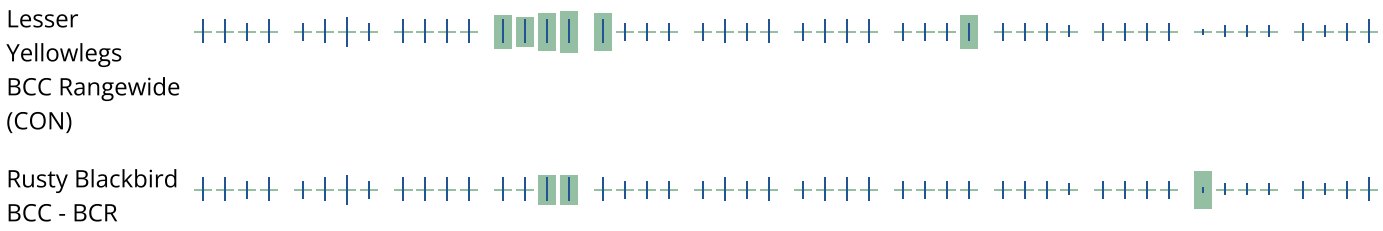
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability

of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

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 at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

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.

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

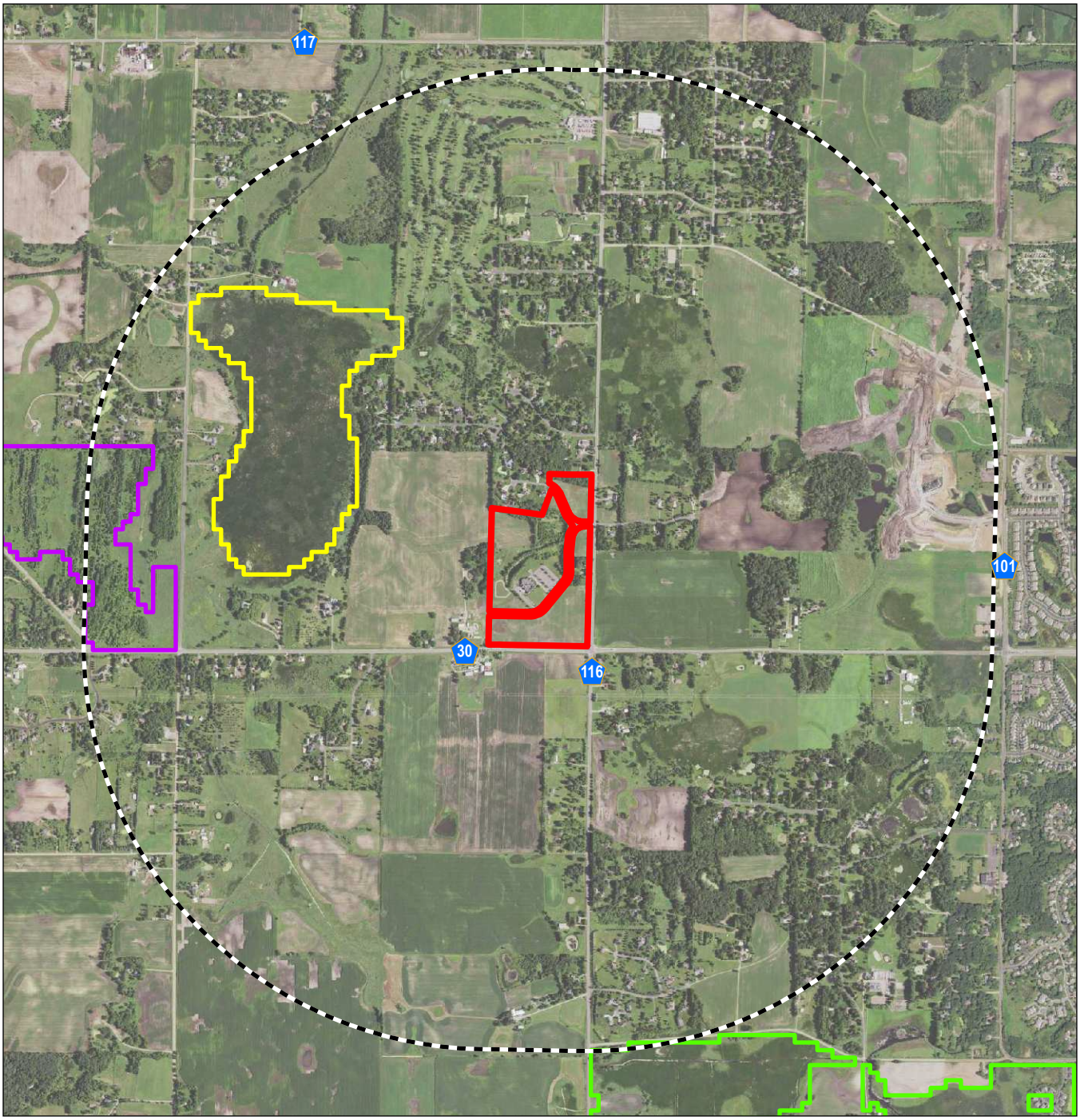
Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

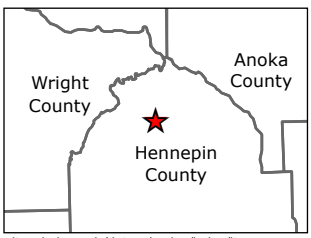
Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.





<ita><bol><und>Notes</und></bol></ita>
<bol>1. </bol>Coordinate System: NAD 1983 UTM Zone 15N
<bol>2. </bol>Data Sources:MN DNR, NHIS
<bol3. </bol>Background: 2019 NAIP

Legend

- Project Boundary
- 1 Mile Radius

Central Region Regionally Significant Ecological Areas

- Moderate
- High
- Outstanding

0 1,000 2,000 Feet

(At original document size of 8.5x11)
1:24,000

N

Stantec

Project Location
Hennepin Co., MN

Prepared by KJM on 2023-03-03

Client/Project
Hope Community
EIW

1

Title
Unique and Natural Features Review

V:\1938\Active\193806102\03_data\gis_cad\gis\proj\eaw\eaw.aprx Revised: 2023-03-03 By: kjmueller

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Hennepin County, Minnesota

March 14, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Map Scale: 1:4,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hennepin County, Minnesota
Survey Area Data: Version 18, Sep 6, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 11, 2020—May 19, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
L21A	Canisteo clay loam, 0 to 2 percent slopes	0.6	1.1%
L22C2	Lester loam, 6 to 10 percent slopes, moderately eroded	7.0	13.0%
L23A	Cordova loam, 0 to 2 percent slopes	8.2	15.2%
L24A	Glencoe clay loam, 0 to 1 percent slopes	4.0	7.4%
L36A	Hamel, overwash-Hamel complex, 0 to 3 percent slopes	3.8	7.0%
L37B	Angus loam, 2 to 6 percent slopes	19.4	35.8%
L40B	Angus-Kilkenny complex, 2 to 6 percent slopes	0.0	0.0%
L44A	Nessel loam, 1 to 3 percent slopes	8.7	16.1%
L45A	Dundas-Cordova complex, 0 to 3 percent slopes	2.4	4.4%
Totals for Area of Interest		**54.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different

management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Hennepin County, Minnesota

L21A—Canisteo clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2vvdm
Elevation: 690 to 1,840 feet
Mean annual precipitation: 24 to 37 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Canisteo and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canisteo

Setting

Landform: Rims on depressions, ground moraines
Landform position (three-dimensional): Talf
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Fine-loamy till

Typical profile

Ap - 0 to 9 inches: clay loam
A - 9 to 16 inches: clay loam
AB - 16 to 20 inches: clay loam
Bkg - 20 to 36 inches: clay loam
Cg - 36 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 to 8 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: R103XY001MN - Loamy Wet Prairies
Forage suitability group: Level Swale, Calcareous (G103XS009MN)
Other vegetative classification: Level Swale, Calcareous (G103XS009MN)
Hydric soil rating: Yes

Minor Components

Okoboji

Percent of map unit: 13 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R103XY015MN - Depressional Marsh
Other vegetative classification: Ponded If Not Drained (G103XS013MN)
Hydric soil rating: Yes

Harps

Percent of map unit: 5 percent
Landform: Rims on depressions
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: R103XY009MN - Calcareous Rim Prairies
Other vegetative classification: Level Swale, Calcareous (G103XS009MN)
Hydric soil rating: Yes

Webster

Percent of map unit: 5 percent
Landform: Ground moraines
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R103XY001MN - Loamy Wet Prairies
Other vegetative classification: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: Yes

Glencoe

Percent of map unit: 2 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R103XY015MN - Depressional Marsh
Other vegetative classification: Ponded If Not Drained (G103XS013MN)
Hydric soil rating: Yes

L22C2—Lester loam, 6 to 10 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: 2ttc4
Elevation: 690 to 1,840 feet
Mean annual precipitation: 24 to 37 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lester, moderately eroded, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lester, Moderately Eroded

Setting

Landform: Ground moraines, hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, rise
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Fine-loamy till

Typical profile

Ap - 0 to 6 inches: loam
Bt - 6 to 38 inches: clay loam
C - 38 to 79 inches: loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 47 to 63 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R103XY020MN - Loamy Upland Savannas
Forage suitability group: Sloping Upland, Acid (G103XS006MN)
Other vegetative classification: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

Minor Components

Storden, moderately eroded

Percent of map unit: 10 percent
Landform: Ground moraines
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Rise
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Ecological site: R103XY020MN - Loamy Upland Savannas
Other vegetative classification: Sloping Upland, Calcareous (G103XS010MN)
Hydric soil rating: No

Le sueur

Percent of map unit: 3 percent
Landform: Hillslopes, ground moraines
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, talf
Down-slope shape: Convex, linear
Across-slope shape: Linear
Ecological site: R103XY020MN - Loamy Upland Savannas
Other vegetative classification: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

Hamel

Percent of map unit: 2 percent
Landform: Ground moraines
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Ecological site: F103XY030MN - Wet Footslope/Drainageway Forests
Other vegetative classification: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: Yes

L23A—Cordova loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: h4xf
Elevation: 800 to 1,080 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 124 to 200 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Cordova and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cordova

Setting

Landform: Drainageways on moraines
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Till

Typical profile

Ap,AB - 0 to 13 inches: loam
Btg - 13 to 33 inches: clay loam
Cg - 33 to 80 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 6 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Gypsum, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F103XY027MN - Loamy Wet Forests
Forage suitability group: Level Swale, Neutral (G103XS001MN)
Other vegetative classification: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: Yes

Minor Components

Glencoe, depressional

Percent of map unit: 10 percent
Landform: Depressions on moraines
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R103XY015MN - Depressional Marsh
Other vegetative classification: Ponded If Not Drained (G103XS013MN)
Hydric soil rating: Yes

Nessel

Percent of map unit: 5 percent
Landform: Moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F103XY025MN - Loamy Upland Forests
Other vegetative classification: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

L24A—Glencoe clay loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2tsjr
Elevation: 690 to 1,840 feet
Mean annual precipitation: 24 to 37 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 140 to 180 days

Farmland classification: Prime farmland if drained

Map Unit Composition

Glencoe and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glencoe

Setting

Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Local alluvium over till

Typical profile

Ap - 0 to 9 inches: clay loam
A - 9 to 39 inches: clay loam
Bg - 39 to 50 inches: clay loam
Cg - 50 to 79 inches: clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Ecological site: R103XY015MN - Depressional Marsh
Forage suitability group: Ponded If Not Drained (G103XS013MN)
Other vegetative classification: Ponded If Not Drained (G103XS013MN)
Hydric soil rating: Yes

Minor Components

Okoboji

Percent of map unit: 10 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R103XY015MN - Depressional Marsh
Other vegetative classification: Ponded If Not Drained (G103XS013MN)
Hydric soil rating: Yes

Webster

Percent of map unit: 5 percent
Landform: Ground moraines

Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R103XY001MN - Loamy Wet Prairies
Other vegetative classification: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: Yes

Canisteo

Percent of map unit: 5 percent
Landform: Rims on depressions, ground moraines
Landform position (three-dimensional): Talf
Down-slope shape: Concave, linear
Across-slope shape: Linear
Ecological site: R103XY001MN - Loamy Wet Prairies
Other vegetative classification: Level Swale, Calcareous (G103XS009MN)
Hydric soil rating: Yes

L36A—Hamel, overwash-Hamel complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tsjx
Elevation: 690 to 1,840 feet
Mean annual precipitation: 24 to 37 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Hamel, overwash, and similar soils: 50 percent
Hamel and similar soils: 43 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hamel, Overwash

Setting

Landform: Ground moraines
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Parent material: Colluvium over till

Typical profile

Ap - 0 to 12 inches: loam
A - 12 to 26 inches: loam
Btg - 26 to 48 inches: clay loam
Cg - 48 to 79 inches: clay loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F103XY029MN - Footslope/Drainageway Forests
Forage suitability group: Level Swale, Neutral (G103XS001MN)
Other vegetative classification: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: No

Description of Hamel

Setting

Landform: Ground moraines
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Parent material: Colluvium over till

Typical profile

Ap - 0 to 10 inches: loam
A - 10 to 24 inches: loam
Btg - 24 to 46 inches: clay loam
Cg - 46 to 79 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 to 8 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F103XY030MN - Wet Footslope/Drainageway Forests
Forage suitability group: Level Swale, Neutral (G103XS001MN)
Other vegetative classification: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: Yes

Minor Components

Terril

Percent of map unit: 5 percent
Landform: Ground moraines
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: R103XY011MN - Footslope/Drainageway Prairies
Other vegetative classification: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: No

Glencoe

Percent of map unit: 2 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R103XY015MN - Depressional Marsh
Other vegetative classification: Ponded If Not Drained (G103XS013MN)
Hydric soil rating: Yes

L37B—Angus loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2syrq
Elevation: 690 to 1,840 feet
Mean annual precipitation: 24 to 37 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 140 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Angus and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Angus

Setting

Landform: Hillslopes, ground moraines
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Fine-loamy till

Typical profile

Ap - 0 to 7 inches: loam

Bt - 7 to 37 inches: clay loam
BC - 37 to 50 inches: clay loam
C - 50 to 79 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 39 to 51 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R103XY020MN - Loamy Upland Savannas
Forage suitability group: Sloping Upland, Acid (G103XS006MN)
Other vegetative classification: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

Minor Components

Angus, moderately eroded

Percent of map unit: 10 percent
Landform: Hillslopes, ground moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Ecological site: R103XY020MN - Loamy Upland Savannas
Other vegetative classification: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

Cordova

Percent of map unit: 5 percent
Landform: Ground moraines
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F103XY027MN - Loamy Wet Forests
Other vegetative classification: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: Yes

Le sueur

Percent of map unit: 5 percent
Landform: Hillslopes, ground moraines
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, talf
Down-slope shape: Convex, linear
Across-slope shape: Linear
Ecological site: R103XY020MN - Loamy Upland Savannas

Other vegetative classification: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

L40B—Angus-Kilkenny complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: h64l
Elevation: 820 to 1,080 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 124 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Angus and similar soils: 45 percent
Kilkenny and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Angus

Setting

Landform: Hills on moraines
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Till

Typical profile

Ap - 0 to 8 inches: loam
Bt - 8 to 35 inches: clay loam
BC - 35 to 40 inches: clay loam
C - 40 to 80 inches: loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 43 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Gypsum, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B

Ecological site: R103XY020MN - Loamy Upland Savannas
Forage suitability group: Sloping Upland, Acid (G103XS006MN)
Other vegetative classification: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

Description of Kilkenny

Setting

Landform: Hills on moraines
Landform position (two-dimensional): Summit
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Glaciofluvial sediments and reworked till over till

Typical profile

Ap - 0 to 11 inches: clay loam
Bt - 11 to 35 inches: clay loam
2Bk,2C - 35 to 80 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 20 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Gypsum, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: F103XY026MN - Clayey Upland Forests
Forage suitability group: Sloping Upland, Acid (G103XS006MN)
Other vegetative classification: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

Minor Components

Lerdal

Percent of map unit: 10 percent
Landform: Moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F103XY026MN - Clayey Upland Forests
Other vegetative classification: Level Swale, Acid (G103XS005MN)
Hydric soil rating: No

Mazaska

Percent of map unit: 5 percent
Landform: Swales on moraines
Down-slope shape: Concave
Across-slope shape: Linear

Ecological site: F103XY028MN - Clayey Wet Forests
Other vegetative classification: Level Swale, Acid (G103XS005MN)
Hydric soil rating: Yes

L44A—Nessel loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: h657
Elevation: 820 to 1,080 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 124 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Nessel and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nessel

Setting

Landform: Moraines
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Till

Typical profile

Ap - 0 to 6 inches: loam
Bt - 6 to 38 inches: clay loam
C - 38 to 80 inches: loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Gypsum, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: C
Ecological site: F103XY025MN - Loamy Upland Forests

Forage suitability group: Sloping Upland, Acid (G103XS006MN)
Other vegetative classification: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

Minor Components

Cordova

Percent of map unit: 10 percent
Landform: Drainageways on moraines
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F103XY027MN - Loamy Wet Forests
Other vegetative classification: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: Yes

Angus

Percent of map unit: 5 percent
Landform: Hills on moraines
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R103XY020MN - Loamy Upland Savannas
Other vegetative classification: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

L45A—Dundas-Cordova complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: h660
Elevation: 820 to 1,070 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 124 to 200 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Dundas and similar soils: 65 percent
Cordova and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dundas

Setting

Landform: Moraines
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Till

Typical profile

Ap - 0 to 9 inches: silt loam

E - 9 to 15 inches: loam
Btg - 15 to 40 inches: clay loam
Cg - 40 to 80 inches: loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Gypsum, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: R103XY020MN - Loamy Upland Savannas
Forage suitability group: Level Swale, Neutral (G103XS001MN)
Other vegetative classification: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: No

Description of Cordova

Setting

Landform: Drainageways on moraines
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Till

Typical profile

Ap,AB - 0 to 13 inches: loam
Btg - 13 to 33 inches: clay loam
Cg - 33 to 80 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 6 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Gypsum, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F103XY027MN - Loamy Wet Forests

Forage suitability group: Level Swale, Neutral (G103XS001MN)
Other vegetative classification: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: Yes

Minor Components

Nessel

Percent of map unit: 5 percent
Landform: Moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F103XY025MN - Loamy Upland Forests
Other vegetative classification: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

Glencoe

Percent of map unit: 5 percent
Landform: Depressions on moraines
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R103XY015MN - Depressional Marsh
Other vegetative classification: Ponded If Not Drained (G103XS013MN)
Hydric soil rating: Yes

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From:	MN_MNIT_Data Request SHPO
To:	Mueller, Kevin
Cc:	Banks, Benjamin; Bot, Courtnay
Subject:	RE: Corcoran EAW Lit Search
Date:	Monday, March 20, 2023 6:50:02 PM
Attachments:	image001.png image002.png image003.png image004.png Stantec_Kevin Mueller_Project Area_ALL_Corcoran EAW.zip

---

Hello Kevin,

Please see attached.

Jim

DEPARTMENT OF ADMINISTRATION
STATE HISTORIC PRESERVATION OFFICE

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

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

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

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

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

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

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

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

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

need to be reassessed for eligibility under additional or alternate contexts.
Properties without NR, CEF, SEF, DOE, or CNEF designations in the reports may not have been evaluated and therefore no assumption to their eligibility can be made. Integrity and contexts change over time, therefore any eligibility determination made ten (10) or more years from the date of the current survey are considered out of date and the property will need to be reassessed.
If you require a comprehensive assessment of a project's potential to impact archaeological sites or historic/architectural properties, you may need to hire a qualified archaeologist and/or historian. If you need assistance with a project review, please contact Kelly Gragg-Johnson, Environmental Review Specialist @ 651-201-3285 or by email at kelly.graggjohnson@state.mn.us.
The Minnesota SHPO Archaeology and Historic/Architectural Survey Manuals can be found at https://mn.gov/admin/shpo/identification-evaluation/.

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

To access historic resource information please visit our webpage on Using SHPO's Files.

From: Mueller, Kevin <kevin.mueller@stantec.com>
Sent: Wednesday, March 15, 2023 11:18 AM
To: MN_MNIT_Data Request SHPO <DataRequestSHPO@state.mn.us>
Cc: Banks, Benjamin <Benjamin.Banks@stantec.com>; Bot, Courtnay <Courtnay.Bot@stantec.com>
Subject: Corcoran EAW Lit Search

Hello,

I would like to request a records search for the attached project. Would it also be possible to provide the search results in an access database format?

Thank you and please let me know if there are any questions.

Kevin Mueller
GIS Specialist

Mobile: (952) 334-1991

Stantec
One Carlson Parkway, Suite 100
Plymouth MN 55447

Hope Community Church Development Project
GHG Emissions Summary

Scope	Source	CO_2 (ton/yr)	CH_4 (ton/yr)	N_2O (ton/yr)	CO_2e (ton/yr)
Direct Emissions					
Scope 1	Construction - Mobile Sources Onroad - Gasoline and Diesel	75	0.001	0.002	75
Scope 1	Construction - Mobile Sources Non-road - Diesel	591	0.05	0.05	607
Scope 1	Operations - Stationary Combustion - Natural Gas	1,302	0.02	0.002	1,325
Scope 1	Operations - Mobile Sources - Gasoline and Diesel	7,106	0.1	0.1	7,138
Indirect Emissions					
Scope 2	Purchased Electricity	3,281	0.3	0.05	3,358
Scope 2	Waste - Operations	-	-	-	954
Atmospheric Removals of GHGs					
Scope 1 - Sinks	Land Use (CO2 Removals to Terrestrial Storage)				355
Total		**12,356**	**0.6**	**0.20**	**13,813**

EPA Simplified GHG Emissions Calculator ("the Calculator")

August 2022

The EPA Simplified GHG Emissions Calculator ("the Calculator") is designed as a simplified calculation tool to help organizations estimate and inventory their annual greenhouse gas (GHG) emissions for US-based operations. All methodologies and default values provided are based on the most current Center for Corporate Climate Leadership Greenhouse *Gas Inventory Guidance Documents* and the *Emission Factors Hub*. The Calculator will quantify the direct and indirect emissions from sources at an organization when activity data are entered into the various sections of the workbook for one annual period.

Before entering data, please: 1) Enable Macros and 2) Familiarize yourself with the *Simplified Guide to GHG Management for Organizations.*

Access the guide: https://www.epa.gov/climateleadership/ghg-inventory-guidance-low-emitters

There are three primary steps in completing a GHG inventory. Each emissions source also has these three steps.

