HoustonEngineering Inc.

Maple Grove, MN | HEI No. 6400-0005
August 16, 2021

FINAL ENGINEERS REPORT

Goodhue County Ditch 1 Branch B Tile Improvement

FINAL ENGINEERS REPORT

Goodhue County Ditch 1 Branch B Tile Improvement

August 16, 2021

Houston Engineering, Inc.
7550 Meridian Court, Suite 120
Maple Grove, MN 55369
Phone # 763.493.4522

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 Engineer under the laws of the State of Minnesota

Chris Otterness
License No. 41961

August 16, 2021
Date

TABLE OF CONTENTS

TABLES

FIGURES

1 INTRODUCTION

The petitioned project consists of an improvement of the Branch B drain tile of Goodhue County Ditch 1 (CD 1). The improvement will increase the capacity of the Branch B drain tile to meet current drainage needs. The CD 1 Branch B tile alignment is shown in **Figure 1**. The entire length of drain tile Branch B (including two sub-branches) is proposed for improvement. The project is a result of a petition from several landowners received by Goodhue County requesting the improvement of Branch B. A copy of the petition for improvement is included in **Exhibit A.**

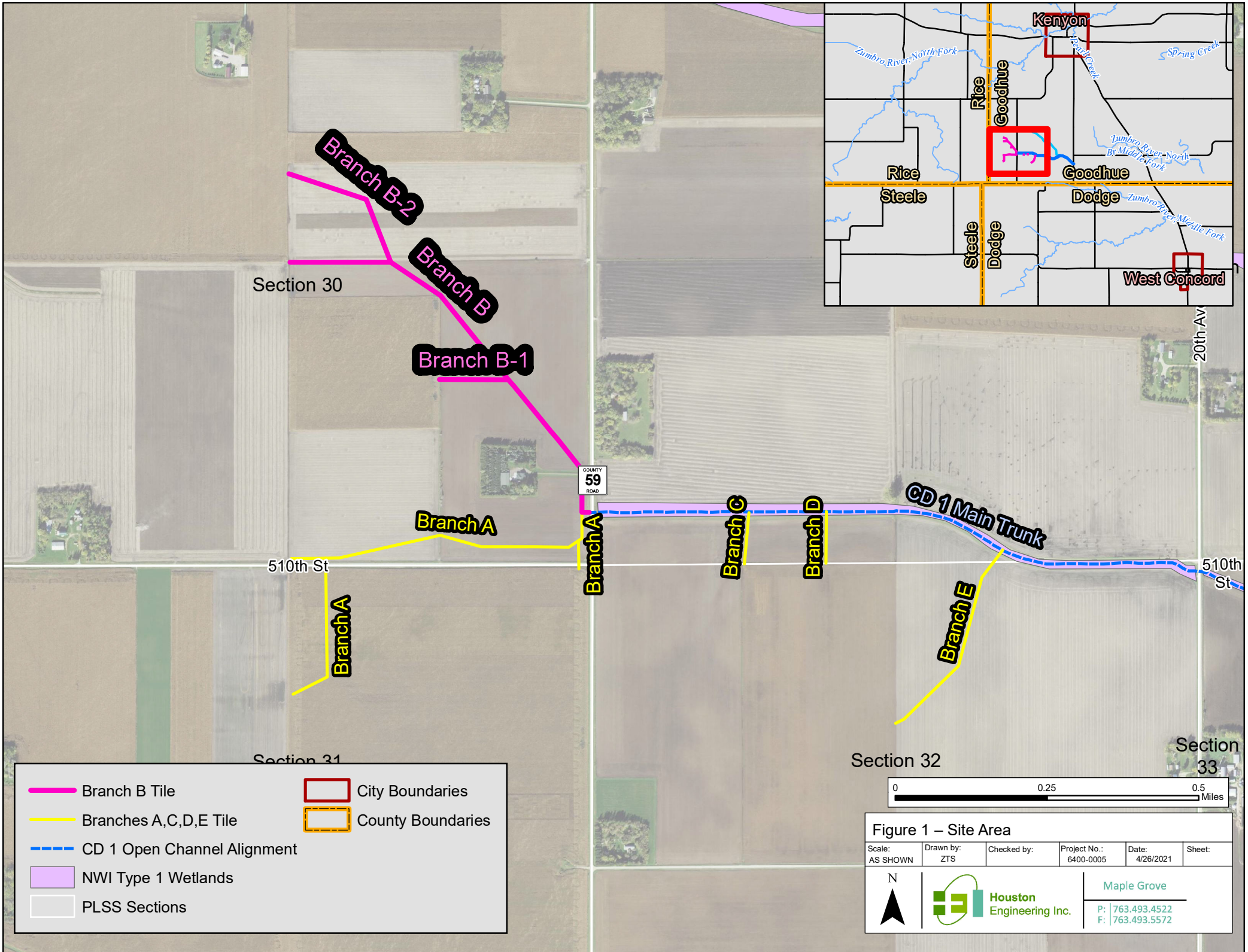
The petition for improvement of CD 1 Branch B states that Branch B has insufficient capacity and the installation of a larger tile is required to provide sufficient drainage capacity and fulfill its originally intended purpose under current farming and drainage practices. It also states that portions of the drainage system have deteriorated, thus impairing its effectiveness and the proposed improvement will be of public utility and promote the public health.

The petition for improvement of CD 1 Branch B was filed with the Goodhue County Board of Commissioners in accordance with Minnesota Statutes