(1) **DEFINE**: The first step in completing a GHG inventory is to determine the boundaries and emissions sources included within those boundaries. After you have defined your organizational and operational boundaries, you can use the questions on the "Boundary Questions" worksheet to help you determine which emissions sources are relevant to your business.

Go to Boundary Questions

(2) **COLLECT**: The second step is to collect data for the defined annual period. This step is typically the most time consuming, since the data can be difficult to gather. This Calculator has help sheets with suggestions and guidance for each emissions source and a general help sheet for data management. **Click the drop down menu boxes below to navigate to these sheets**.

Help - Data Management

(3) **QUANTIFY**: The third step is to calculate emissions. This Calculator is designed to complete the emissions quantification step for you. Once the user enters data in this MS Excel spreadsheet, the emissions will be calculated and totaled on the "Summary" sheet.

Calculator Guidance - Important Information

(A) Navigate to the data entry sheets using the drop down menu in the dark grey cell below and then clicking on the "Go To Data Entry Sheet" button. On the data entry sheets enter data in ORANGE cells only.

(B) This Calculator has several "Tool Sheets" with useful reference data such as unit conversions, heat contents, and emission factors. Click on the buttons below to go to the appropriate Tool Sheet.

(C) Data must be entered in the units specified on the data entry sheets. Use the "Unit Conversions" or "Heat Content" sheets if unit conversion is necessary prior to entering data into the Calculator.

(D) If more guidance is needed, you can reference the emission factor data sources found on the "Emission Factors" sheet.

Tool Sheets	Quick Data Entry Navigation
Unit Conversions	Upstream Trans and Dist
Heat Content	
Emission Factors	

Calculator Notes

Emission sources of all seven major GHGs are accounted for in the inventory and in this Calculator: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). The Calculator allows the user to estimate GHG emissions from scope 1 (direct), scope 2 (indirect), and some scope 3 (other indirect) sources.

The Calculator uses U.S.-specific cross-sector emission factors from the *Emission Factors Hub*. Many industrial sectors also have process-related emissions sources that are specific to their sector. EPA's Greenhouse Gas Reporting Program provides guidance and tools that can aid in the calculation and reporting of these emissions:

https://www.epa.gov/ghgreporting

The GHG Protocol also provides guidance on calculating emissions from industrial processes.

Hope Community Church Development

Source ID	Description	Building Activity	Bldg Square Footage	Natural Gas Combustion (scf/yr)	Electricity Usage (kWh/yr)
Multi-Family-A	Multi-Family Housing "A"	Lodging	43,000	2,119,900	662,200
Retail-B	Proposed Retail "B"	Retail	10,100	342,390	142,410
Medical-C	Proposed Medical "C"	Health care	47,000	4,027,900	1,179,700
Medical-D	Proposed Medical "D"	Health care	43,200	3,702,240	1,084,320
Retail-E	Proposed Retail "E"	Retail	10,000	339,000	141,000
Multi-Family-F	Multi-Family Housing "F"	Lodging	51,000	2,514,300	785,400
Senior-G	Senior Senior Housing "G"	Lodging	56,000	2,760,800	862,400
Senior-H	55+ Housing "H"	Lodging	33,100	1,631,830	509,740
Villas-I	Villas "I"	Lodging	48,000	2,366,400	739,200
Rowhomes-J	Rowhomes "J"	Lodging	38,535	1,899,776	593,439
		Total	379,935		

Mobile Source Information

Construction Duration: 5 Years (estimate)
Project Lifetime: 50 Years (estimate)

									Annual		Total for Project		Emission Factors[5]			Total Emissions (ton)				Emissions Annualized over Project Lifetime (50 yrs)			
Onroad/Off-Road	Vehicle Type[1]	Number of Vehicles per Day[2]	Fuel Type	Vehicle Year[1]	VMT (miles per day, per vehicle)[2]	Miles per Gallon[3]	Fuel Usage (gal/day, all vehicles)	Days Per Year[4]	Miles Traveled (mi/yr, all vehicles)	Fuel Usage (gal/yr, all vehicles)	Miles Traveled (mi)	Fuel Usage (gal)	CO2 (kg/gal)	CH4 (g/mile)	N2O (g/mile)	CO2 (short ton)	CH4 (short ton)	N2O (short ton)	CO2e (short ton)	CO2 (short ton/yr)	CH4 (short ton/yr)	N2O (short ton/yr)	CO2e (short ton/yr)
Onroad	Passenger Cars - Laborers (commute)	50	Gas	2007	40	22.9	87.47	260	520,000	22,742	2,600,000	113,708	8.78	0.0072	0.0052	1,100.50	0.0206	0.01490	1,105	22.0	0.00041	0.00030	22.109
	Heavy Duty Trucks - Dump Trucks (onsite and offsite)	20	Diesel	2007	30	7.5	80.11	260	156,000	20,828	780,000	104,139	10.21	0.0095	0.0431	1,172.04	0.0082	0.0371	1,183	23.4	0.00016	0.0007	23.666
	Heavy Duty Trucks - Semis (onsite and offsite)	20	Diesel	2007	30	6.0	100.00	260	156,000	26,000	780,000	130,000	10.21	0.0095	0.0431	1,463.10	0.0082	0.0371	1,474	29.3	0.00016	0.0007	29.487
																		Total	**3,763**			**Total**	**75.3**

1. Assumed vehicle year 2007 to match the first year a new methodology for gas mileage was developed by the Federal Highway Administration (FHWA). The new category Light duty vehicle, short wheel base replaces the old category Passenger car and includes passenger cars, light trucks, vans and sport utility vehicles with a wheelbase (WB) equal to or less than 121 inches. Model Year 2007 is also assumed for heavy duty trucks to allow for use of more conservative GHG emission factors compared to later years.

2. Estimate. Assume passenger cars have 20 mile commute (one-way). Heavy duty trucks vehicle miles traveled includes both onsite and hauling to and from the site during construction.

3. Mileage for passenger cars based upon the U.S. Department of Transportation's Bureau of Transportation Average Fuel Efficiency of Light Duty Vehicles (https://www.bts.gov/content/average-fuel-efficiency-us-light-duty-vehicles). Mileage for dump trucks and semis based on U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2019 (December 2021), Table VM-1.

4. Based on construction schedule of 52 weeks per year, 5 days per week.

5. Emission factors based on the U.S. EPA's Emission Factors Hub (https://www.epa.gov/climateleadership/ghg-emission-factors-hub, updated April 2022).

									Emission Factors[4]			Total Project Emissions				Emissions Annualized over Project Lifetime (50 yrs)			
Onroad/Offroad	Vehicle Type	Number of Vehicles[1]	Fuel type	Engine Size (hp)[1]	Consumption Rate (gal/hour per hp-hr)[2]	Hours per Year[3]	Total Gallons per Year	Total Gallons for Project	CO2 (kg/gal)	CH4 (g/gal)	N2O (g/gal)	CO2 (short ton)	CH4 (short ton)	N2O (short ton)	CO2e (short ton)	CO2 (short ton/yr)	CH4 (short ton/yr)	N2O (short ton/yr)	CO2e (short ton/yr)
Off-road	Crane	4	Diesel	250	0.05	2,080	104,000	520,000	10.21	0.94	0.87	5852.39	0.539	0.499	6,014	117.0	0.0108	0.0100	120.3
	Backhoe	6	Diesel	125	0.05	2,080	78,000	390,000	10.21	0.94	0.87	4389.29	0.404	0.374	4,511	87.8	0.0081	0.0075	90.2
	Loader/Bulldozer	8	Diesel	250	0.05	2,080	208,000	1,040,000	10.21	0.94	0.87	11704.78	1.078	0.997	12,029	234.1	0.0216	0.0199	240.6
	Excavator	4	Diesel	250	0.05	2,080	104,000	520,000	10.21	0.94	0.87	5852.39	0.539	0.499	6,014	117.0	0.0108	0.0100	120.3
	Skid Steer	6	Diesel	50	0.05	2,080	31,200	156,000	10.21	0.94	0.87	1755.72	0.162	0.150	1,804	35.1	0.0032	0.0030	36.1
	Total	28					525,200	2,626,000						**Total**	**30,373**			**Total**	**607.5**

1. Estimate.

2. Off-road mobile source fuel usage based on South Coast Air Quality Management District CEQA Air Quality Handbook, Table A9-3E.

3. Based on construction schedule of 52 weeks per year, 5 days per week, 8 hours per day.

4. Emission factors based on the U.S. EPA's Emission Factors Hub (https://www.epa.gov/climateleadership/ghg-emission-factors-hub, updated April 2022).

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U.S. Environmental Protection Agency

Scope 1 Emissions from Stationary Combustion Sources

Guidance

(A) Enter annual data for each combustion unit, facility, or site (by fuel type) in ORANGE cells on **Table 1**. Example entry is shown in first row (*GREEN Italics*).
- Select "Fuel Combusted" from drop down box.
- Enter "Quantity Combusted" and choose the appropriate units from the drop down box in the unit column. If it's necessary to convert units, common heat contents can be found on the "Heat Content" sheet and unit conversions on the "Unit Conversion" sheet.

(B) If fuel is consumed in a facility but stationary fuel consumption data are not available, an estimate should be made for completeness. See the "Items to Note" section of the Help sheet for suggested estimation approaches.

(C) Biomass CO_2 emissions are not reported in the total emissions, but are reported separately at the bottom of the sheet.

Table 1. Stationary Source Fuel Combustion

Source ID	Source Description	Source Area (sq ft)	Fuel Combusted	Quantity Combusted	Units
BLR-012	*East Power Plant*	*12,517*	*Natural Gas*	*10,000*	*MMBtu*
Multi-Family	Multi-Family Housing "A"	43,000	Natural Gas	2,119,900	SCF
Retail-B	Proposed Retail "B"	10,100	Natural Gas	342,390	SCF
Medical-C	Proposed Medical "C"	47,000	Natural Gas	4,027,900	SCF
Medical-D	Proposed Medical "D"	43,200	Natural Gas	3,702,240	SCF
Retail-E	Proposed Retail "E"	10,000	Natural Gas	339,000	SCF
Multi-Family	Multi-Family Housing "F"	51,000	Natural Gas	2,514,300	SCF
Senior-G	Senior Senior Housing "G"	56,000	Natural Gas	2,760,800	SCF
Senior-H	55+ Housing "H"	33,100	Natural Gas	1,631,830	SCF
Villas-I	Villas "I"	48,000	Natural Gas	2,366,400	SCF
Rowhomes	Rowhomes "J"	38,535	Natural Gas	1,899,776	SCF

GHG Emissions

Total Organization-Wide Stationary Source Combustion by Fuel Type

Fuel Type	Quantity Combusted	Units
Anthracite Coal	0	short tons
Bituminous Coal	0	short tons
Sub-bituminous Coal	0	short tons
Lignite Coal	0	short tons
Natural Gas	21,704,536	scf
Distillate Fuel Oil No. 2	0	gallons
Residual Fuel Oil No. 6	0	gallons
Kerosene	0	gallons
Liquefied Petroleum Gases (LPG)	0	gallons
Wood and Wood Residuals	0	short tons
Landfill Gas	0	scf

Total Organization-Wide CO_2, CH_4 and N_2O Emissions from Stationary Source Fuel Combustion

Fuel Type	CO_2 (kg)	CH_4 (g)	N_2O (g)
Anthracite Coal	0.0	0.0	0.0
Bituminous Coal	0.0	0.0	0.0
Sub-bituminous Coal	0.0	0.0	0.0
Lignite Coal	0.0	0.0	0.0
Natural Gas	1,181,594.9	22,355.7	2,170.5
Distillate Fuel Oil No. 2	0.0	0.0	0.0
Residual Fuel Oil No. 6	0.0	0.0	0.0
Kerosene	0.0	0.0	0.0
Liquefied Petroleum Gases (LPG)	0.0	0.0	0.0
Total Fossil Fuel Emissions	**1,181,594.9**	**22,355.7**	**2,170.5**
Wood and Wood Residuals	0.0	0.0	0.0
Landfill Gas	0.0	0.0	0.0
Total Non-Fossil Fuel Emissions	**0.0**	**0.0**	**0.0**
Total Emissions for all Fuels	**1,181,594.9**	**22,355.7**	**2,170.5**

Total CO_2 Equivalent Emissions (metric tons) - Stationary Combustion	**1,182.8**
Total Biomass CO_2 Equivalent Emissions (metric tons) - Stationary Combustion	**0.0**

Mobile Source - Operations

													Emission Factors[6]			Emissions			
Onroad/Off-Road	Vehicle Type[1]	Vehicle Driver	Daily Trips	Fuel Type	Vehicle Year[2]	VMT (miles per trip)[3]	Miles per Gallon[4]	Fuel Usage (gal/day, all vehicles)	Days Per Year[5]	Miles per Year (per Vehicle)	Miles per Year All Vehicles	Fuel Usage (gal/yr, all vehicles)	CO2 (kg/gal)	CH4 (g/mile)	N2O (g/mile)	CO2 (short ton/yr)	CH4 (short ton/yr)	N2O (short ton/yr)	CO2e (short ton/yr)
Onroad	Light Duty Vehicle, Short Wheel Base (Passenger Cars, small trucks and SUVs)	Resident	3171	Gas	2007	5	22.9	693.40	365	1,825	5,787,075	253,090	8.78	0.0072	0.0052	2,449	0.05	0.03	2,461
		Retail Facilities	2794	Gas	2007	5	22.9	610.96	365	1,825	5,099,050	223,001	8.78	0.0072	0.0052	2,158	0.0405	0.02923	2,168
		Medical Facilities	3181	Gas	2007	5	22.9	695.59	365	1,825	5,805,325	253,889	8.78	0.0072	0.0052	2,457	0.0461	0.03328	2,468
	Heavy Duty Trucks (Deliveries)	Parcel and Supply Deliveries	15	Diesel	2007	5	7.49	10.01	365	1,825	27,375	3,655	10.21	0.0095	0.0431	41	0.000	0.001	42
																		Total	7,138

1. Assumes members and employees drive gasoline powered light duty vehicles and deliveries are made by heavy duty diesel vehicles.

2. Assumed vehicle year 2007 to match the first year a new methodology for gas mileage was developed by the Federal Highway Administration (FHWA). The new category Light duty vehicle, short wheel base replaces the old category Passenger car and includes passenger cars, light trucks, vans and sport utility vehicles with a wheelbase (WB) equal to or less than 121 inches. The new category Light duty vehicle, long wheel base replaces Other 2-axle, 4-tire vehicle and includes large passenger cars, vans, pickup trucks, and sport/utility vehicles with wheelbases (WB) larger than 121 inches.

3. Assumes 5 miles per trip for all vehicles.

4. Mileage based upon the U.S. Department of Transportation's Bureau of Transportation Average Fuel Efficiency of Light Duty Vehicles (https://www.bts.gov/content/average-fuel-efficiency-us-light-duty-vehicles). Mileage for delivery trucks based on U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2019 (December 2021), Table VM-1.

5. Assume daily trips take place 365 days per year.

Back to Intro | Back to Summary | Help | Help - Market-Based Method

Scope 2 Emissions from Purchase of Electricity

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U.S. Environmental Protection Agency

Guidance

The Indirect Emissions from Purchased Electricity Guidance document provides guidance for quantifying two scope 2 emissions totals, using a **location-based method** and a **market-based method**. The organization should quantify and report both totals in its GHG inventory. The location-based method considers average emission factors for the electricity grids that provide electricity. The market-based method considers contractual arrangements under which the organization procures electricity from specific sources, such as renewable energy.

(A) Enter total annual electricity purchased in kWh and each eGRID subregion for each facility or site in ORANGE cells of **Table 1**.
(B) If electricity consumption data are not available for a facility, an estimate should be made for completeness.
See the "Items to Note" section of the Help sheet for suggested estimation approaches.
(C) Select "eGRID subregion" from drop box and enter "Electricity Purchased."
- Use map (Figure 1) at bottom of sheet to determine appropriate eGRID subregion. If subregion cannot be determined from the map, find the correct subregion by entering the location's zip code into EPA's Power Profiler:
https://www.epa.gov/egrid/power-profiler#/
(D) See the market-based emission factor hierarchy on the market-based method Help sheet. If any of the first four types of emission factors are applicable, enter the factors in the yellow cells marked as "<enter factor>". If not, leave the yellow cells as is, and eGRID subregion factors will be used for market-based emissions.
Example entry is shown in first row (*GREEN Italics*) for a facility that purchases RECs for 100% of its consumption, and therefore has a market-based emission factor of 0.

Help - Market-Based Method

Tips: Enter electricity usage by location and then look up the eGRID subregion for each location.
If you purchase renewable energy that is less than 100% of your site's electricity, see the example in the market-based method Help sheet.

Table 1. Total Amount of Electricity Purchased by eGRID Subregion

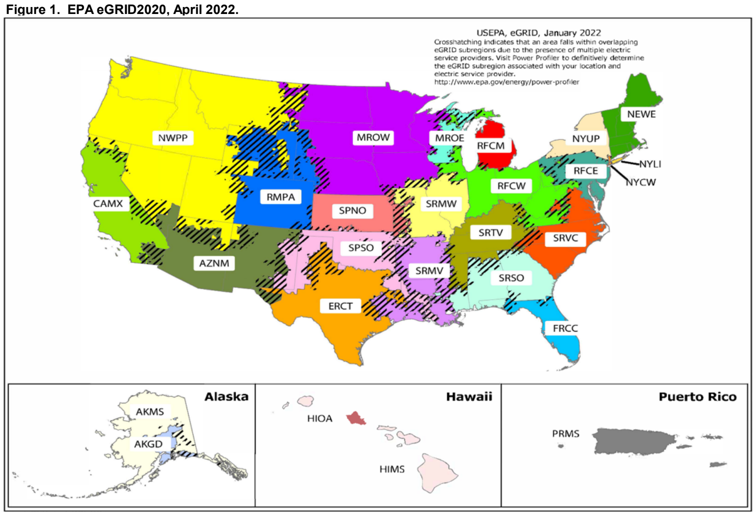
					Market-Based *Use these cells to enter applicable market-based emission factors*						Location-Based		
					Emission Factors			Emissions			Emissions		
Source ID	Source Description	Source Area (sq ft)	eGRID Subregion *where electricity is consumed*	Electricity Purchased (kWh)	CO_2 Emissions (lb/MWh)	CH_4 Emissions (lb/MWh)	N_2O Emissions (lb/MWh)	CO_2 Emissions (lb)	CH_4 Emissions (lb)	N_2O Emissions (lb)	CO_2 Emissions (lb)	CH_4 Emissions (lb)	N_2O Emissions (lb)
Bldg-012	*East Power Plant*	*12,517*	*HIMS (HICC Miscellaneous)*	*200,000*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*228,640.0*	*22.0*	*3.4*
Multi-Famil	Multi-Family Housin	43,000	MROW (MRO West)	662,200	<enter factor>	<enter factor>	<enter factor>	648,624.9	68.9	9.9	648,624.9	68.9	9.9
Retail-B	Proposed Retail "B"	10,100	MROW (MRO West)	142,410	<enter factor>	<enter factor>	<enter factor>	139,490.6	14.8	2.1	139,490.6	14.8	2.1
Medical-C	Proposed Medical "(	47,000	MROW (MRO West)	1,179,700	<enter factor>	<enter factor>	<enter factor>	1,155,516.2	122.7	17.7	1,155,516.2	122.7	17.7
Medical-D	Proposed Medical "I	43,200	MROW (MRO West)	1,084,320	<enter factor>	<enter factor>	<enter factor>	1,062,091.4	112.8	16.3	1,062,091.4	112.8	16.3
Retail-E	Proposed Retail "E"	10,000	MROW (MRO West)	141,000	<enter factor>	<enter factor>	<enter factor>	138,109.5	14.7	2.1	138,109.5	14.7	2.1
Multi-Famil	Multi-Family Housin	51,000	MROW (MRO West)	785,400	<enter factor>	<enter factor>	<enter factor>	769,299.3	81.7	11.8	769,299.3	81.7	11.8
Senior-G	Senior Senior Housi	56,000	MROW (MRO West)	862,400	<enter factor>	<enter factor>	<enter factor>	844,720.8	89.7	12.9	844,720.8	89.7	12.9
Senior-H	55+ Housing "H"	33,100	MROW (MRO West)	509,740	<enter factor>	<enter factor>	<enter factor>	499,290.3	53.0	7.6	499,290.3	53.0	7.6
Villas-I	Villas "I"	48,000	MROW (MRO West)	739,200	<enter factor>	<enter factor>	<enter factor>	724,046.4	76.9	11.1	724,046.4	76.9	11.1
Rowhomes	Rowhomes "J"	38,535	MROW (MRO West)	593,439	<enter factor>	<enter factor>	<enter factor>	581,273.5	61.7	8.9	581,273.5	61.7	8.9
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
Total Emissions for All Sources				6,699,809				6,562,462.9	696.8	100.5	6,562,462.9	696.8	100.5

GHG Emissions

CO_2 Equivalent Emissions (metric tons)	
Location-Based Electricity Emissions	**2,998.2**
Market-Based Electricity Emissions	**2,998.2**

Notes:
1. CO_2, CH_4 and N_2O emissions are estimated using methodology provided in EPA's Center for Corporate Climate Leadership Greenhouse Gas Inventory Guidance - Indirect Emissions from Purchased Electricity (January 2016).

Figure 1. EPA eGRID2020, April 2022.



Hope Community Church
Greenhouse Gas Emissions Associated with Land Use Changes

			Land Use Emissions or Reductions					
Land Use Change[1]	**Description**	**Land Area (acres)**	**Net CO2 Emissions Flux (tons CO2e)[2]**	**Total Area Land Use Change (hectares)[3]**	**Emission Factor (tons CO2e/acre)**	**Emissions (tons CO2e, negative value represents sink/removal of carbon)**	**Project Lifetime Multiplier (assume 50+ years)**	**Emission Rate (ton/yr)**
Wetland Remaining Wetland (includes stormwater ponds)		4.5	15,800,000	37,658,000	0.17	0.8	1	0.8
Wetland to Settlement		0.2	300,000	46,000	2.64	0.5	1	0.5
Forest to Settlement		6.9	61,500,000	541,000	46.01	317.4	1	317
Impervious Surface Remaining Impervious Surface		5	0	0	0	0	1	0
Cropland to Wetland (Stormwater Pond)		4	5,000	440,000	0.005	0.02	1	0.02
Cropland to Settlement	Settlement includes developed areas, including residential, industrial, commercial and institutional land.	37.3	5,900,000	2,452,000	0.97	36.3	1	36
Total		**57.9**						**355**

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

2. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020. Net Flux from Soil, Dead Organic Matter and Biomass Carbon Stock Changes.
Cropland Converted to Settlements: Table 6-125
Wetland Converted to Settlements: Table 6-125
Forest Converted to Settlements: Table 6-125
Cropland Converted to Wetland: Table 6-87 (Note that value "does not exceed <5,000 tons CO2e")
Wetlands Remaining Wetlands: Table 6-1.

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

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Scope 1 Emissions from Mobile Sources

Guidance

(A) Enter annual data for each vehicle or group of vehicles (grouped by vehicle type, vehicle year, and fuel type) in ORANGE cells in **Table 1**. Example entry is shown in first row (GREEN *Italics*). Only enter vehicles owned or leased by your organization on this sheet. All other vehicle use such as employee commuting or business travel is considered a scope 3 emissions source and should be reported in the corresponding scope 3 sheets.

- Select "On-Road" or "Non-Road" from drop down box to determine the Vehicle Types available. **Must select before picking vehicle type.**
- Select "Vehicle Type" from drop down box (closest type available).
- Enter "Fuel Usage" in appropriate units (units appear when vehicle type is selected).
  - If mileage or fuel usage is unknown, estimate using approximate fuel economy values (see **Reference Table** below).
  - Vehicle year and Miles traveled are not necessary for non-road equiment.

(B) When using biofuels, typically the biofuel (biodiesel or ethanol) is mixed with a petroleum fuel (diesel or gasoline) for use in vehicles. Enter the biodiesel and ethanol percentages of the fuel if known, or leave default values.

Biodiesel Percent: 20 %
Ethanol Percent: 80 %

(C) Biomass CO_2 emissions from biodiesel and ethanol are not reported in the total emissions, but are reported separately at the bottom of the sheet.

Table 1. Mobile Source Fuel Combustion and Miles Traveled

Source ID	Source Description	On-Road or Non-Road?	Vehicle Type	Vehicle Year	Fuel Usage	Units	Miles Traveled
Fleet-012	*HQ Fleet*	*OnRoad*	*Passenger Cars - Gasoline*	*2019*	*500*	*gal*	*12,065*

Reference Table: Average Fuel Economy by Vehicle Type

Vehicle Type	Average Fuel Economy (mpg)
Passenger Cars	24.1
Motorcycles	44.0
Diesel Buses (Diesel Heavy-Duty Vehicles)	7.3
Other 2-axle, 4-Tire Vehicles	17.6
Single unit 2-Axle 6-Tire or More Trucks	7.5
Combination Trucks	6.0

GHG Emissions

Total Organization-Wide Mobile Source Fuel Usage and CO_2 Emissions (On-Road and Off-Road Vehicles)

Fuel Type	Fuel Usage	Units	CO_2 (kg)	
Motor Gasoline	0	gallons	0.0	
Diesel Fuel	0	gallons	0.0	
Residual Fuel Oil	0	gallons	0.0	
Aviation Gasoline	0	gallons	0.0	
Kerosene-Type Jet Fuel	0	gallons	0.0	
Liquefied Petroleum Gas (LPG)	0	gallons	0.0	
Ethanol	0	gallons	0.0	*Note: emissions here are only for the g*
Biodiesel	0	gallons	0.0	*Note: emissions here are only for the d*
Liquefied Natural Gas (LNG)	0	gallons	0.0	
Compressed Natural Gas (CNG)	0	scf	0.0	

Total Organization-Wide On-Road Gasoline Mobile Source Mileage and CH_4/N_2O Emissions

Vehicle Type	Vehicle Year	Mileage (miles)	CH_4 (g)	N_2O (g)
Passenger Cars - Gasoline	1984-93	0	0.0	0.0
	1994	0	0.0	0.0
	1995	0	0.0	0.0
	1996	0	0.0	0.0
	1997	0	0.0	0.0
	1998	0	0.0	0.0
	1999	0	0.0	0.0
	2000	0	0.0	0.0
	2001	0	0.0	0.0
	2002	0	0.0	0.0
	2003	0	0.0	0.0
	2004	0	0.0	0.0
	2005	0	0.0	0.0
	2006	0	0.0	0.0
	2007	0	0.0	0.0
	2008	0	0.0	0.0
	2009	0	0.0	0.0
	2010	0	0.0	0.0
	2011	0	0.0	0.0
	2012	0	0.0	0.0
	2013	0	0.0	0.0
	2014	0	0.0	0.0
	2015	0	0.0	0.0
	2016	0	0.0	0.0
	2017	0	0.0	0.0
	2018	0	0.0	0.0
	2019	0	0.0	0.0
Light-Duty Trucks - Gasoline	1987-93	0	0.0	0.0
(Vans, Pickup Trucks, SUVs)	1994	0	0.0	0.0
	1995	0	0.0	0.0
	1996	0	0.0	0.0
	1997	0	0.0	0.0
	1998	0	0.0	0.0
	1999	0	0.0	0.0
	2000	0	0.0	0.0
	2001	0	0.0	0.0
	2002	0	0.0	0.0
	2003	0	0.0	0.0
	2004	0	0.0	0.0
	2005	0	0.0	0.0
	2006	0	0.0	0.0
	2007	0	0.0	0.0
	2008	0	0.0	0.0
	2009	0	0.0	0.0
	2010	0	0.0	0.0
	2011	0	0.0	0.0
	2012	0	0.0	0.0
	2013	0	0.0	0.0
	2014	0	0.0	0.0
	2015	0	0.0	0.0
	2016	0	0.0	0.0
	2017	0	0.0	0.0
	2018	0	0.0	0.0
	2019	0	0.0	0.0
Heavy-Duty Vehicles - Gasoline	1985-86	0	0.0	0.0
	1987	0	0.0	0.0
	1988-1989	0	0.0	0.0
	1990-1995	0	0.0	0.0
	1996	0	0.0	0.0
	1997	0	0.0	0.0
	1998	0	0.0	0.0
	1999	0	0.0	0.0
	2000	0	0.0	0.0
	2001	0	0.0	0.0
	2002	0	0.0	0.0
	2003	0	0.0	0.0
	2004	0	0.0	0.0
	2005	0	0.0	0.0
	2006	0	0.0	0.0
	2007	0	0.0	0.0
	2008	0	0.0	0.0
	2009	0	0.0	0.0
	2010	0	0.0	0.0
	2011	0	0.0	0.0
	2012	0	0.0	0.0
	2013	0	0.0	0.0
	2014	0	0.0	0.0
	2015	0	0.0	0.0
	2016	0	0.0	0.0
	2017	0	0.0	0.0
	2018	0	0.0	0.0
	2019	0	0.0	0.0
Motorcycles - Gasoline	1960-1995	0	0.0	0.0
	1996-2019	0	0.0	0.0

Total Organization-Wide On-Road Non-Gasoline Mobile Source Mileage and CH_4/N_2O Emissions

Vehicle Type	Fuel Type	Vehicle Year	Mileage (miles)	CH_4 (g)	N_2O (g)
Passenger Cars - Diesel	Diesel	1960-1982	0	0	0
		1983-2006	0	0	0
		2007-2019	0	0	0
Light-Duty Trucks - Diesel	Diesel	1960-1982	0	0	0
		1983-2006	0	0	0
		2007-2019	0	0	0
Medium- and Heavy-Duty Vehicles -	Diesel	1960-2006	0	0	0
		2007-2019	0	0	0
Light-Duty Cars	Methanol		0	0.0	0.0
	Ethanol		0	0.0	0.0
	CNG		0	0.0	0.0
	LPG		0	0.0	0.0
	Biodiesel		0	0.0	0.0
Light-Duty Trucks	Ethanol		0	0.0	0.0
	CNG		0	0.0	0.0
	LPG		0	0.0	0.0
	LNG		0	0.0	0.0
	Biodiesel		0	0.0	0.0
Medium-Duty Trucks	CNG		0	0.0	0.0
	LPG		0	0.0	0.0
	LNG		0	0.0	0.0
	Biodiesel		0	0.0	0.0
Heavy-Duty Trucks	Methanol		0	0.0	0.0
	Ethanol		0	0.0	0.0
	CNG		0	0.0	0.0
	LPG		0	0.0	0.0
	LNG		0	0.0	0.0
	Biodiesel		0	0.0	0.0
Buses	Methanol		0	0.0	0.0
	Ethanol		0	0.0	0.0
	CNG		0	0.0	0.0
	LPG		0	0.0	0.0
	LNG		0	0.0	0.0
	Biodiesel		0	0.0	0.0

Total Organization-Wide Non-Road Mobile Source Fuel Usage and CH_4/N_2O Emissions

Vehicle Type	Fuel Type	Fuel Usage (gallons)	CH_4 (g)	N_2O (g)
Ships and Boats	Residual Fuel Oil	-	-	-
	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
Locomotives	Diesel	-	-	-
Aircraft	Jet Fuel	-	-	-
	Aviation Gasoline	-	-	-
Agricultural Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
	LPG	-	-	-
Agricultural Offroad Trucks	Gasoline	-	-	-
	Diesel	-	-	-
Construction/Mining Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
	LPG	-	-	-
Construction/Mining Offroad Trucks	Gasoline	-	-	-
	Diesel	-	-	-
Lawn and Garden Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
	LPG	-	-	-
Airport Equipment	Gasoline	-	-	-
	Diesel	-	-	-
	LPG	-	-	-
Industrial/Commercial Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
	LPG	-	-	-
Logging Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
Railroad Equipment	Gasoline	-	-	-
	Diesel	-	-	-
	LPG	-	-	-
Recreational Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
	LPG	-	-	-

Total CO_2 Equivalent Emissions (metric tons) - Mobile Sources	**0.0**
Total Biomass CO_2 Equivalent Emissions (metric tons) - Mobile Sources	**0.0**

Notes:

1. Average mpg values from the U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2019 (December 2021), Table VM-1.

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Tool Sheet: Emission Factors

All emission factors sourced from EPA's Emission Factors Hub, April 2022. Unless otherwise noted. Fuel emission factors presented represent the combustion-only emissions (e.g., tank-to-wheel)
https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub

Stationary Combustion Emission Factors (Used for Steam and Stationary Combustion)

Fuel Type	CO_2 Factor (kg / mmBtu)	CH_4 Factor (g / mmBtu)	N_2O Factor (g / mmBtu)	CO_2 Factor (kg / Unit)	CH_4 Factor (g / unit)	N_2O Factor (g / unit)	Unit
Natural Gas	53.06	1.0	0.10	0.05444	0.00103	0.00010	scf
Distillate Fuel Oil No. 2	73.96	3.0	0.60	10.21	0.41	0.08	gallons
Residual Fuel Oil No. 6	75.10	3.0	0.60	11.27	0.45	0.09	gallons
Kerosene	75.20	3.0	0.60	10.15	0.41	0.08	gallons
Liquefied Petroleum Gases (LPG)	61.71	3.0	0.60	5.68	0.28	0.06	gallons
Anthracite Coal	103.69	11	1.6	2,602	276	40	short tons
Bituminous Coal	93.28	11	1.6	2,325	274	40	short tons
Sub-bituminous Coal	97.17	11	1.6	1,676	190	28	short tons
Lignite Coal	97.72	11	1.6	1,389	156	23	short tons
Mixed (Electric Power Sector)	95.52	11	1.6				
Coal Coke	113.67	11	1.6				
Wood and Wood Residuals	0	7.2	3.6	1,640	126	63	short tons
Landfill Gas	0	3.2	0.63	0.02525	0.001552	0.000306	scf

Mobile Combustion Emission Factors

CO_2 Emissions for Road Vehicles

Fuel Type	CO_2 Emission Factor (kg CO_2 / unit)	Unit
Motor Gasoline	8.78	gallon
Diesel Fuel	10.21	gallon
Residual Fuel Oil	11.27	gallon
Aviation Gasoline	8.31	gallon
Kerosene-Type Jet Fuel	9.75	gallon
Liquefied Petroleum Gases (LPG)	5.68	gallon
Ethanol (100%)	5.75	gallon
Biodiesel (100%)	9.45	gallon
Liquefied Natural Gas (LNG)	4.50	gallon
Compressed Natural Gas (CNG)	0.05444	scf

CH_4 and N_2O Emissions for Highway Vehicles

Vehicle Type	Year	CH_4 Factor (g / mile)	N_2O Factor (g / mile)	Notes
Gasoline Passenger Cars	1984-93	0.0704	0.0647	
	1994	0.0617	0.0603	
	1995	0.0531	0.0560	
	1996	0.0434	0.0503	
	1997	0.0337	0.0446	
	1998	0.0240	0.0389	
	1999	0.0215	0.0355	
	2000	0.0175	0.0304	
	2001	0.0105	0.0212	
	2002	0.0102	0.0207	
	2003	0.0095	0.0181	
	2004	0.0078	0.0085	
	2005	0.0075	0.0067	
	2006	0.0076	0.0075	
	2007	0.0072	0.0052	
	2008	0.0072	0.0049	
	2009	0.0071	0.0046	
	2010	0.0071	0.0046	
	2011	0.0071	0.0046	
	2012	0.0071	0.0046	
	2013	0.0071	0.0046	
	2014	0.0071	0.0046	
	2015	0.0068	0.0042	
	2016	0.0065	0.0038	
	2017	0.0054	0.0018	
	2018	0.0052	0.0016	
	2019	0.0051	0.0015	

Gasoline Light-Duty Trucks (Vans, Pickup Trucks, SUVs)	1987-93	0.0813	0.1035	
	1994	0.0646	0.0982	
	1995	0.0517	0.0908	
	1996	0.0452	0.0871	
	1997	0.0452	0.0871	
	1998	0.0412	0.0787	
	1999	0.0333	0.0618	
	2000	0.0340	0.0631	
	2001	0.0221	0.0379	
	2002	0.0242	0.0424	
	2003	0.0221	0.0373	
	2004	0.0115	0.0088	
	2005	0.0105	0.0064	
	2006	0.0108	0.0080	
	2007	0.0103	0.0061	
	2008	0.0095	0.0036	
	2009	0.0095	0.0036	
	2010	0.0095	0.0035	
	2011	0.0096	0.0034	
	2012	0.0096	0.0033	
	2013	0.0095	0.0035	
	2014	0.0095	0.0033	
	2015	0.0094	0.0031	
	2016	0.0091	0.0029	
	2017	0.0084	0.0018	
	2018	0.0081	0.0015	
	2019	0.0080	0.0013	Assume these CH_4 and N_2O factors for ethanol light-duty vehicles
Gasoline Heavy-Duty Vehicles	1985-86	0.4090	0.0515	
	1987	0.3675	0.0849	
	1988-1989	0.3492	0.0933	
	1990-1995	0.3246	0.1142	
	1996	0.1278	0.1680	
	1997	0.0924	0.1726	
	1998	0.0655	0.1750	
	1999	0.0648	0.1724	
	2000	0.0630	0.1660	
	2001	0.0577	0.1468	
	2002	0.0634	0.1673	
	2003	0.0602	0.1553	
	2004	0.0298	0.0164	
	2005	0.0297	0.0083	
	2006	0.0299	0.0241	
	2007	0.0322	0.0015	
	2008	0.0340	0.0015	
	2009	0.0339	0.0015	
	2010	0.0320	0.0015	
	2011	0.0304	0.0015	
	2012	0.0313	0.0015	
	2013	0.0313	0.0015	
	2014	0.0315	0.0015	
	2015	0.0332	0.0021	
	2016	0.0321	0.0061	
	2017	0.0329	0.0084	
	2018	0.0326	0.0082	
	2019	0.0330	0.0091	Assumed these CH_4 and N_2O factors for ethanol heavy-duty vehicles and buses
Gasoline Motorcycles	1960-1995	0.0899	0.0087	
	1996-2019	0.0672	0.0069	

Vehicle Type	Fuel Type	Vehicle Year	CH_4 Factor (g / mile)	N_2O Factor (g / mile)
Passenger Cars	Diesel	1960-1982	0.0006	0.0012
		1983-2006	0.0005	0.0010
		2007-2019	0.0302	0.0192
Light-Duty Trucks	Diesel	1960-1982	0.0011	0.0017
		1983-2006	0.0009	0.0014
		2007-2019	0.0290	0.0214
Medium- and Heavy-Duty Vehicles	Diesel	1960-2006	0.0051	0.0048
		2007-2019	0.0095	0.0431
Light-Duty Cars	Methanol		0.0080	0.0050
	Ethanol		0.0080	0.0050
	CNG		0.0810	0.0050
	LPG		0.0080	0.0050
	Biodiesel		0.0300	0.0190
Light-Duty Trucks	Ethanol		0.0120	0.0090
	CNG		0.1210	0.0090
	LPG		0.0120	0.0120
	LNG		0.1210	0.0090
	Biodiesel		0.0290	0.0210
Medium-Duty Trucks	CNG		4.2000	0.0010
	LPG		0.0140	0.0340
	LNG		4.2000	0.0010
	Biodiesel		0.0090	0.0430
Heavy-Duty Trucks	Methanol		0.0750	0.0280
	Ethanol		0.0750	0.0280
	CNG		3.7000	0.0010
	LPG		0.0130	0.0260
	LNG		3.7000	0.0010
	Biodiesel		0.0090	0.0430
Buses	Methanol		0.0160	0.0320
	Ethanol		0.0160	0.0320
	CNG		10.0000	0.0010
	LPG		0.0340	0.0170
	LNG		10.0000	0.0010
	Biodiesel		0.0090	0.0430

CH_4 and N_2O Emissions for Non-Road Vehicles

Vehicle Type (superscript from EF Hub removed)	Fuel Type	CH_4 Factor (g / gallon)	N_2O Factor (g / gallon)
Ships and Boats	Residual Fuel Oil	1.11	0.32
	Gasoline (2 stroke)	4.58	0.08
	Gasoline (4 stroke)	2.24	0.01
	Diesel	6.41	0.17
Locomotives	Diesel	0.80	0.26
Aircraft	Jet Fuel	0	0.30
	Aviation Gasoline	7.06	0.11
Agricultural Equipment	Gasoline (2 stroke)	9.19	0.26
	Gasoline (4 stroke)	3.33	1.83
	Diesel	0.97	0.90
	LPG	0.42	0.60
Agricultural Offroad Trucks	Gasoline	3.33	1.84
	Diesel	0.99	0.92
Construction/Mining Equipment	Gasoline (2 stroke)	12.11	0.34
	Gasoline (4 stroke)	3.03	1.67
	Diesel	0.94	0.87
	LPG	0.44	0.63
Construction/Mining Offroad Trucks	Gasoline	3.03	1.67
	Diesel	0.99	0.92
Lawn and Garden Equipment	Gasoline (2 stroke)	10.21	0.28
	Gasoline (4 stroke)	2.85	1.56
	Diesel	0.93	0.86
	LPG	0.45	0.64
Airport Equipment	Gasoline	3.88	2.13
	Diesel	0.99	0.91
	LPG	0.45	0.64
Industrial/Commercial Equipment	Gasoline (2 stroke)	9.21	0.26
	Gasoline (4 stroke)	3.04	1.67
	Diesel	0.93	0.87
	LPG	0.45	0.64
Logging Equipment	Gasoline (2 stroke)	12.48	0.35
	Gasoline (4 stroke)	2.85	1.57
	Diesel	0.99	0.92
Railroad Equipment	Gasoline	2.87	1.59
	Diesel	0.83	0.78
	LPG	0.43	0.63
Recreational Equipment	Gasoline (2 stroke)	4.27	0.20
	Gasoline (4 stroke)	4.30	2.22
	Diesel	0.80	0.75
	LPG	0.41	0.58

Refrigerants and Global Warming Potentials (GWPs)

Gas	GWP
CO_2	1
CH_4	25
N_2O	298
HFC-23	14,800
HFC-32	675
HFC-41	92
HFC-125	3,500
HFC-134	1,100
HFC-134a	1,430
HFC-143	353
HFC-143a	4,470
HFC-152	53
HFC-152a	124
HFC-161	12
HFC-227ea	3,220
HFC-236cb	1,340
HFC-236ea	1,370
HFC-236fa	9,810
HFC-245ca	693
HFC-245fa	1,030
HFC-365mfc	794
HFC-43-10mee	1,640
SF_6	22,800
NF_3	17,200
CF_4	7,390
C_2F_6	12,200
C_3F_8	8,830
c-C_4F_8	10,300
C_4F_{10}	8,860
C_5F_{12}	9,160
C_6F_{14}	9,300
$C_{10}F_{18}$	>7,500

	Blended Refrigerants (ASHRAE #)	
ASHRAE #	Blend GWP HFC/PFC	Blend Make-up
R-401A	16	53% HCFC-22 , 34% HCFC-124 , 13% HFC-152a
R-401B	14	61% HCFC-22 , 28% HCFC-124 , 11% HFC-152a
R-401C	19	33% HCFC-22 , 52% HCFC-124 , 15% HFC-152a
R-402A	2,100	38% HCFC-22 , 6% HFC-125 , 2% propane
R-402B	1,330	6% HCFC-22 , 38% HFC-125 , 2% propane
R-403B	3,444	56% HCFC-22 , 39% PFC-218 , 5% propane
R-404A	3,922	44% HFC-125 , 4% HFC-134a , 52% HFC 143a
R-406A	0	55% HCFC-22 , 41% HCFC-142b , 4% isobutane
R-407A	2,107	20% HFC-32 , 40% HFC-125 , 40% HFC-134a
R-407B	2,804	10% HFC-32 , 70% HFC-125 , 20% HFC-134a
R-407C	1,774	23% HFC-32 , 25% HFC-125 , 52% HFC-134a
R-407D	1,627	15% HFC-32 , 15% HFC-125 , 70% HFC-134a
R-407E	1,552	25% HFC-32 , 15% HFC-125 , 60% HFC-134a
R-408A	2,301	47% HCFC-22 , 7% HFC-125 , 46% HFC 143a
R-409A	0	60% HCFC-22 , 25% HCFC-124 , 15% HCFC-142b
R-410A	2,088	50% HFC-32 , 50% HFC-125
R-410B	2,229	45% HFC-32 , 55% HFC-125
R-411A	14	87.5% HCFC-22 , 11 HFC-152a , 1.5% propylene
R-411B	4	94% HCFC-22 , 3% HFC-152a , 3% propylene
R-413A	2,053	88% HFC-134a , 9% PFC-218 , 3% isobutane
R-414A	0	51% HCFC-22 , 28.5% HCFC-124 , 16.5% HCFC-142b
R-414B	0	5% HCFC-22 , 39% HCFC-124 , 9.5% HCFC-142b
R-417A	2,346	46.6% HFC-125 , 5% HFC-134a , 3.4% butane
R-422A	3,143	85.1% HFC-125 , 11.5% HFC-134a , 3.4% isobutane
R-422D	2,729	65.1% HFC-125 , 31.5% HFC-134a , 3.4% isobutane
R-423A	2,280	47.5% HFC-227ea , 52.5% HFC-134a ,
R-424A	2,440	50.5% HFC-125, 47% HFC-134a, 2.5% butane/pentane
R-426A	1,508	5.1% HFC-125, 93% HFC-134a, 1.9% butane/pentane
R-428A	3,607	77.5% HFC-125 , 2% HFC-143a , 1.9% isobutane
R-434A	3,245	63.2% HFC-125, 16% HFC-134a, 18% HFC-143a, 2.8% isobutane
R-500	32	73.8% CFC-12 , 26.2% HFC-152a , 48.8% HCFC-22
R-502	0	48.8% HCFC-22 , 51.2% CFC-115
R-504	325	48.2% HFC-32 , 51.8% CFC-115
R-507	3,985	5% HFC-125 , 5% HFC143a
R-508A	13,214	39% HFC-23 , 61% PFC-116
R-508B	13,396	46% HFC-23 , 54% PFC-116

Molecular Weights

Element	Atomic Weight
Carbon	12.011

Electricity Emission Factors (System Average)

CO_2, CH_4 and N_2O Total Output Emission Factors by Subregion eGRID2020, February 2022.

Subregion	CO_2 Factor (lb CO_2/MWh)	CH_4 Factor (lb CH_4/MWh)	N_2O Factor (lb N_2O/MWh)
AKGD (ASCC Alaska Grid)	1,097.6	0.100	0.014
AKMS (ASCC Miscellaneous)	534.1	0.027	0.005
AZNM (WECC Southwest)	846.6	0.054	0.007
CAMX (WECC California)	513.5	0.032	0.004
ERCT (ERCOT All)	818.6	0.052	0.007
FRCC (FRCC All)	835.1	0.049	0.006
HIMS (HICC Miscellaneous)	1,143.2	0.110	0.017
HIOA (HICC Oahu)	1,653.0	0.178	0.027
MROE (MRO East)	1,526.4	0.139	0.020
MROW (MRO West)	979.5	0.104	0.015
NEWE (NPCC New England)	528.2	0.074	0.010
NWPP (WECC Northwest)	600.0	0.056	0.008
NYCW (NPCC NYC/Westchester)	634.6	0.022	0.003
NYLI (NPCC Long Island)	1,203.9	0.138	0.018
NYUP (NPCC Upstate NY)	233.5	0.016	0.002
PRMS (Puerto Rico Miscellaneous)	1,602.2	0.085	0.014
RFCE (RFC East)	652.5	0.045	0.006
RFCM (RFC Michigan)	1,153.1	0.101	0.014
RFCW (RFC West)	985.0	0.086	0.012
RMPA (WECC Rockies)	1,144.8	0.101	0.014
SPNO (SPP North)	954.0	0.100	0.014
SPSO (SPP South)	931.8	0.060	0.009
SRMV (SERC Mississippi Valley)	740.4	0.032	0.004
SRMW (SERC Midwest)	1,480.7	0.156	0.023
SRSO (SERC South)	860.2	0.060	0.009
SRTV (SERC Tennessee Valley)	834.2	0.075	0.011
SRVC (SERC Virginia/Carolina)	623.1	0.050	0.007

Business Travel and Employee Commuting Emission Factors

Vehicle Type (superscript from EF Hub removed)	CO_2 Factor (kg / unit)	CH_4 Factor (g / unit)	N_2O Factor (g / unit)	Units
Passenger Car	0.332	0.007	0.007	vehicle-mile
Light-Duty Truck	0.454	0.012	0.009	vehicle-mile
Motorcycle	0.183	0.070	0.007	vehicle-mile
Intercity Rail - Northeast Corridor	0.058	0.0055	0.0007	passenger-mile
Intercity Rail - Other Routes	0.150	0.0117	0.0038	passenger-mile
Intercity Rail - National Average	0.113	0.0092	0.0026	passenger-mile
Commuter Rail	0.139	0.0112	0.0028	passenger-mile
Transit Rail (i.e. Subway, Tram)	0.099	0.0084	0.0012	passenger-mile
Bus	0.056	0.0210	0.0009	passenger-mile
Short Haul (< 300 miles)	0.207	0.0064	0.0066	passenger-mile
Medium Haul (>= 300 miles, < 2300 miles)	0.129	0.0006	0.0041	passenger-mile
Long Haul (>= 2300 miles)	0.163	0.0006	0.0052	passenger-mile

Product Transport Emission Factors

Vehicle Type (superscript from EF Hub removed)	CO_2 Factor (kg / unit)	CH_4 Factor (g / unit)	N_2O Factor (g / unit)	Units
Medium- and Heavy-Duty Truck	1.450	0.013	0.034	vehicle-mile
Passenger Car	0.332	0.007	0.007	vehicle-mile
Light-Duty Truck	0.454	0.012	0.009	vehicle-mile
Medium- and Heavy-Duty Truck	0.211	0.0020	0.0049	ton-mile
Rail	0.022	0.0017	0.0006	ton-mile
Waterborne Craft	0.041	0.0183	0.0008	ton-mile
Aircraft	1.165	0.0000	0.0359	ton-mile

Fire Suppresant Leak Rates

Type of Equipment	Leak Rate
Fixed	3.5%
Portable	2.5%

Source:
EPA (2021) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019. Page A-275.

Waste Emission Factors

WARM Material	Material for SGEC Lookup (red text indicates different name from WARM)	Metric Tons CO_2e / Short Ton Material					
		Recycled	Landfilled	Combusted	Composted	Anaerobically Digested (Dry Digestate with Curing)	Anaerobically Digested (Wet Digestate with Curing)
Aluminum Cans	Aluminum Cans	0.06	0.02	0.01	NA	NA	NA
Aluminum Ingot	Aluminum Ingot	0.04	0.02	0.01	NA	NA	NA
Steel Cans	Steel Cans	0.32	0.02	0.01	NA	NA	NA
Copper Wire	Copper Wire	0.18	0.02	0.01	NA	NA	NA
Glass	Glass	0.05	0.02	0.01	NA	NA	NA
HDPE	HDPE	0.21	0.02	2.80	NA	NA	NA
LDPE	LDPE	NA	0.02	2.80	NA	NA	NA
PET	PET	0.23	0.02	2.05	NA	NA	NA
LLDPE	LLDPE	NA	0.02	2.80	NA	NA	NA
PP	PP	NA	0.02	2.80	NA	NA	NA
PS	PS	NA	0.02	3.02	NA	NA	NA
PVC	PVC	NA	0.02	1.26	NA	NA	NA
PLA	PLA	NA	0.02	0.01	0.17	NA	NA
Corrugated Containers	Corrugated Containers	0.11	0.90	0.05	NA	NA	NA
Magazines/Third-class mail	Magazines and Third class mail	0.02	0.42	0.05	NA	NA	NA
Newspaper	Newspaper	0.02	0.35	0.05	NA	NA	NA
Office Paper	Office Paper	0.02	1.25	0.05	NA	NA	NA
Phonebooks	Phonebooks	0.04	0.35	0.05	NA	NA	NA
Textbooks	Textbooks	0.04	1.25	0.05	NA	NA	NA
Dimensional Lumber	Dimensional Lumber	0.09	0.17	0.05	NA	NA	NA
Medium-density Fiberboard	Medium density Fiberboard	0.15	0.07	0.05	NA	NA	NA
Food Waste (non-meat)	Food Waste non meat	NA	0.58	0.05	0.15	0.14	0.11
Food Waste (meat only)	Food Waste meat only	NA	0.58	0.05	NA	0.14	0.11
Beef	Beef	NA	0.58	0.05	0.15	0.14	0.11
Poultry	Poultry	NA	0.58	0.05	0.15	0.14	0.11
Grains	Grains	NA	0.58	0.05	0.15	0.14	0.11
Bread	Bread	NA	0.58	0.05	0.15	0.14	0.11
Fruits and Vegetables	Fruits and Vegetables	NA	0.58	0.05	0.15	0.14	0.11
Dairy Products	Dairy Products	NA	0.58	0.05	0.15	0.14	0.11
Yard Trimmings	Yard Trimmings	NA	0.33	0.05	0.19	0.11	NA
Grass	Grass	NA	0.26	0.05	0.19	0.09	NA
Leaves	Leaves	NA	0.26	0.05	0.19	0.13	NA
Branches	Branches	NA	0.53	0.05	0.19	0.16	NA
Mixed Paper (general)	Mixed Paper general	0.07	0.80	0.05	NA	NA	NA
Mixed Paper (primarily residential)	Mixed Paper primarily residential	0.07	0.77	0.05	NA	NA	NA
Mixed Paper (primarily from offices)	Mixed Paper primarily from offices	0.03	0.75	0.05	NA	NA	NA
Mixed Metals	Mixed Metals	0.23	0.02	0.01	NA	NA	NA
Mixed Plastics	Mixed Plastics	0.22	0.02	2.34	NA	NA	NA
Mixed Recyclables	Mixed Recyclables	0.09	0.68	0.11	NA	NA	NA
Food Waste	Food Waste	NA	0.58	0.05	0.15	NA	NA
Mixed Organics	Mixed Organics	NA	0.48	0.05	0.17	NA	NA
Mixed MSW	Mixed MSW municipal solid waste	NA	0.52	0.43	NA	NA	NA
Carpet	Carpet	NA	0.02	1.68	NA	NA	NA
Desktop CPUs	Desktop CPUs	NA	0.02	0.40	NA	NA	NA
Portable Electronic Devices	Portable Electronic Devices	NA	0.02	0.89	NA	NA	NA
Flat-panel Displays	Flat panel Displays	NA	0.02	0.74	NA	NA	NA
CRT Displays	CRT Displays	NA	0.02	0.64	NA	NA	NA
Electronic Peripherals	Electronic Peripherals	NA	0.02	2.23	NA	NA	NA
Hard-copy Devices	Hard copy Devices	NA	0.02	1.92	NA	NA	NA
Mixed Electronics	Mixed Electronics	NA	0.02	0.87	NA	NA	NA
Clay Bricks	Clay Bricks	NA	0.02	NA	NA	NA	NA
Concrete	Concrete	0.01	0.02	NA	NA	NA	NA
Fly Ash	Fly Ash	0.01	0.02	NA	NA	NA	NA
Tires	Tires	0.10	0.02	2.21	NA	NA	NA
Asphalt Concrete	Asphalt Concrete	-	0.02	NA	NA	NA	NA
Asphalt Shingles	Asphalt Shingles	0.03	0.02	0.70	NA	NA	NA
Drywall	Drywall	NA	0.02	NA	NA	NA	NA
Fiberglass Insulation	Fiberglass Insulation	0.05	0.02	NA	NA	NA	NA
Vinyl Flooring	Vinyl Flooring	NA	0.02	0.29	NA	NA	NA
Wood Flooring	Wood Flooring	NA	0.18	0.08	NA	NA	NA

Notes: These factors do not include any avoided emissions impact from any of the disposal methods. All the factors presented here include transportation emissions, which are optional in the Scope 3 Calculation Guidance, with an assumed average distance traveled to the processing facility. AR4 GWPs are used to convert all waste emission factors into CO_2e.

Recycling emissions include transport to recycling facility and sorting of recycled materials at material recovery facility.
Landfilling emissions include transport to landfill, equipment use at landfill and fugitive landfill CH4 emissions. Landfill CH4 is based on typical landfill gas collection practices and average landfill moisture conditions.
Combustion emissions include transport to combustion facility and combustion-related non-biogenic CO2 and N2O
Composting emissions include transport to composting facility, equipment use at composting facility and CH4 and N2O emissions during composting.

EPA CENTER FOR CORPORATE CLIMATE LEADERSHIP
U.S. Environmental Protection Agency

Scope 3 Emissions from Waste - HELP SHEET

DEFINITION

Scope 3 emissions from waste include the disposal and treatment of waste generated in the reporting company's operations in the reporting year in facilities not owned or controlled by the reporting company. These emission factors align with the requirements of the GHG Protocol Scope 3 Standard. The emission factors do not include any avoided emissions impact from any of the disposal methods. All the factors presented include transportation emissions, which are optional in the Scope 3 Calculation Guidance, with an assumed average distance traveled to the processing facility. AR4 GWPs are used to convert all waste emission factors into CO_2e.

COLLECT

Collect information on the amount of weight disposed at your facilities, by the type of waste (plastics, paper, etc.) and disposal method (recycling, incineration, etc.). Refer to the Emission Factors tab for a complete list of materials and available disposal methods.

Data Collection Checklist

- Weight of waste disposed by material type and disposal method

QUANTIFY

Enter the data into the appropriate orange colored boxes (Tables 1) of the Calculator section titled "Waste." Once the data are entered into the Calculator, the CO_2 equivalent emissions are calculated and summarized in the green colored box.

Hope Community Church
Development Infrastructure
Feasibility Study

May 2023

Prepared for:

City of Corcoran, MN
8200 County Road 116
Corcoran, MN 55340

Prepared by:

Stantec Consulting Services Inc.
One Carlson Parkway
Plymouth, MN 55447

Project Number: 193806190_112

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APPENDICES

1.0 Introduction

Hope Community Church Development representatives have been planning for developing this parcel for over 20 years and has submitted a concept to develop a multi-purpose campus that maintains the church operations and expands the site to include housing for seniors along with more diverse uses such as commercial and medical.

The concept shows that full development provides 738 varied housing units and up to 110,300 square feet of commercial, retail, and medical office space.

This study reviews the City infrastructure components involved in development that consists of transportation, sewer, water and stormwater. Although the City is the lead for the local government process, there are multiple agencies involved with reviewing and issuing permits or approvals for the development including Hennepin County (CR 116 and CR30 access and septic abandonment), Minnesota Pollution Control (MPCA—Construction Stormwater and sewer system), Minnesota Department of Health (MDH--watermain), Elm Creek Water Management Commission (stormwater), and Metropolitan Council Environmental Services (MCES—trunk sewer compliance).

This site has a significant ongoing infrastructure component for water supply, in that the project is scheduled to use the City's Water Treatment Plant and Tower unless a temporary contract amendment with Corcoran and Maple Grove is executed.

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2.0 Transportation

2.1 Background

This study examined weekday A.M. and P.M. peak hour traffic impacts of the proposed development at the following intersections:

- CSAH 30/CR 116
- CR 116/Oswald Farm Road
- CSAH 30/access (future)

2.2 Proposed Development Characteristics

For purpose of the traffic impact analysis, the proposed development is assumed to consist of the following uses:

- Rowhomes – 54 dwelling units
- Villas – 20 dwelling units
- Senior housing – 324 dwelling units
- Apartments – 340 dwelling units
- Medical office – 72,160 square feet
- General office – 18,040 square feet
- Coffee shop – 4,000 square feet
- Fast casual restaurant – 4,000 square feet
- Retail – 12,100 square feet

Access will be provided on the north by reconfiguring the connection of Oswald Farm Road and Hunters Ridge and on the south via a new connection to CSAH 30.

2.3 Existing Conditions

The proposed project site is currently partially utilized by Hope Community Church, which will remain at its current location. The site is bounded by CSAH 30 on the south, agricultural land on the west, existing residential uses on the north, and CR 116 on the east.

Near the site location, CSAH 30 and CR 116 are two lane undivided roadways with turn lanes and traffic signal control at major intersections. Oswald Farm Road is a local two-lane roadway.

Existing conditions near the proposed project location are described below.

CSAH 30/CR 116 - This four-way intersection is controlled with a traffic signal. The eastbound, northbound, and southbound approaches provide one left turn lane, one through lane, and one right turn lane. The westbound approach provides one left turn lane and one through/right turn lane with a channelized right turn island.

CR 116/Oswald Farm - This four-way intersection is controlled on two legs with stop signs on the eastbound and westbound approaches. The northbound and southbound approaches provide one left turn/through lane and one through/right turn lane. The eastbound and westbound approaches provide one left turn/through/right turn lane, with turn lanes under design as part of the Bellwether development.

Weekday traffic volume data was recorded at the existing intersections in February, 2023. Existing traffic volume data is presented later in this report.

2.4 Traffic Forecasts

To adequately address the impacts of the proposed project, forecasts and analyses were completed for the years 2028 and 2040. Specifically, weekday a.m. and p.m. peak hour traffic forecasts were completed for the following scenarios:

- *2023 Existing*. Existing volumes were determined through traffic counts at the subject intersections. The existing volume information includes trips generated by the uses near the project site.
- *2028 No-Build*. Existing volumes at the subject intersections were increased by 1.6 percent per year to determine 2028 No-Build volumes. The 1.6 percent per year growth rate was calculated based on historic traffic volume growth in the project area and traffic forecast information presented in the Corcoran Comprehensive Plan.
- *2028 Build*. Trips generated by the proposed development were added to the 2028 No-Build volumes to determine 2028 Build volumes.
- *2040 No-Build*. Existing volumes at the subject intersections were increased by 1.6 percent per year to determine 2040 No-Build volumes. The 1.6 percent per year growth rate was calculated based on historic traffic volume growth in the project area and traffic forecast information presented in the Corcoran Comprehensive Plan.
- *2040 Build*. Trips generated by the proposed development were added to the 2040 No-Build volumes to determine 2040 Build volumes.

The expected new development trips were calculated based on data presented in Trip Generation, Eleventh Edition, published by the Institute of Transportation Engineers. These calculations represent total trips that will be generated by the proposed development. The gross trip generation totals were reduced by 10 percent to account for internal trips. The resultant trip generation estimates are shown in Table 1.

Table 1: Weekday Trip Generation for Proposed Project

Land Use (ITE Code)	Size	Weekday AM Peak Hour			Weekday PM Peak Hour			Weekday Daily
		In	**Out**	**Total**	**In**	**Out**	**Total**	**Total**
Rowhomes (215)	54 DU	6	20	26	18	13	31	389
Villas (210)	20 DU	4	10	14	12	7	19	189
Senior Housing (252)	324 DU	22	43	65	46	35	81	1050
Apartments (221)	340 DU	29	97	126	81	52	133	1543

Medical Office (720)	72,160 SF	177	47	224	85	199	284	2598
General Office (710)	18,040 SF	25	2	27	4	22	26	196
Coffee Shop (937)	4,000 SF	176	168	344	78	78	156	2134
Fast Casual Restaurant (930)	4,000 SF	2	4	6	28	22	50	388
Retail (822)	12,100 SF	17	11	28	40	40	80	659
Totals		**458**	**402**	**860**	**392**	**468**	**860**	**9146**
10% reduction for internal trips		(46)	(40)	(86)	(39)	(47)	(86)	(915)
Net Totals		**412**	**362**	**774**	**353**	**421**	**774**	**8231**

Notes: SF=square feet and DU=dwelling units

The coffee shop, restaurant, and retail trips can be categorized in the following trip types:

- *New Trips.* Trips solely to and from the proposed development.
- *Pass-By Trips.* Trips that are attracted from the traffic volume on roadways immediately adjacent to the site.

Based on information published in the *Trip Generation Handbook*, 3rd Edition, by the Institute of Transportation Engineers, the percentage of each trip type is as follows:

- 60% new, 40% pass by

Trip distribution percentages for the subject development trips were established based on the nearby roadway network, existing and expected future traffic patterns, and location of the subject development in relation to major attractions and population concentrations.

The distribution percentages for trips generated by the proposed development are described below:

- 15 percent to/from the north on CR 116
- 70 percent to/from the east on CSAH 30
- 5 percent to/from the west on CSAH 30
- 10 percent to/from the south on CR 116

Development trips from Table 1 were assigned to the surrounding roadway network using the preceding trip distribution percentages. Traffic volumes were established for all the forecasting scenarios described earlier during the weekday a.m. and p.m. peak hours. The resultant peak hour volumes are shown in Tables 2 and 3.

Table 2: Weekday A.M. Peak Hour Traffic Volumes

CR 116/ Hunters/ Oswald	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
2023 Existing	8	0	14	1	0	0	13	80	0	1	389	13
2028 No-Build	9	0	15	1	0	0	14	87	0	1	421	14
2028 Build	60	0	180	1	0	0	170	80	0	1	400	87
2040 No-Build	10	0	18	1	0	0	17	105	0	1	509	17
2040 Build	61	0	183	1	0	0	173	98	0	1	488	90
CSAH 30/CR 116	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**

2023 Existing	6	499	37	88	120	27	7	60	58	87	302	9
2028 No-Build	6	540	40	95	130	29	8	65	63	94	327	10
2028 Build	6	618	47	95	231	160	23	83	63	220	345	10
2040 No-Build	8	654	48	115	157	35	9	79	76	114	396	12
2040 Build	8	732	59	115	266	166	25	97	76	240	414	12
CSAH 30/access	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
2023 Existing	-	542	-	-	136	-	-	-	-	-	-	-
2028 No-Build	-	587	-	-	147	-	-	-	-	-	-	-
2028 Build	48	555	-	-	137	135	-	-	-	121	-	25
2040 No-Build	-	710	-	-	178	-	-	-	-	-	-	-
2040 Build	48	678	-	-	168	135	-	-	-	121	-	25

Table 3: Weekday P.M. Peak Hour Traffic Volumes

CR 116/ Hunters/ Oswald	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
2023 Existing	13	0	15	3	0	0	17	365	2	0	135	10
2028 No-Build	14	0	16	3	0	0	18	395	2	0	146	11
2028 Build	85	0	190	3	0	0	175	379	2	0	141	60
2040 No-Build	17	0	20	4	0	0	22	478	3	0	177	13
2040 Build	88	0	194	4	0	0	179	462	3	0	172	62
CSAH 30/CR 116	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
2023 Existing	11	283	13	56	488	78	34	295	131	51	83	17
2028 No-Build	12	306	14	61	528	84	37	319	142	55	90	18
2028 Build	12	417	28	61	584	215	45	338	142	203	111	18
2040 No-Build	14	371	17	73	639	102	45	386	172	67	109	22
2040 Build	14	482	33	73	718	233	56	405	172	215	130	22
CSAH 30/access	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
2023 Existing	-	307	-	-	539	-	-	-	-	-	-	-
2028 No-Build	-	332	-	-	584	-	-	-	-	-	-	-
2028 Build	27	321	-	-	563	111	-	-	-	138	-	39
2040 No-Build	-	402	-	-	706	-	-	-	-	-	-	-
2040 Build	2	391	-	-	685	111	-	-	-	138	-	39

2.5 Traffic Analysis

Traffic analyses were completed for the subject intersections for all scenarios described earlier during the weekday a.m. and p.m. peak hours using Synchro software. Initial analysis was completed using existing geometrics and intersection control.

The existing northbound and southbound by-pass lanes on CR 116 at Hunters Ridge/Oswald will be replaced with left and right turn lanes with the 2023 turn lane improvements. The modified geometrics were used for all future analysis scenarios.

Capacity analysis results are presented in terms of level of service (LOS), which is defined in terms of traffic delay at the intersection. LOS ranges from A to F. LOS A represents the best intersection operation, with little delay for each vehicle using the intersection. LOS F represents the worst intersection

operation with excessive delay. The following is a detailed description of the conditions described by each LOS designation:

- Level of service A corresponds to a free flow condition with motorists virtually unaffected by the intersection control mechanism. For a signalized or an unsignalized intersection, the average delay per vehicle would be approximately 10 seconds or less.

- Level of service B represents stable flow with a high degree of freedom, but with some influence from the intersection control device and the traffic volumes. For a signalized intersection, the average delay ranges from 10 to 20 seconds. An unsignalized intersection would have delays ranging from 10 to 15 seconds for this level.

- Level of service C depicts a restricted flow which remains stable, but with significant influence from the intersection control device and the traffic volumes. The general level of comfort and convenience changes noticeably at this level. The delay ranges from 20 to 35 seconds for a signalized intersection and from 15 to 25 seconds for an unsignalized intersection at this level.

- Level of service D corresponds to high-density flow in which speed and freedom are significantly restricted. Though traffic flow remains stable, reductions in comfort and convenience are experienced. The control delay for this level is 35 to 55 seconds for a signalized intersection and 25 to 35 seconds for an unsignalized intersection.

- Level of service E represents unstable flow of traffic at or near the capacity of the intersection with poor levels of comfort and convenience. The delay ranges from 55 to 80 seconds for a signalized intersection and from 35 to 50 seconds for an unsignalized intersection at this level.

- Level of service F represents forced flow in which the volume of traffic approaching the intersection exceeds the volume that can be served. Characteristics often experienced include long queues, stop-and-go waves, poor travel times, low comfort and convenience, and increased accident exposure. Delays over 80 seconds for a signalized intersection and over 50 seconds for an unsignalized intersection correspond to this level of service.

The LOS results for the study intersections are presented in Tables 4 and 5.

Table 4: Weekday A.M. Peak Hour Level of Service Results

CR 116/Hunters /Oswald	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**Intersection**
2023 Existing	B	B	B	B	B	B	A	A	A	A	A	A	A
2028 No-Build	B	B	B	B	B	B	A	A	A	A	A	A	A
2028 Build	D	D	D	C	C	C	A	A	A	A	A	A	A
2040 No-Build	B	B	B	B	B	B	A	A	A	A	A	A	A
2040 Build	E	E	E	D	D	D	A	A	A	A	A	A	B
CSAH 30/ CR 116	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**Intersection**
2023 Existing	B	B	B	B	A	A	B	B	C	B	C	B	B
2028 No-Build	B	B	B	B	B	A	C	C	C	B	C	B	B
2028 Build	B	C	B	B	B	A	C	C	C	C	C	C	C
2040 No-Build	B	C	B	B	B	A	C	C	C	C	C	C	C
2040 Build	B	C	B	C	B	A	C	D	D	C	D	C	C

CSAH 30/ access	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
2023 Existing	-	A	-	-	A	-	-	-	-	-	-	-	A
2028 No-Build	-	A	-	-	A	-	-	-	-	-	-	-	A
2028 Build	A	A	-	-	A	A	-	-	-	C	-	A	A
2040 No-Build	-	A	-	-	A	-	-	-	-	-	-	-	A
2040 Build	A	A	-	-	A	-	-	-	-	D	-	A	A

Table 5: Weekday P.M. Peak Hour Level of Service Results

CR 116/Hunters /Oswald	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
2023 Existing	B	B	B	B	B	B	A	A	A	A	A	A	A
2028 No-Build	B	B	B	B	B	B	A	A	A	A	A	A	A
2028 Build	C	C	C	D	D	D	A	A	A	A	A	A	A
2040 No-Build	B	B	B	C	C	C	A	A	A	A	A	A	A
2040 Build	E	E	E	D	D	D	A	A	A	A	A	A	B
CSAH 30/ CR 116	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**Intersection**
2023 Existing	B	B	B	B	B	A	B	C	B	B	B	B	B
2028 No-Build	B	B	B	B	B	A	B	C	B	B	B	B	B
2028 Build	B	C	B	B	C	A	C	C	C	C	B	B	C
2040 No-Build	B	B	B	B	C	A	B	C	C	C	C	C	C
2040 Build	C	C	B	B	D	A	C	E	D	D	C	C	D
CSAH 30/ access	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**Intersection**
2023 Existing	-	A	-	-	A	-	-	-	-	-	-	-	A
2028 No-Build	-	A	-	-	A	-	-	-	-	-	-	-	A
2028 Build	A	A	-	-	A	A	-	-	-	E	-	A	A
2040 No-Build	-	A	-	-	A	-	-	-	-	-	-	-	A
2040 Build	A	A	-	-	A	-	-	-	-	F	-	A	A

Under existing, 2028 No-Build, 2028 Build, and 2040 No-Build conditions, all movements and intersections operate at LOS E or better during the a.m. and p.m. peak hours.

Under 2040 Build conditions, the southbound left turn at the CSAH 30/access intersection operates at LOS F during the p.m. peak hour. The overall intersection operates at LOS A during both the a.m. and p.m. peak hours. All other movements and intersections operate at LOS E or better during the a.m. and p.m. peak hours.

Vehicle queues for exiting movements at the site access points under 2040 Build conditions were reviewed to determine the recommended turn lane lengths. The 95th percentile maximum queue for eastbound movements at the CR 116/Oswald intersection was 81 feet during the a.m. peak hour and 73 feet during the p.m. peak hour. At the CSAH 30/access intersection, the 95th percentile maximum queue for southbound movements was 80 feet during the a.m. peak hour and 107 feet during the p.m. peak hour.

Under existing conditions at the CSAH 30/CR 116 intersection, the westbound right turn movement is accommodated with a channelized island but no dedicated right turn lane. As traffic volumes increase due to background growth and development traffic, the lack of a dedicated right turn lane impacts overall

intersection operations. In order to adequately accommodate traffic volumes, a dedicated westbound right turn lane is recommended at this intersection.

2.6 Findings

The following mitigation measures are recommended at each intersection:

- CSAH 30/CR 116
  - Construct dedicated westbound right lane 300 feet in length.

- CR 116/Hunters Ridge/Oswald Farm
  - Previously programmed northbound and southbound left and right turn lane improvements will provide access at intersection.
  - Widen eastbound Oswald Farm and widen westbound Hunters Ridge to provide a 200 foot left turn lane and through / right lane.

- New CSAH 30 access
  - Construct a 300-foot eastbound left turn and westbound right turn lanes on CSAH 30. Construct southbound approach with 200-foot left turn and right turn lanes.

County will review their system as part of the EAW process and ensure the County system is adequate to handle increased volumes and patterns.

3.0 Sewer and Water

The development is located near the west boundary of the 2040 MUSA, and trunk utilities will need to be extended to and through the site.

3.1 Sewer

The development can be serviced by extending the trunk main from its planned location at the west boundary of Water Treatment Plant site. Currently the trunk terminates in the Bellwether development and a City project will install the 30-inch line to the east ROW of CR 116. The development will be responsible for extending the sewer trunk from the City's Water Treatment parcel and continue through the site at elevations consistent with the Trunk Sewer Comprehensive Plan.

The alignment is shown within development's street and CR 116 ROWs and alignment and ROW/easement widths will be reviewed with the development construction plan process. Currently the 2040 Comprehensive Plan shows the trunk alignment crosses beneath Hunters Ridge Road just northwest of its junction with Oswald Farm Road (Appendix A) and follows the low area/wetland north of Hope Community Church to the west property boundary. The trunk sewer invert is planned for elevation 905.2 (Node NE 5 at Water Treatment Plant) resulting in a 42-foot cut through the road corridor based on existing topography.

Other factors to be coordinated include the development's construction phasing, the water tower construction activities, and Hope Church operations.

Sewer stubs/laterals will be extended for adjacent properties consistent with City policy. Preliminary finding would be a stub for future installation to service the existing development of Hunters Ridge Road and a stub towards CR 116 for Node NE 6 shown in Appendix A . Offsite work is typically designed and managed by the City under an escrow process. Agency permitting will be extensive and involve MCES, WCA, County, and MPCA.

3.2 Water

Corcoran has authorized contracts for construction of a water treatment plant (WTP) and an elevated storage tank (tower) in the NE Zone with planned operation at the end of 2024. This development is contingent upon an operational system unless a modification of the Corcoran/Maple Grove water supply contract is executed. A 2021 feasibility study for raw water wells and pipes is also included in Appendix B.

For the purposes of this report, the main analysis was executed assuming the WTP and tower are operational, with the tower providing the hydraulic grade line (WTP pumps off). An additional worst-case scenario was evaluated in which both the Tower and WTP are offline, with the existing 16-inch interconnect with Maple Grove providing the hydraulic grade line.

3.2.1 Demands

The demands for the development were estimated using data from the developer-provided site plan. The site plan included numbers of residential units and commercial uses with proposed square footages. Average demands for residential uses were calculated based on the number of units and relative residential densities in accordance with previous Corcoran water studies. Demand estimates for commercial/institutional uses were based on occupied square footage and type of use. The calculated demand for each building shown on the concept site plan was assigned a model node.

The table below presents the average and maximum day demands calculated for each building and assigned to each node within the Hope Community Church Development. A factor of 3.0 was used to calculate maximum day demands from average day demands. Peak hour demands (not shown in the table) were calculated using a factor of 2.0 multiplied by maximum day demands.

Building	Building Type	Avg Day Flow	Node	Avg Day Demand	Max Day Demand
		gal/day		gal/day	gal/day
A	Multi-Fam Housing	28,800	J-264	37,400	112,200
B	Retail	1,600			
C	Medical	7,000			
D	Medical	5,800	J-265	13,400	40,200
E	Retail	1,600			
K	Church	6,000			
F	Multi-Fam Housing	35,100	J-263	81,900	245,700
G	Senior Housing	46,800			
H	55+ Housing	27,300	J-261	31,800	95,400
I	Villas	4,500			
J	Row Homes	12,400	J-262	12,400	37,200

The total NE Zone system demands used for each scenario are shown below.

- Average Day – 0.32 MGD
- Maximum Day – 0.95 MGD
- Peak Hour – 1,321 gal/min

3.2.2 Scenario Descriptions

A map of the NE Zone pipe network that was used for this modeling work is shown on Figure 1 of Appendix B. The Hope Community Church Development area watermains are proposed to include 20-inch trunk main and 8-inch water mains. Scenario 1 evaluated predicted pressures and available fire flows within the NE Zone with the tower providing the hydraulic grade and the WTP pumps and connection to Maple Grove turned off. The assumed water levels in the tower were 5 ft below overflow for average day and 10 ft below overflow for maximum day and peak hour demand conditions.

Scenario 2 evaluated predicted pressures and available fire flow within the NE Zone with the 16-inch Maple Grove connection providing the hydraulic grade and the tower and WTP off. The assumed hydraulic grade at the Maple Grove interconnect was 1,093 ft for all demand conditions.

For fire flow analyses, the industry standard minimum residual pressure of 20 psi was used. For residential areas, a target fire flow of 1,500 gpm is assumed. For commercial/industrial areas, a higher target fire flow of 3,000 gpm is typical. New commercial/industrial buildings may be sprinklered and, as such, most of these buildings will ultimately have a lower acceptable target. However, 3,000 gpm is deemed a reasonable overall target, and allows for some conservatism in this safety-driven parameter. These targets are only estimates for planning purposes and do not represent a rating for the site.

3.2.3 Scenario 1 - Tower On, Maple Grove Off

The results for this scenario for the nodes within the proposed Hope Community Church Development are shown in the table below. The full results for all nodes in the NE Zone with Tower On are shown in Appendix B Table 1. Additionally, the average day pressure results and maximum day available fire flow results for this scenario are mapped in Figures 2 and 3 of Appendix B, respectively.

Node	Elevation (ft)	Average Day Demand (gpm)	Average Day Pressure (psi)	Max Day Fire Flow (Available) (gpm)
J-261	946	22.1	68.8	2,562
J-262	952	8.6	66.2	3,255
J-263	950.3	56.8	66.9	>5,000
J-264	952	25.8	66.2	>5,000
J-265	952.2	9.2	66.1	>5,000

As shown above, average day pressures are within the 60-70 psi range. Modeling also indicates that during the peak hour (of maximum day, a condition of rare occurrence), pressure in the development area fall by approximately 7-8 psi. This means the lowest expected pressure within the development is approximately 58.8 psi, which is above the recommended minimum of 35 psi.

The maximum available fire flows along the 20-inch trunk main are over 5,000 gpm. However, J-261, which would supply multistory senior housing and residential villas, is modeled at approximately 2,600 gpm available fire flow, above the 1,500 gpm target.

3.2.4 Scenario 2 - Maple Grove On, Tower Off

The results for this scenario for the nodes within the proposed Hope Community Church Development are shown in the table below. The full results for all nodes in the NE Zone with Maple Grove connection on are shown in Appendix B Table 2. Additionally, the average day pressure results and maximum day available fire flow results for this scenario are mapped in Figures 4 and 5 of Appendix B, respectively.

Node	Elevation (ft)	Average Day Demand (gpm)	Average Day Pressure (psi)	Max Day Fire Flow (Available) (gpm)
J-261	946	22.1	63.3	1,582
J-262	952	8.6	60.7	1,732
J-263	950.3	56.8	61.5	2,258
J-264	952	25.8	60.7	2,233
J-265	952.2	9.2	60.6	2,243

As shown above, average day pressures are within the 60-65 psi range. Modeling also indicates that during the peak hour (of maximum day, a condition of rare occurrence), pressures in the development area fall by approximately 7-8 psi. This means the lowest expected pressure within the development is approximately 53 psi, which is above the recommended minimum of 35 psi.

Under this scenario, all of the fire flows within the Hope Community Church Development nodes are below the 3,000-gpm target for commercial uses but exceed the 1,500-gpm target for residential areas.

3.3 Findings

The following mitigation measures are required for sewer and water:

Sewer

- Sewer trunk will need to be extended from the City's Water Treatment Plant site and installed at inverts consistent with the City's 2040 Sewer Comprehensive Plan and shall be responsibility of Developer. Onsite alignment is currently within development roads, and these will be finalized during Construction Plan approval process.
    - ROW and easement needs are based on pipe depth, for example ROW is a minimum of 60 feet for any internal streets with trunk sewer at 30 feet, and combination of ROW and larger easement will be coordinated with City for sewer depths greater than 30 feet.
- A lateral will be extended to north property border within Hunter's Ridge Road for future connection of the existing development.
- Stub will be installed to east boundary of property along CR 116 for future service for Node NE 6 as shown in City NE Sewer Comprehensive Plan.

Water

- This development is contingent upon an operational NE Corcoran treatment plant and tower, unless an amendment to the existing Maple Grove water agreement is obtained.
- Both the Tower and Maple Grove connection can provide average day pressure within an range of 60-70 psi at ground elevation. Supply from Maple Grove will result in slightly less pressure.
- Construction of the water tower shows that target fire flows of 3,000 gpm can be provided to the Hope Community Development Area.
- Extend a 20-inch trunk water main to the tower from the treatment plant and also south from the tower to the CR-30 ROW.

- Loop the west property boundary with 8-inch lateral from Oswald Farm Way to Hope Road for redundancy and water quality, depending on timing and phasing of development.

- A dedicated lot for a future municipal well should be shown to provide a well site consistent with City water supply needs.

- Provide 20 foot easement and install the raw water line along CR 116 for municipal water supply.

- Provide 20 foot easement along CR30 for future raw water supply from the west.

4.0 Water Resources

4.1 Regulatory Overview

Stormwater management regulations in the proposed project area would be guided or directed by Corcoran's Local Surface Water Management Plan (Local Plan) the City's Guidelines, Stormwater Pollution Prevention Plan (SWPPP) and MS4 requirements. Each of these documents has a larger regulatory context:

- The Local Plan reflects the goals, policies and rules of the Elm Creek Watershed Management Commission's Third Generation Watershed Management Plan (Commission's WMP).
- The SWPPP is a requirement of the City's stormwater permit, also known as the Municipal Separate Storm Sewer System (MS4) permit. The MS4 permit is issued by the Minnesota Pollution Control Agency (MPCA) which was reissued in October of 2021.
- Among other goals, both documents include plans to meet pollutant load reductions calculated in the Elm Creek Watershed Total Maximum Daily Load (TMDL) study. TMDL studies are required for surface waters that are designated as impaired – in other words, those that do not meet one or more State water quality standards.
- City guidelines lay out the required modeling parameters, preferred BMPs and some construction materials. City approval is required prior to application for the WMO approval process. Further City review occurs with construction plan approval process.

4.2 Watershed Setting and Land Use

Stormwater is manageable for the site and will be subject to City stormwater guidelines, wetland regulations and Elm Creek Watershed approval.

- Stormwater management for the concept plan is shown on the perimeter of the site with basins on the northwest, west, southeast and southwest. This site has high percentage of impervious and rate control will be accomplished in ponds and filtration basins.
    - Perimeter discharge locations will be reviewed for downstream conveyance capacity.
- The watershed reviews the abstraction and water quality components, along with rate control.
- No FEMA floodplain exists on site (see Figure C-1 in Appendix C) and for reference the nearest floodplain to the west is identified at a 915 elevation as compared to the onsite low area (wetland) at a 940 contour and the northeast low corner is a 935 elevation.
- The urban/rural fringe is challenging for drainage and the City reviews potential offsite drainage impacts for the additional volume associated with increased urbanization (impervious roads and rooftops). The City has required prior developments to study these impacts and also, when necessary, make offsite improvements. This same approach will be applied during the Hope Community approval process when stormwater management and grading plans are available.

4.3 Wetlands

Significant wetlands exist and the formal process will need to be followed and the EAW has a wetland review component. Corcoran is the LGU for the WCA process.

4.4 Roadway Drainage Improvements

- Development should provide treatment for required road improvements when feasible.

4.5 Findings

Stormwater is manageable for the site, although modifications will occur during the City and approval process.

- City stormwater guidelines will be utilized (see Appendix C) that cover modeling and drainage items. These guidelines will be updated with the 2023 Engineering Standards update prior to final plat approval.

- A City stormwater area charge may be in place prior to final plat.

- Modeling and grading plan will be reviewed with the preliminary plat process and strategies for mitigation of offsite volume or conveyance impacts will be determined.

- Hope Development will be required to provide on site stormwater management for offsite road improvements, where feasible.

- Draintile information shall be provided with existing conditions analysis of the site.

5.0 Financing

5.1 Summary

Financing options of the development necessary for infrastructure and to mitigate impacts typically follow the approach of:

- On-site infrastructure is managed by the developer.
- Stormwater fee may be implemented by City prior to final plat.
- All trunk fees (TLAC) and potential stormwater area charge will be due at the time of final plat.
- Off-site projects are typically managed by the by City (engineering, bidding and construction management) through an escrow.

The details of area fees, credits, and infrastructure financial commitments will be identified in the Developer Agreement, which is updated with each phase of the development

6.0 Conclusions and Recommendations

The following infrastructure improvements are feasible and necessary to manage the development. These improvements are consistent with similar requirements for other developments in Corcoran, and have shown to be necessary for managing the additional population:

Transportation

- CSAH 30/CR 116
  - Construct dedicated westbound right lane 300 feet in length.

- CR 116/Hunters Ridge/Oswald Farm
  - Previously programmed northbound and southbound left and right turn lane improvements will provide access at intersection.
  - Widen eastbound Oswald Farm and widen westbound Hunters Ridge to provide a 200 foot left turn lane and through / right lane.

- New CSAH 30 access
  - Construct a 300-foot eastbound left turn and westbound right turn lanes on CSAH 30. Construct southbound approach with 200-foot left turn and right turn lanes.

County will review their system as a responsibility of permitting the improvements and review during the EAW process to ensure the County system is adequate to handle increased volumes and patterns.

Sewer

- Sewer trunk will need to be extended from the City's Water Treatment Plant site and installed at inverts consistent with the City's 2040 Sewer Comprehensive Plan and shall be responsibility of Developer. Onsite alignment is currently within development roads, and these will be finalized during Construction Plan approval process.

    - ROW and easement needs are based on pipe depth, for example ROW is a minimum of 60 feet for any internal streets with trunk sewer at 30 feet, and combination of ROW and larger easement will be coordinated with City for sewer depths greater than 30 feet.

- A lateral will be extended to north property border within Hunter's Ridge Road for future connection of the existing development.

- Stub will be installed to east boundary of property along CR 116 for future service for Node NE 6 as shown in City NE Sewer Comprehensive Plan.

Water

- This development is contingent upon an operational NE Corcoran treatment plant and tower, unless an amendment to the existing Maple Grove water agreement is obtained.

- Both the Tower and Maple Grove connection can provide average day pressure in Hope Community Church's proposed 20-inch and 8-inch water main within an ideal range of 60-70 psi. Supply from Maple Grove will result in slightly less pressure.

- Construction of the water tower shows that target fire flows of 3,000 gpm can be provided to the Hope Community Church Development Area.

- Extend a 20-inch trunk water main to the tower from the treatment plant and also south from the tower to the CR-30 Right of Way.

- Loop the west property boundary with 8-inch lateral from Oswald Farm Way to Hope Road for redundancy and water quality, depending on timing and phasing of development.

- A dedicated lot for a future municipal well should be shown to provide a well site consistent with City water supply needs.

- Provide 20-foot easement and install the raw water line along CR 116 for municipal water supply.

- Provide 20-foot easement along CR30 for future raw water supply from the west.

Water Resources

- City stormwater guidelines will be utilized (see Appendix C) that cover modeling and drainage items. These guidelines will be updated with the 2023 Engineering Standards update prior to final plat approval.

- A City stormwater area charge may be in place prior to final plat.

- Modeling and grading plan will be reviewed with the preliminary plat process and strategies for mitigation of offsite volume or conveyance impacts will be determined.

- Hope Development will be required to provide on-site stormwater management for offsite road improvements, where feasible.

- Draintile information shall be provided with existing conditions analysis of the site.

FIGURE

Site Plan

NO	DATE	BY	CKD	APPR	COMMENT

I hereby certify 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.

Print Name: _____

Date _____ License # _____

PRELIMINARY	DRAWN BY
DESIGN REVIEW	DESIGNED BY
PERMIT SUBMITTAL	CHECKED BY
CONSTRUCTION DOCUMENTS	PROJECT NO.

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SITE PLAN CONCEPT W AERIAL

HOPE COMMUNITY CHURCH
HOPE COMMUNITY CHURCH DEVELOPMENT PROJECT
CORCORAN, MN

SHEET
C3.02
OF
REV. #

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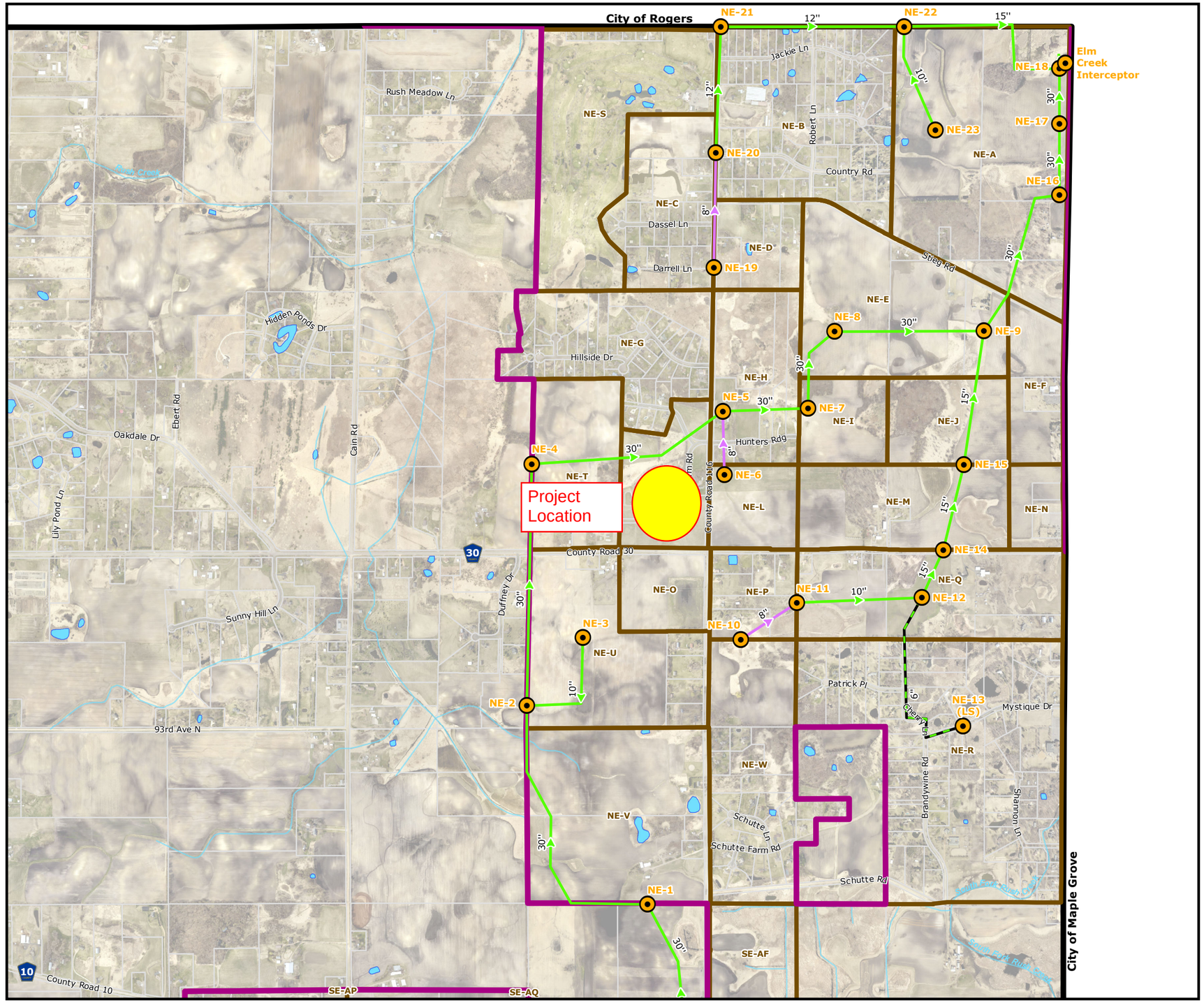
APPENDIX A

Sewer Comprehensive Plan System



CITY OF CORCORAN

2040 COMPREHENSIVE PLAN

Map 7-2
Proposed Trunk Sanitary
Sewer System - NE District

- Proposed Gravity
- Proposed Gravity (Lateral)
- Proposed Forcemain
- Sewer Nodes (LS) = Lift Station
- Sewer Subdistricts
- Municipal Boundary
- 2040 MUSA
- Parcel Boundaries
- Streams
- Lake/Open Water

1,500 750 0 1,500
Feet

N

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Date: 1/8/2019 Time: 7:15:58 AM User: ShuJC0243

FULL ACCESS INTERSECTION

COUNTY ROAD #30

OSWALD FARM ROAD

POND
4.48 ACRES

FILTRATION

FUTURE CEMETERY

EXISTING CEMETERY

WATER TOWER

1.2 ACRES

EXISTING POND

WETLAND LOCATED BY SAMBATEK ON 09/27/2022 AND DELINEATED BY SAMBATEK ON 09/15/2022

MULTI-FAMILY HOUSING "A"
43,000 S.F.
4 STORIES OVER 1
156 UNITS

50.0'

EXISTING BUILDING

PROPOSED RETAIL "B"
10,100 S.F.

120.0' ROW

POND

PROPOSED MEDICAL "C"
47,000 S.F.
(3 STORIES)

FILTRATION

AMENITY POND

PROPOSED MEDICAL "D"
43,200 S.F.
(3 STORIES)

PROPOSED

FILTRATION

Add Stub to CR 116 for Node NE 6

10.0' PROPOSED ROW

100.0' EXISTING ROW

Comp Plan shows Node NE 6 serviced east of CR 116

COUNTY ROAD #116

5.41 ACRES

SENIOR HOUSING "G"
56,000 S.F.
4 STORIES OVER 1
204 UNITS

FILTRATION

POND

POND

55+ HOUSING "H"
33,100 S.F.
4 STORIES OVER 1
120 UNITS

3.95 ACRES

HOPE WAY

REGIONAL TRAIL

TEMPORARY CUL-DE-SAC

Comp Plan Sewer Alignment to be rerouted through streets and/or open spaces

42 foot cut

OSWALD FARM ROAD

4.33 ACRES

MULTI-FAMILY HOUSING "F"
51,000 S.F.
4 STORIES OVER 1
184 UNITS

50.0'

HOPE WAY

PARK / PLAYGROUND

6 UNITS

PROPOSED ROWHOMES "J"
54 UNITS

8 UNITS

4 UNITS

8 UNITS

4 UNITS

8 UNITS

8 UNITS

8 UNITS

FILTRATION

POND

POND

DRAINAGE & UTILITY EASEMENT

Node NE 5 Elevation 905.2

HUNTERS RIDGE

FND IP 1/2" OPEN

FND IP CAPPED 24992

FND IP CAPPED 24992

SERENITY MEADOWS

OUTLOT B

NORTH

0 80 160
SCALE IN FEET

NO	DATE	BY	CKD	APPR	COMMENT

I hereby certify 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.

Print Name: _____

Date _____ License # _____

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SITE PLAN CONCEPT W AERIAL

HOPE COMMUNITY CHURCH
HOPE COMMUNITY CHURCH DEVELOPMENT PROJECT
CORCORAN, MN

SHEET
C3.02
OF
REV. #

24.1S (LMS TECH) | SCOTT FROST | 11/23/2022 1:14:21 PM
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Trunk Inverts from Comprehensive Plan

APPENDIX A - ULTIMATE TRUNK SYSTEM DESIGN

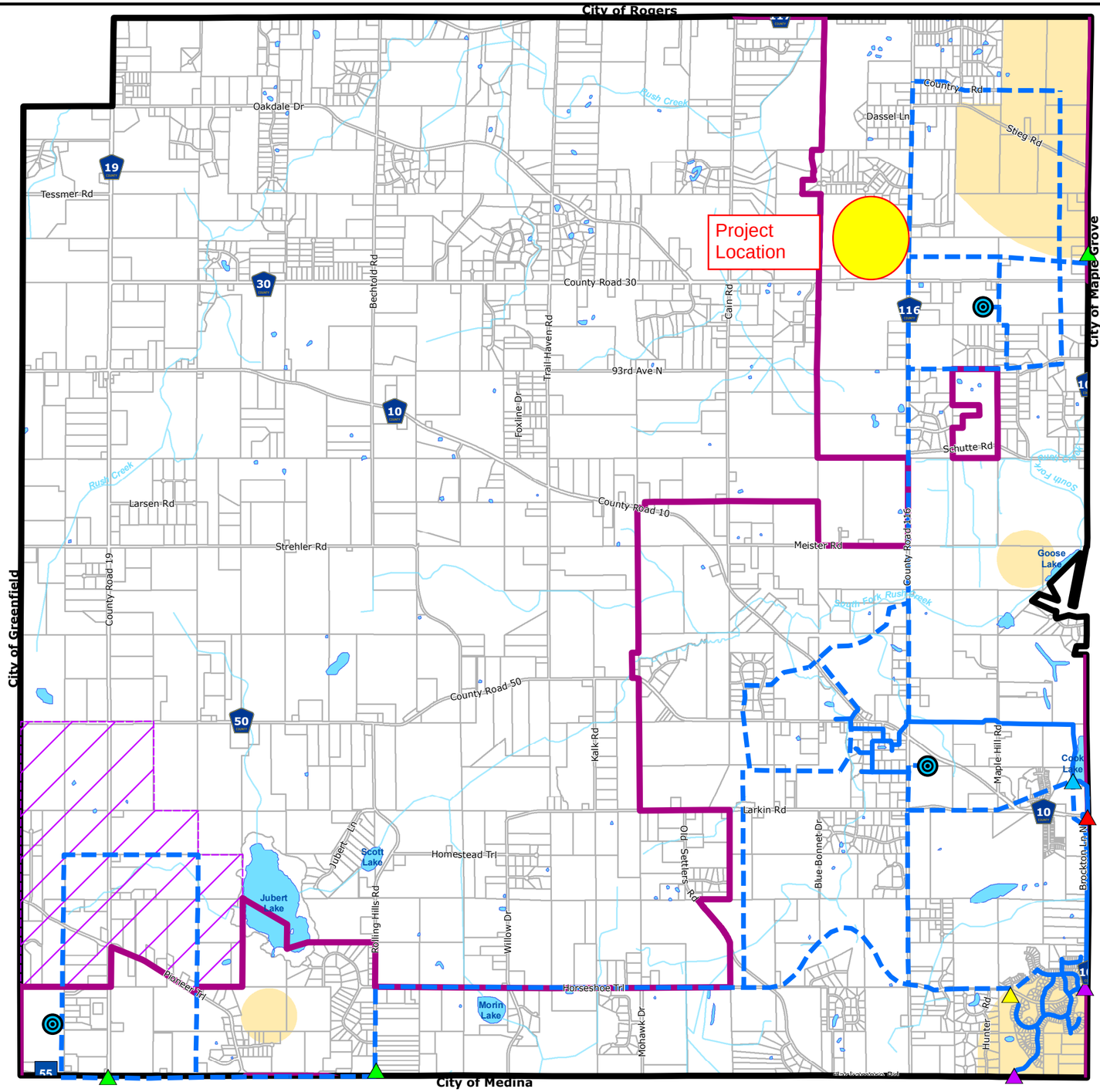
From Point	To Point	Design Flow	Existing/ Proposed	Pipe Size	Pipe Material	Length	Upstream			Average Slope	Down-stream Elev	Capacity					Capacity to Design Flow Ratio
							Rim Elev	Invert Elev	Manhole Depth			Inlet Control		Outlet Control		Actual Capacity	
		(mgd)		(in)		(ft)	(ft)	(ft)	(ft)	(%)	(ft)	(cfs)	(mgd)	(cfs)	(mgd)	(mgd)	
NE DISTRICT																	
NE-1	NE-2	4.70	Prop.	30	PVC	4400	938	914.7	23	0.08	911.1	23.3	15.1	11.6	7.52	7.52	1.6
NE-3	NE-2	0.72	Prop.	10	PVC	2000	950	921.1	29	0.50	911.1	1.7	1.1	1.55	1.00	1.00	1.4
NE-2	NE-4	5.25	Prop.	30	PVC	4200	939	911.1	28	0.08	907.8	23.3	15.1	11.6	7.52	7.52	1.4
NE-4	NE-5	5.33	Prop.	30	PVC	3200	930	907.8	22	0.08	905.2	23.3	15.1	11.6	7.52	7.52	1.4
NE-6	NE-5	0.15	Prop.	8	PVC	1000	950	920.2	30	1.50	905.2	1.4	0.9	1.48	0.96	0.90	5.9
NE-5	NE-7	5.64	Prop.	30	PVC	1300	937	905.2	32	0.08	904.2	23.3	15.1	11.6	7.52	7.52	1.3
NE-7	NE-8	5.64	Prop.	30	PVC	1300	920	904.2	16	0.08	903.1	23.3	15.1	11.6	7.52	7.52	1.3
NE-8	NE-9	5.88	Prop.	30	PVC	3000	925	903.1	22	0.08	900.7	23.3	15.1	11.6	7.52	7.52	1.3
NE-10	NE-11	0.22	Prop.	8	PVC	1500	953	929.7	23	0.40	923.7	1.4	0.9	0.8	0.50	0.50	2.2
NE-11	NE-12	0.42	Prop.	10	PVC	2200	952	923.7	28	0.28	917.5	1.7	1.1	1.2	0.75	0.75	1.8
NE-13 (LS)	NE-12	0.21	Prop. FM	6	HDPE	3000	936	(905 LS)	(31 LS)	---	917.5	---	---	---	---	0.6	2.9
NE-12	NE-14	1.05	Prop.	15	PVC	1500	946	917.5	29	0.15	915.2	4.1	2.6	2.5	1.62	1.62	1.5
NE-14	NE-15	1.41	Prop.	15	PVC	1400	950	915.2	35	0.25	911.7	4.1	2.6	3.2	2.09	2.09	1.5
NE-15	NE-9	1.71	Prop.	15	PVC	2400	945	911.7	33	0.25	905.7	4.1	2.6	3.2	2.09	2.09	1.2
NE-9	NE-16	6.99	Prop.	30	PVC	2600	937	900.7	36	0.10	898.1	23.3	15.1	13.0	8.41	8.41	1.2
NE-16	NE-17	6.99	Prop.	30	PVC	1200	938	898.1	40	0.10	896.9	23.3	15.1	13.0	8.41	8.41	1.2
NE-17	NE-18	6.99	Prop.	30	PVC	800	933	896.9	36	1.00	888.9	23.3	15.1	41.1	26.6	15.1	2.2
NE-19	NE-20	0.12	Prop.	8	PVC	1800	919	912.4	7	0.40	905.2	1.4	0.9	0.77	0.50	0.50	4.1
NE-20	NE-21	0.68	Prop.	12	PVC	2000	931	905.2	26	0.22	900.8	2.2	1.4	1.68	1.08	1.08	1.6
NE-21	NE-22	0.68	Prop.	12	PVC	2800	925	900.8	24	0.22	894.6	2.2	1.4	1.68	1.08	1.08	1.6
NE-23	NE-22	0.71	Prop.	10	PVC	1500	928	907.1	21	0.50	899.6	1.7	1.1	1.6	1.00	1.00	1.4
NE-22	NE-18	1.30	Prop.	15	PVC	3200	918	894.6	23	0.15	889.8	4.1	2.6	2.51	1.62	1.62	1.2
NE-18	**ECI**	**7.67**	**Ex.**	**27**	**PVC**	**25**	**910**	**888.9**	**21**	**0.18**	**888.9**	**17.7**	**11.4**	**13.2**	**8.52**	**8.52**	**1.1**

APPENDIX A - ULTIMATE TRUNK SYSTEM DESIGN

From Point	To Point	Design Flow	Existing/ Proposed	Pipe Size	Pipe Material	Length	Upstream			Average Slope	Down-stream Elev	Capacity					Capacity to Design Flow Ratio
							Rim Elev	Invert Elev	Manhole Depth			Inlet Control		Outlet Control		Actual Capacity	
		(mgd)		(in)		(ft)	(ft)	(ft)	(ft)	(%)	(ft)	(cfs)	(mgd)	(cfs)	(mgd)	(mgd)	
SE DISTRICT																	
SE-A	**M.G.[1]**	**0.02**	**Ex.**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**
SE-36 (LS)	SE-37	0.72	Prop. FM	8	HDPE	8000	972	(940 LS)	(32 LS)	---	964.6	---	---	---	---	1.1	1.5
SE-37	SE-1	0.72	Prop.	12	PVC	2000	980	964.6	15	0.22	960.2	2.2	1.4	1.7	1.08	1.08	1.5
SE-1	SE-2	1.14	Prop.	15	PVC	3500	985	960.2	25	0.30	949.7	4.1	2.6	3.5	2.29	2.29	2.0
SE-2	SE-3	1.24	Prop.	15	PVC	1800	980	949.7	30	0.25	945.2	4.1	2.6	3.2	2.09	2.09	1.7
SE-3	SE-4	1.28	Prop.	15	PVC	1800	968	945.2	23	0.15	942.5	4.1	2.6	2.5	1.62	1.62	1.3
SE-4	SE-5	1.48	Prop.	18	PVC	2000	970	942.5	28	0.15	939.5	6.2	4.0	4.1	2.64	2.64	1.8
SE-6	SE-5	0.11	Prop.	8	PVC	800	962	945.5	17	0.75	939.5	1.4	0.9	1.0	0.68	0.68	6.2
SE-5	SE-7	1.58	Prop.	18	PVC	2000	960	939.5	21	0.12	937.1	6.2	4.0	3.6	2.36	2.36	1.5
SE-8	SE-9	0.63	Prop.	10	PVC	3600	980	954.2	26	0.28	944.1	1.7	1.1	1.2	0.75	0.75	1.2
SE-9	SE-7	0.63	Prop.	12	PVC	3200	964	944.1	20	0.22	937.1	2.2	1.4	1.7	1.08	1.08	1.7
SE-7	**SE-10**	**2.23**	**Ex.**	**18**	**PVC**	**685**	**958**	**937.1**	**21**	**0.19**	**935.8**	**6.2**	**4.0**	**4.6**	**2.97**	**2.97**	**1.3**
SE-10	SE-11	2.23	Prop.	18	PVC	1000	966	935.8	30	0.44	931.4	6.2	4.0	7.0	4.52	4.00	1.8
SE-11	SE-12	2.56	Prop.	18	PVC	2200	946	931.4	15	0.20	927.0	6.2	4.0	4.7	3.04	3.04	1.2
SE-13	SE-14	0.43	Prop.	10	PVC	1500	960	939.7	20	0.28	935.5	1.7	1.1	1.2	0.75	0.75	1.7
SE-14	SE-15	1.41	Prop.	15	PVC	2500	950	935.5	14	0.15	931.8	4.1	2.6	2.5	1.62	1.62	1.2
SE-15	SE-12	1.65	Prop.	18	PVC	4000	944	931.8	12	0.12	927.0	6.2	4.0	3.6	2.36	2.36	1.4
SE-16	SE-17	0.10	Prop.	8	PVC	1400	948	937.6	10	0.40	932.0	1.4	0.9	0.8	0.50	0.50	4.7
SE-17	SE-12	0.40	Prop.	10	PVC	1800	940	932.0	8	0.28	927.0	1.7	1.1	1.2	0.75	0.75	1.9
SE-12	SE-18	4.35	Prop.	30	PVC	3000	941	927.0	14	0.08	917.2	23.3	15.1	11.6	7.52	7.52	1.7
SE-18	NE-1	4.37	Prop.	30	PVC	3200	940	917.2	23	0.08	914.7	23.3	15.1	11.6	7.52	7.52	1.7
SE-19	SE-20	0.27	Prop.	8	PVC	3000	1000	975.0	25	0.45	961.5	1.4	0.9	0.8	0.53	0.53	2.0
SE-21	SE-20	0.69	Prop.	12	PVC	1200	988	964.1	24	0.22	961.5	2.2	1.4	1.7	1.08	1.08	1.6
SE-20	SE-22	0.90	Prop.	12	PVC	3000	994	961.5	33	0.40	949.5	2.2	1.4	2.3	1.46	1.40	1.6
SE-23	**SE-22**	**0.96**	**Ex.**	**15**	**PVC**	**2550**	**966**	**958.5**	**8**	**0.35**	**949.5**	**4.1**	**2.6**	**3.8**	**2.49**	**2.49**	**2.6**
SE-22	**SE-24**	**1.71**	**Ex.**	**15**	**PVC**	**1700**	**974**	**949.5**	**25**	**0.42**	**942.4**	**4.1**	**2.6**	**4.2**	**2.71**	**2.60**	**1.5**
SE-24	**MCES LS**	**2.20**	**Ex.**	**15**	**PVC**	**2550**	**970**	**942.4**	**28**	**0.44**	**931.2**	**4.1**	**2.6**	**4.3**	**2.77**	**2.60**	**1.2**

APPENDIX B

NE Water System



CITY OF CORCORAN

2040 COMPREHENSIVE PLAN

Map 9-2
Trunk Water System

- Existing Watermain
- Proposed Watermain
- Potential Water Tower Locations
- Existing Supply Connection with Neighboring Communities
- Proposed Supply Connection with Neighboring Communities
- Emergency Connection with Neighboring Communities (Normally Closed)
- Potential Water Storage
- Potential Booster Station
- Potential Future Well Exploration Areas
- Municipal Boundary
- 2040 MUSA
- Future MUSA Expansion Area
- Parcel Boundaries
- Streams
- Lake/Open Water

3,000 1,500 0 3,000
Feet

N

Path: L:\2294\100\2040CompPlan\Trunk Water System.mxd
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Water Modeling Results

Table 1
Water Model Results
Scenario 1 - Tower On, Maple Grove Off

		Average Day Demand			Maximum Day Demand				Peak Hour Demand		
Node Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade	Pressure (psi)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Fire Flow (Available) (gpm)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
Maple Grove	942	0	1,105	70.5	0	1,100	68.2	3,073	0	1,099	67.7
J-95	943	3.6	1,105	70.1	10.8	1,100	67.7	3,175	21.6	1,099	67.3
J-96	945	1.6	1,105	69.2	4.8	1,100	66.9	4,251	9.6	1,099	66.4
J-100	941	0	1,105	70.9	0	1,100	68.6	4,791	0	1,099	68.2
J-101	947	0	1,105	68.3	0	1,100	66.1	5,000	0	1,099	65.8
J-102	953	4.8	1,105	65.7	14.4	1,100	63.5	5,000	28.8	1,099	63.2
J-94	952	3.4	1,105	66.2	10.2	1,100	63.9	3,073	20.4	1,099	63.4
J-103	946	1.4	1,105	68.8	4.2	1,100	66.5	3,175	8.4	1,099	66
J-158	943	4.2	1,105	70.1	12.6	1,100	67.8	5,000	25.2	1,099	67.5
J-182	930	0	1,105	75.7	0	1,100	73.5	5,000	0	1,099	73.3
J-183	940	0	1,105	71.4	0	1,100	69.2	5,000	0	1,099	69
J-185	941	3.4	1,105	70.9	10.2	1,100	68.7	5,000	20.4	1,099	68.3
J-186	927	3	1,105	77	9	1,100	74.7	5,000	18	1,099	74.4
J-187	926	0	1,105	77.4	0	1,100	75.1	5,000	0	1,099	74.7
J-188	940	0	1,105	71.4	0	1,100	69.1	4,924	0	1,099	68.7
J-189	946	4.2	1,105	68.8	12.6	1,100	66.5	4,208	25.2	1,099	66
J-190	944	2.8	1,105	69.6	8.4	1,100	67.3	4,970	16.8	1,099	66.9
J-191	947	5.2	1,105	68.3	15.6	1,100	66	4,375	31.2	1,099	65.6
J-192	946	3.2	1,105	68.8	9.6	1,100	66.5	4,701	19.2	1,099	66
J-245	945	4.2	1,105	69.2	12.6	1,100	66.9	2,178	25.2	1,099	66.4
J-246	938	0	1,105	72.2	0	1,100	69.9	1,772	0	1,099	69.5
J-247	942	1.8	1,105	70.5	5.4	1,100	68.2	3,336	10.8	1,099	67.7
J-248	950	3.2	1,105	67	9.6	1,100	64.7	3,097	19.2	1,099	64.3
J-249	945.5	2.2	1,105	69	6.6	1,100	66.7	3,472	13.2	1,099	66.2
J-254	950	0	1,105	67.1	0	1,100	64.8	5,000	0	1,100	64.7
J-261	946	22.1	1,105	68.8	66.2	1,100	66.5	2,562	132.4	1,099	66.2
J-262	952	8.6	1,105	66.2	25.8	1,100	64	3,255	51.6	1,099	63.8
J-263	950.3	56.8	1,105	66.9	170.4	1,100	64.7	5,000	340.8	1,100	64.6
J-264	952	25.8	1,105	66.2	77.5	1,100	64	5,000	155.1	1,100	64
J-265	952.2	9.2	1,105	66.1	27.6	1,100	63.9	5,000	51.6	1,100	63.8
J-267	953	0	1,105	65.8	0	1,100	63.6	5,000	0	1,100	63.6
J-271	943	5	1,105	70.1	15	1,100	67.8	3,825	30	1,099	67.3
J-272	943	4.4	1,105	70.1	13.2	1,100	67.8	3,963	26.4	1,099	67.3
J-273	944	3.8	1,105	69.6	11.4	1,100	67.3	4,106	22.8	1,099	66.9
J-274	945	3	1,105	69.2	9	1,100	66.9	5,000	18	1,099	66.5
J-275	946	3.8	1,105	68.8	11.4	1,100	66.5	4,658	22.8	1,099	66.1
J-276	942	0	1,105	70.5	0	1,100	68.2	4,783	0	1,099	67.8
J-277	944	2.2	1,105	69.6	6.6	1,100	67.3	2,979	13.2	1,099	66.9
J-278	943	0	1,105	70.1	0	1,100	67.8	4,324	0	1,099	67.4
J-279	947	2	1,105	68.3	6	1,100	66	3,191	12	1,099	65.7
J-280	940	0	1,105	71.4	0	1,100	69.1	4,473	0	1,099	68.7
J-281	945	3.6	1,105	69.2	10.8	1,100	66.9	5,000	21.6	1,099	66.6
J-282	935	2.6	1,105	73.5	7.8	1,100	71.3	3,342	15.6	1,099	71
J-283	932	0	1,105	74.8	0	1,100	72.5	5,000	0	1,099	72.2
J-284	938	5	1,105	72.2	15	1,100	69.9	4,497	30	1,099	69.5
J-285	944	4.6	1,105	69.6	13.8	1,100	67.4	5,000	27.6	1,099	67.1
J-286	953	3.2	1,105	65.7	9.6	1,100	63.5	5,000	19.2	1,099	63.2
J-287	950	2.8	1,105	67	8.4	1,100	64.8	2,731	16.8	1,099	64.5

Table 2
Water Model Results
Scenario 2 - Tower Off, Maple Grove On

		Average Day Demand			Maximum Day Demand				Peak Hour Demand		
Node Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Fire Flow (Available) (gpm)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
Maple Grove	942	0	1,093	65.3	0	1,092	65	5,000	0	1,090	64.2
J-95	943	3.6	1,093	64.8	10.8	1,092	64.3	5,000	21.6	1,088	62.8
J-96	945	1.6	1,093	63.8	4.8	1,090	62.6	3,190	9.6	1,081	59
J-100	941	0	1,093	65.5	0	1,089	64.1	2,775	0	1,079	59.9
J-101	947	0	1,092	62.9	0	1,088	61.1	2,382	0	1,076	55.8
J-102	953	4.8	1,092	60.3	14.4	1,088	58.5	2,342	28.8	1,076	53.2
J-94	952	3.4	1,093	60.9	10.2	1,092	60.6	5,000	20.4	1,089	59.4
J-103	946	1.4	1,093	63.5	4.2	1,092	63	5,000	8.4	1,088	61.5
J-158	943	4.2	1,092	64.6	12.6	1,088	62.8	2,292	25.2	1,076	57.5
J-182	930	0	1,092	70.2	0	1,088	68.4	2,281	0	1,075	62.9
J-183	940	0	1,092	65.9	0	1,088	64.1	2,274	0	1,075	58.6
J-185	941	3.4	1,092	65.5	10.2	1,088	63.8	2,445	20.4	1,076	58.6
J-186	927	3	1,092	71.6	9	1,089	69.9	2,521	18	1,077	64.9
J-187	926	0	1,092	72	0	1,089	70.5	2,650	0	1,078	65.9
J-188	940	0	1,092	66	0	1,089	64.5	2,731	0	1,079	60.2
J-189	946	4.2	1,093	63.4	12.6	1,090	62.2	3,251	25.2	1,081	58.6
J-190	944	2.8	1,092	64.2	8.4	1,089	62.6	2,613	16.8	1,078	57.8
J-191	947	5.2	1,092	62.9	15.6	1,089	61.3	2,473	31.2	1,077	56.5
J-192	946	3.2	1,092	63.4	9.6	1,089	61.8	2,700	19.2	1,078	57.3
J-245	945	4.2	1,093	63.8	12.6	1,090	62.6	1,886	25.2	1,081	59
J-246	938	0	1,093	66.9	0	1,090	65.7	1,578	0	1,081	62
J-247	942	1.8	1,093	65.2	5.4	1,091	64.6	4,824	10.8	1,087	62.6
J-248	950	3.2	1,093	61.8	9.6	1,091	61	3,910	19.2	1,086	58.9
J-249	945.5	2.2	1,093	63.7	6.6	1,091	62.9	4,350	13.2	1,086	60.6
J-254	950	0	1,092	61.6	0	1,088	59.7	2,264	0	1,075	54.2
J-261	946	22.1	1,092	63.3	66.2	1,088	61.4	1,582	132.4	1,075	55.7
J-262	952	8.6	1,092	60.7	25.8	1,088	58.9	1,732	51.6	1,075	53.3
J-263	950.3	56.8	1,092	61.5	170.4	1,088	59.6	2,258	340.8	1,075	54.1
J-264	952	25.8	1,092	60.7	77.5	1,088	58.9	2,233	155.1	1,075	53.3
J-265	952.2	9.2	1,092	60.6	27.6	1,088	58.8	2,243	51.6	1,075	53.2
J-267	953	0	1,092	60.3	0	1,088	58.4	2,223	0	1,075	52.9
J-271	943	5	1,093	64.7	15	1,090	63.7	3,647	30	1,083	60.7
J-272	943	4.4	1,092	64.7	13.2	1,089	63.1	2,460	26.4	1,078	58.4
J-273	944	3.8	1,092	64.2	11.4	1,089	62.6	2,448	22.8	1,077	57.8
J-274	945	3	1,092	63.8	9	1,089	62.1	2,524	18	1,077	57.1
J-275	946	3.8	1,092	63.3	11.4	1,088	61.6	2,344	22.8	1,077	56.5
J-276	942	0	1,092	65.1	0	1,089	63.4	2,443	0	1,077	58.3
J-277	944	2.2	1,092	64.2	6.6	1,089	62.5	1,967	13.2	1,077	57.5
J-278	943	0	1,092	64.6	0	1,088	62.9	2,298	0	1,077	57.9
J-279	947	2	1,092	62.9	6	1,088	61.2	2,000	12	1,077	56.1
J-280	940	0	1,092	65.9	0	1,088	64.2	2,358	0	1,077	59.1
J-281	945	3.6	1,092	63.8	10.8	1,088	62	2,411	21.6	1,076	56.7
J-282	935	2.6	1,092	68.1	7.8	1,088	66.3	2,029	15.6	1,076	61.1
J-283	932	0	1,092	69.4	0	1,089	67.8	2,579	0	1,078	63
J-284	938	5	1,092	66.8	15	1,089	65.2	2,526	30	1,077	60.2
J-285	944	4.6	1,092	64.2	13.8	1,088	62.4	2,377	27.6	1,076	57.1
J-286	953	3.2	1,092	60.3	9.6	1,088	58.5	2,296	19.2	1,076	53.2
J-287	950	2.8	1,092	61.6	8.4	1,088	59.8	1,712	16.8	1,076	54.5

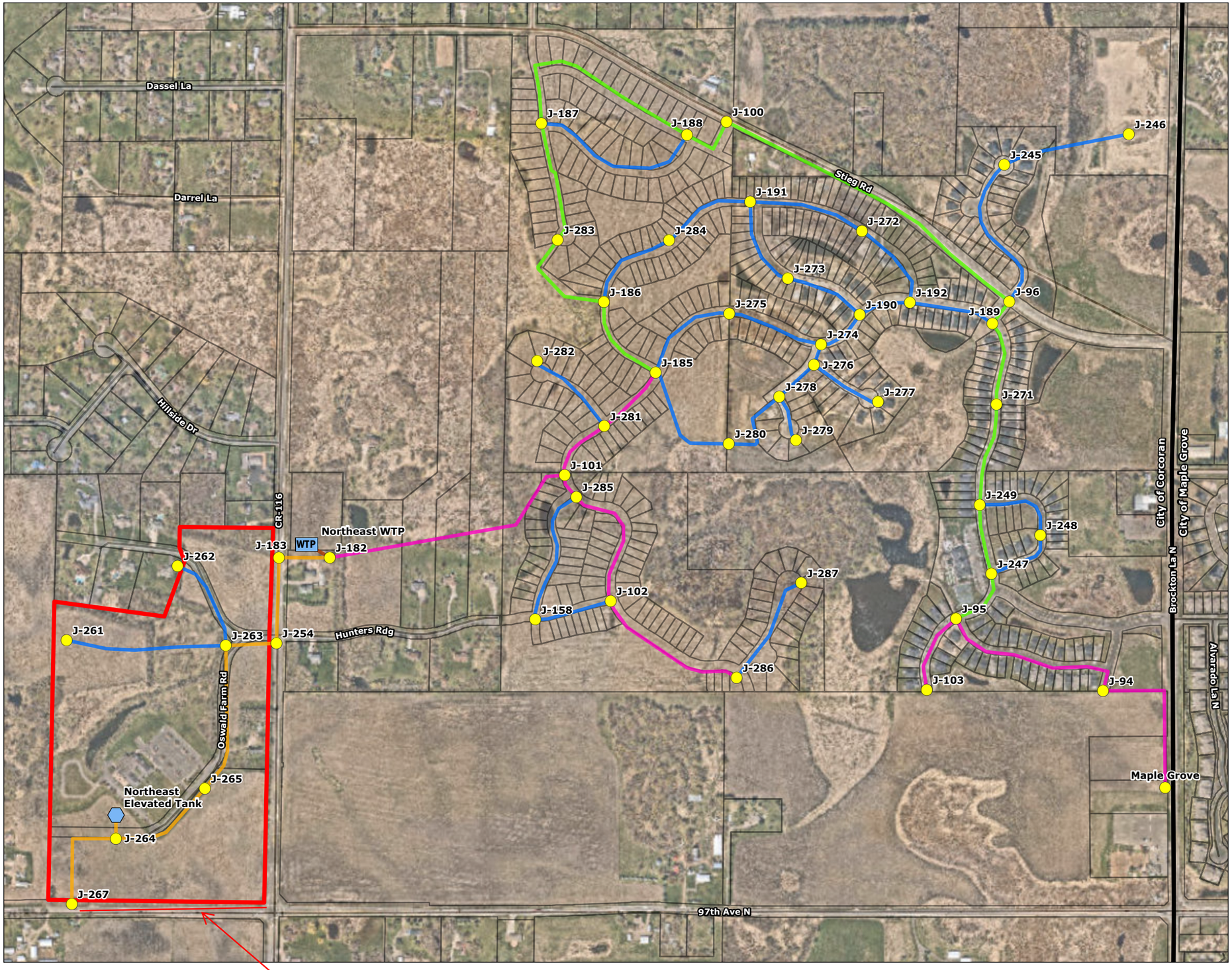


Figure No.
1

Title
Pipe Network

Client/Project
City of Corcoran
Hope Church Development
193806102

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by BS on 2023-03-30

N

0 300 600 Feet
(At original document size of 11x17)
1:7,200

Legend

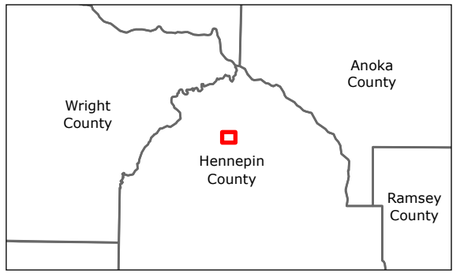
- County Parcels
- Municipal Boundaries
- Hope Community Church Development Location

Water System Facility

- WTP Water Treatment Plant
- Storage Tank
- Junction

Water Main Diameter

- 8 Inch
- 12 Inch
- 16 Inch
- 20 Inch
- 24 Inch



Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Hennepin County
3. Background: Hennepin County 2020 Imagery

Stantec

show water loop

Figure No.

2

Title

Average Day Water Distribution System Pressure: Tower On

Client/Project 193806102

City of Corcoran
Hope Church Development

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by BS on 2023-03-30

N

0 300 600 Feet
(At original document size of 11x17)
1:7,200

Legend

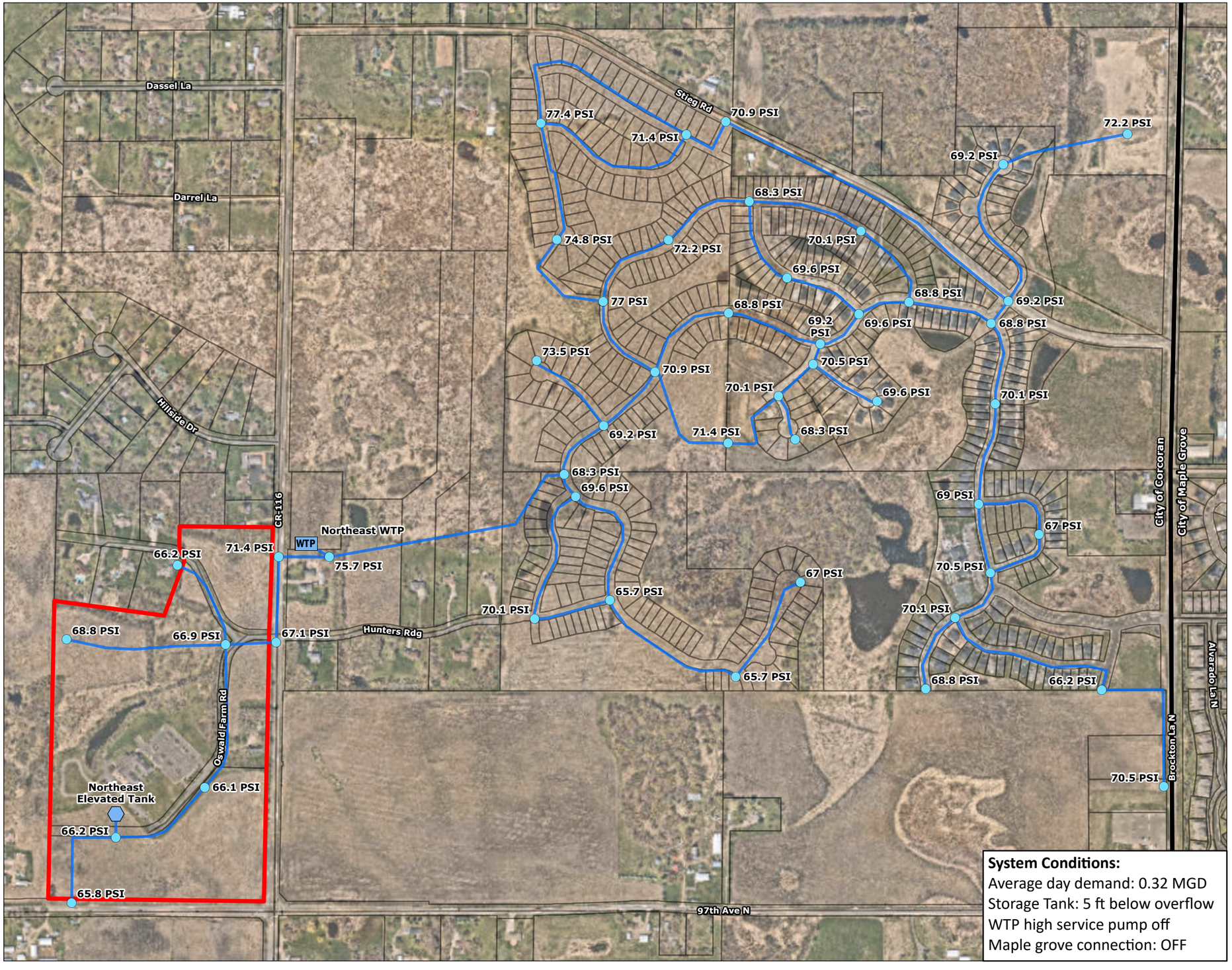
- County Parcels
- Municipal Boundaries
- Hope Community Church Development Location

Water System Facility

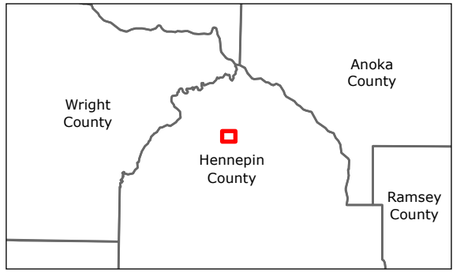
- WTP Water Treatment Plant
- Storage Tank
- Water Main

Water System Pressure

- < 35 PSI
- 35-50 PSI
- 50-65 PSI
- 65-80 PSI
- 80-95 PSI
- >95 PSI



System Conditions:
Average day demand: 0.32 MGD
Storage Tank: 5 ft below overflow
WTP high service pump off
Maple grove connection: OFF



Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Hennepin County
3. Background: Hennepin County 2020 Imagery

Stantec

V:\193806\Active\193806102\03_data\gis_cad\gis\proj\watercad\figures\watercadfigures.aprx Revised: 2023-03-30 By: bschaffermeyer

Figure No.

3

Title

Maximum Day Available Fire Flow: Tower On

Client/Project 193806102

City of Corcoran
Hope Church Development

Project Location

T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by BS on 2023-03-30

N

0 300 600 Feet

(At original document size of 11x17)
1:7,200

Legend

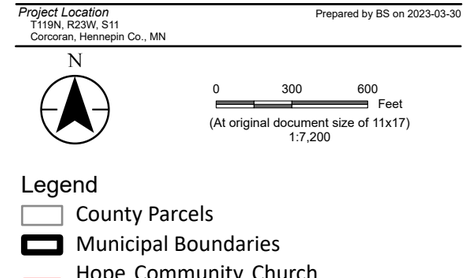
- County Parcels
- Municipal Boundaries
- Hope Community Church Development Location

Water System Facility

- WTP — Water Treatment Plant
- Storage Tank
- Water Main

Available Fire Flow

- 500-1,000 GPM
- 1,000-2,500 GPM
- 2,500-3,500 GPM
- > 3,500 GPM



Notes

1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Hennepin County
3. Background: Hennepin County 2020 Imagery

System Conditions:

Maximum day demand: 0.95 MGD
Storage Tank: 10 ft below overflow
WTP high service pump off
Maple grove connection: OFF

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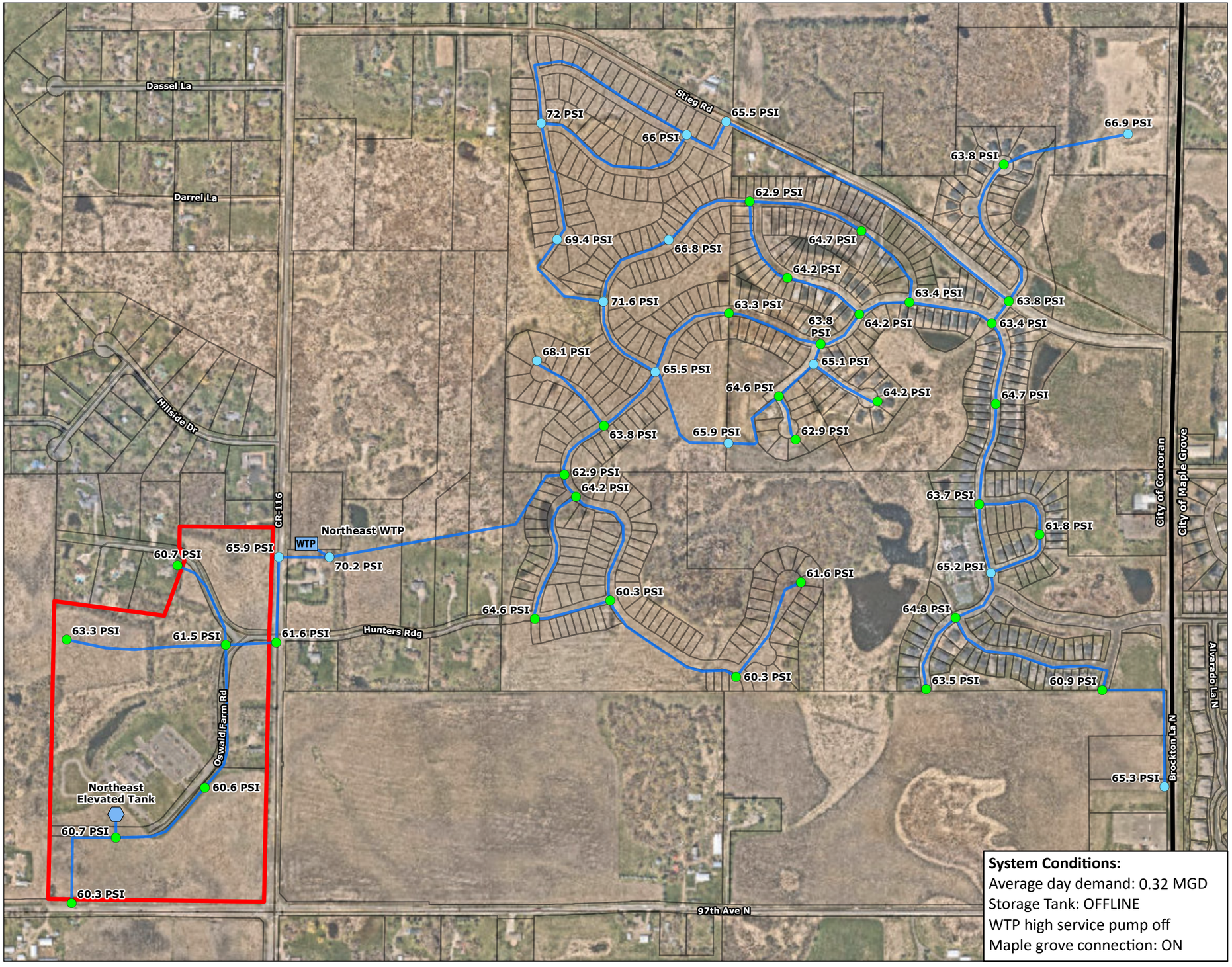


System Conditions:
Average day demand: 0.32 MGD
Storage Tank: OFFLINE
WTP high service pump off
Maple grove connection: ON

Figure No.
4

Title
Average Day Water Distribution System Pressure: Maple Grove On

Client/Project 193806102
City of Corcoran
Hope Church Development

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by BS on 2023-03-30

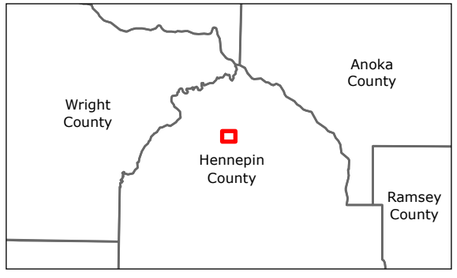
N

0 300 600 Feet
(At original document size of 11x17)
1:7,200

Legend
- County Parcels
- Municipal Boundaries
- Hope Community Church Development Location

Water System Facility
- WTP Water Treatment Plant
- Storage Tank
- Water Main

Water System Pressure
- <35 PSI
- 35-50 PSI
- 50-65 PSI
- 65-80 PSI
- 80-95 PSI
- >95 PSI



Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Hennepin County
3. Background: Hennepin County 2020 Imagery

Stantec

Figure No.
5

Title
Maximum Day Available Fire Flow: Maple Grove On

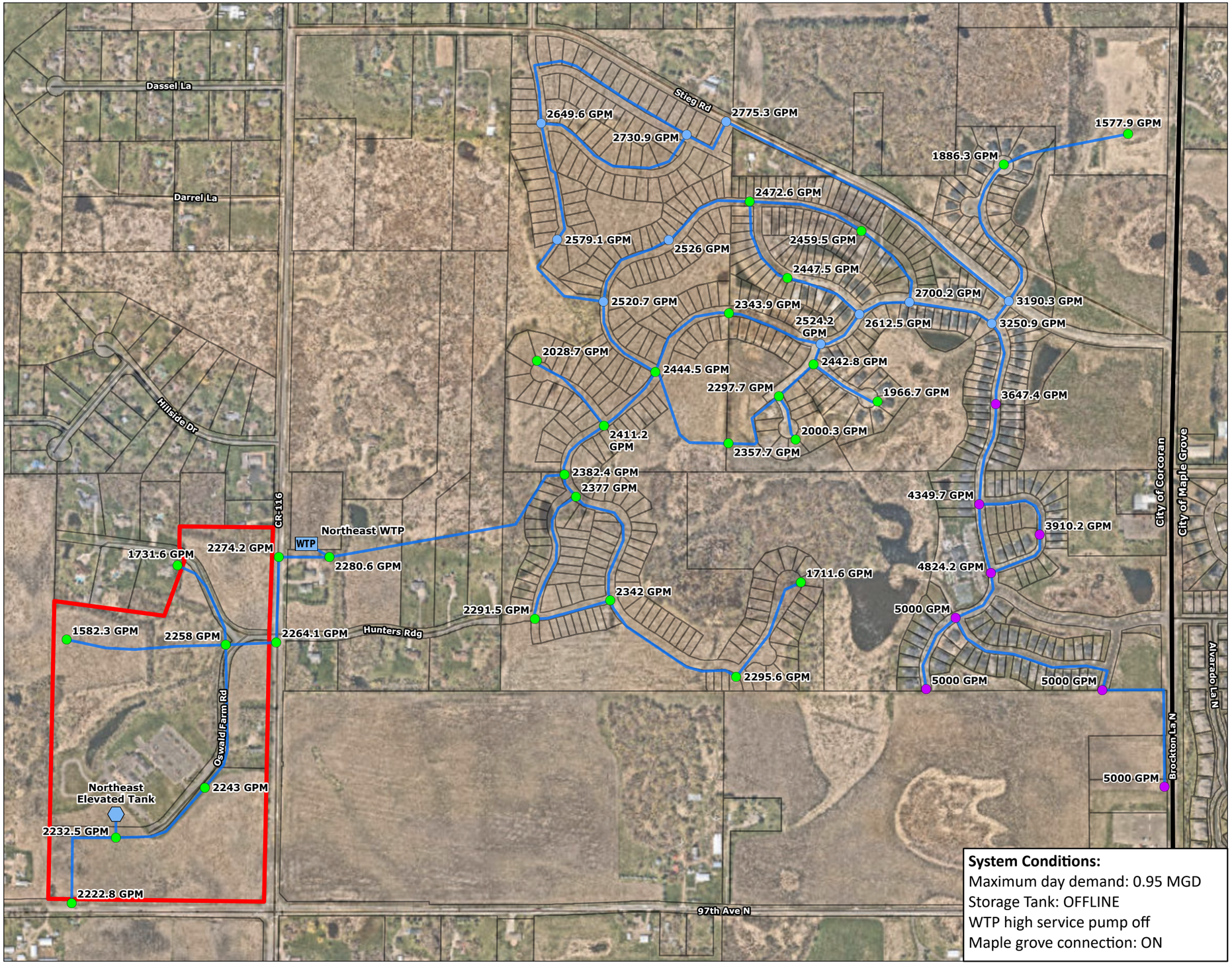
Client/Project 193806102
City of Corcoran
Hope Church Development

Project Location
T119N, R23W, S11
Corcoran, Hennepin Co., MN

Prepared by BS on 2023-03-30

N

0 300 600 Feet
(At original document size of 11x17)
1:7,200



System Conditions:
Maximum day demand: 0.95 MGD
Storage Tank: OFFLINE
WTP high service pump off
Maple grove connection: ON

Legend

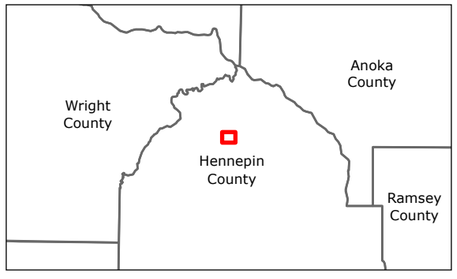
- County Parcels
- Municipal Boundaries
- Hope Community Church Development Location

Water System Facility

- WTP — Water Treatment Plant
- Storage Tank
- Water Main

Available Fire Flow

- 500-1,000 GPM
- 1,000-2,500 GPM
- 2,500-3,500 GPM
- > 3,500 GPM



Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Hennepin County
3. Background: Hennepin County 2020 Imagery

Stantec

Well Locations from NE Water Feasibility

2021

Stantec

Feasibility Report Supplements

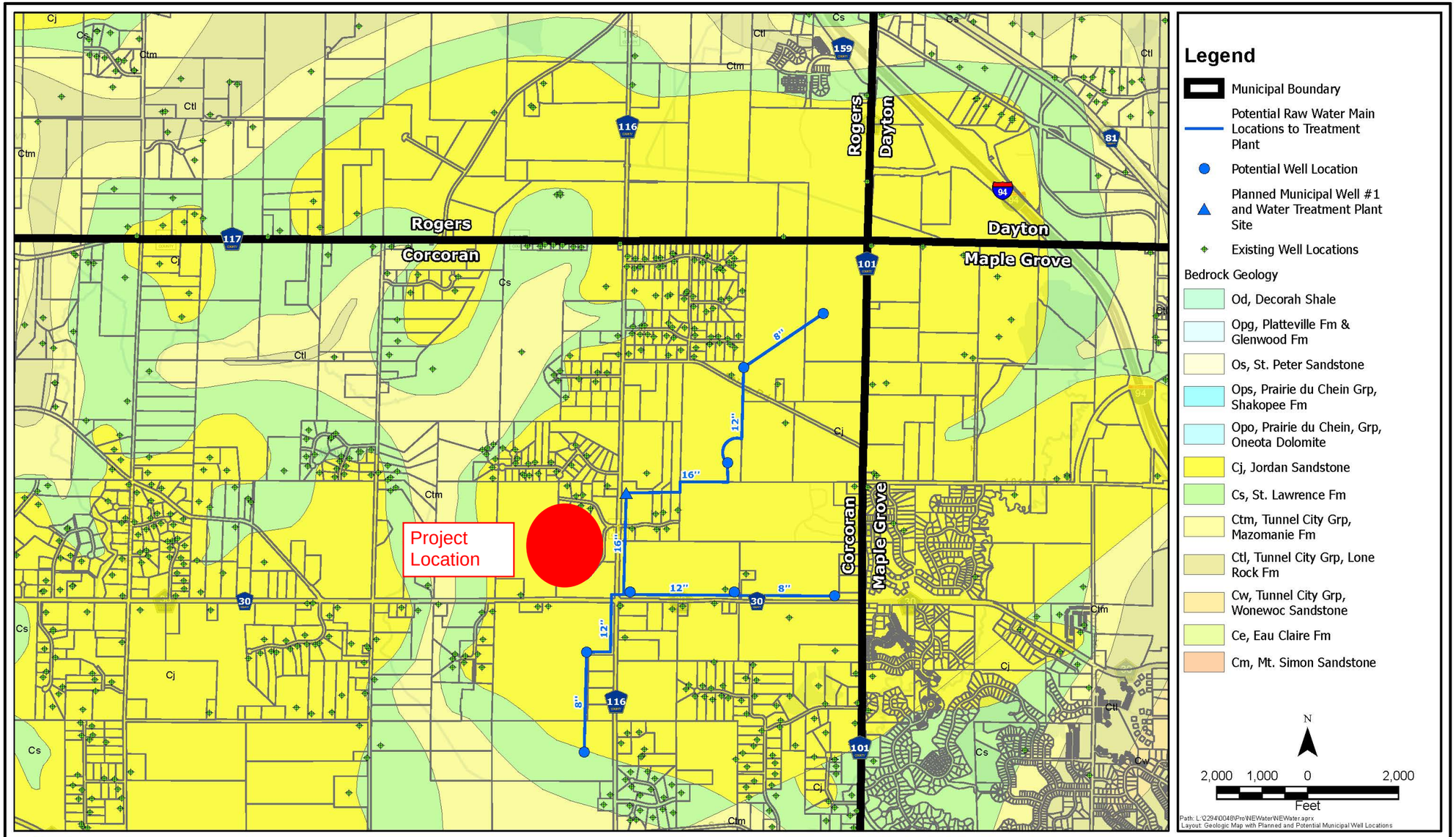
2020 Northeast Water System

June 4, 2021

Prepared for:

City of Corcoran

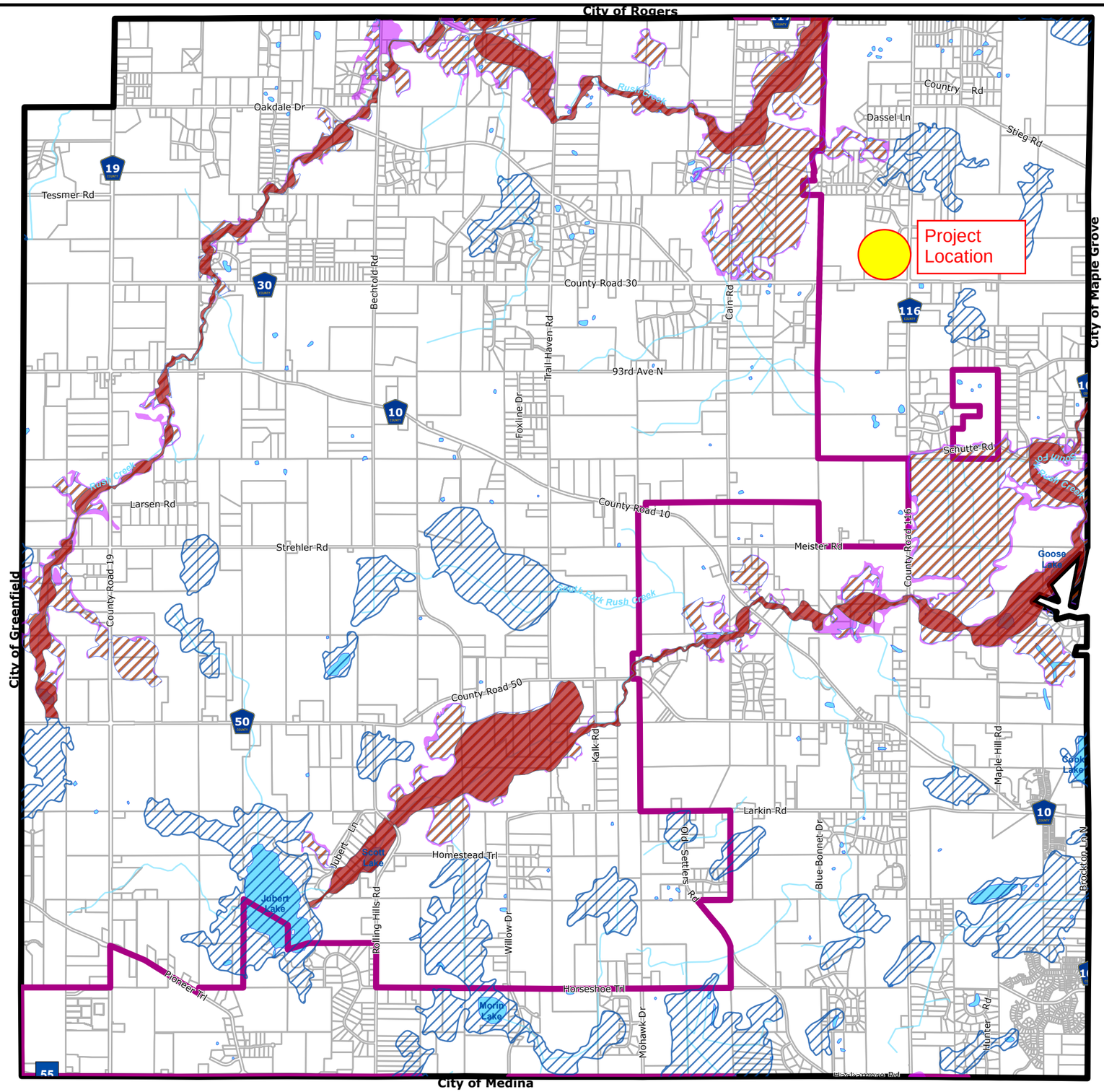
Figure 1 Geologic Map with Planned and Potential Municipal Well Locations



CITY OF CORCORAN	WENCK Responsive partner. Exceptional outcomes.	MAY 2021
Geologic Map with Planned and Potential Municipal Well Locations		Figure 1

APPENDIX C

Floodplain



City of Corcoran

2040 COMPREHENSIVE PLAN

Map App C-1
Floodplain

- Municipal Boundary
- 2040 MUSA
- Parcel Boundaries
- Streams
- Lake/Open Water
- Floodway

100 Year Floodplain
- A
- AE

500 Year Floodplain
- 0.2 PCT ANNUAL CHANCE FLOOD HAZARD

3,000 1,500 0 3,000
Feet

N

Path: V:\2277\resource\gis\Corcoran\Pro\Comp_Plan\Comp_Plan.aprx
Date: 2023-03-27 Time: 9:12 AM User: kberglund

Stormwater Modeling Guidelines

Stantec

Stormwater Guidelines for Development
March 2019

Issue

Cities changing from rural to urban development are challenged by the additional stormwater generated due to construction of impervious surfaces, along with the offsite infrastructure, or lack thereof, to manage effectively. To standardize the modeling and review process, the guidelines below were created for efficiency.

Note: A watershed approval is required per Elm Creek WMO rules, which also reviews flow rates, water quality and volume management.

Modeling

Watershed Information

- Provide an aerial photo of the development that includes the overall watershed and subwatershed boundaries
- Provide a summary of the acreage to each discharge point leaving the site. Any increase (or decrease) shall be identified.
- Show any floodplain adjacent to project or within the project
- Show downstream water bodies and flow paths
    - Downstream flow paths and water bodies typically need to have elevations, inverts, and condition identified.

Subwatersheds

A HydroCAD model (typically used) has inputs that can vary by user. To minimize resubmittals, review time and effort, the following data shall be utilized.

- Electronic model shall be submitted
- Hydrologic Soil Group (HSG) shall be lowered one category due to the mass grading and compaction of the soils. For example, an existing B soil, shall be modeled as a proposed C soil (unless it remains undisturbed)
- Wetlands, filtration basins, and ponds shall be modeled at CN of 98
- Identify peak rates for storm events and proposed shall be equal or less than existing rates.
    - Note: There are certain conditions where at City's discretion the off-site conditions require a reduction in flow rate from existing rates.
- SWMM (i.e. EPA-, XP-, or PC-) models can be submitted for review, however these increase review time.

Model Setup for Outlet Control Structures, NWLs and Infiltration

- The model's flow control structures (OCS, culverts, etc.) shall match the construction plan information. During the plan and model review both may be modified and revised
- Individual detail plates are required for each OCS, and individual plates shall have inverts identified
- A pond or wetland NWL (and model starting elevation) shall be set at the constructed outlet control elevation.
    - No live storage shall be utilized below the controlling OCS elevation.
    - No live storage shall be used for filtration shelves on ponds below controlling OCS elevation
- If a pond or wetland has an NWL (wet surface), infiltration shall not be used in flood routing.
- If a pond has filtration BMP causing drawdown below the NWL, this drawdown elevation shall not be used as the NWL for flood routing. (Filtration has a slower release time and during wet periods is not available as live storage).

Construction Plans

Catch Basins

- Street drainage shall be sufficient to manage the 10-year event

- Typical a CB inlet capacity is 2 to 2.5 CFS, and CBs shall be spaced accordingly
- Three inches (0.25 feet) of head on a CB will inundate a street centerline (2% slope).
- Spacing is 200 to 250 feet using longitudinal street dimensions of 40 feet from road centerline to half the house footprint (assumes rear half of house drains to rear yard). Dimensions equal 10,000 SF.
- CBs may be required on both sides of ped ramps to capture flows

Natural Drainage Features

- Waterbodies receiving urban drainage (wetlands, ditches, gullies) may need to have OCS installed, erosion protection, or reduced flow rates to allow the feature to function over the long term due to more consistent flows from increased impervious via development
- Offsite work may be necessary and City will assist with coordination, easements, etc.

HWLs and EOFs

- The freeboard requirements are:
    - Low Opening is a minimum of two feet above the HWL
    - Low Opening is a minimum of two feet above the EOF
- EOFs shall be accurately shown and as builts are required. The highest point shall be the EOF (for example top of curb) since this is the controlling elevation
    - In certain instances, channel calculations of the swale may be required to show the EOF has capacity to manage estimated flow
- Overland EOFs are preferred, however if a second pipe serves as an EOF then modeling will include a 100-year event using the second pipe (EOF) as the only outlet (primary outlet plugged).

Rear Yards

- Rear yards or swales less than 2% shall have draintile. Typically, every two to three lots will require rear yard CBs.

Sump Connections

- Houses adjoining a wetland or pond do not need individual sump connection
- Others will have access to rear yard stormsewer.

Offsite Impacts

Adjacent Parcels

- City will review adjacent parcels (downstream and upstream) for impacts from volume, point discharge, etc. and may require off site improvements. City will assist in coordination of any off site work.
- Off site water quality improvement projects may be determined by the City for assistance with compliance with City's TMDL approach of implementing improvements upon development.
- FEMA modifications may be necessary due to development and implemented by City.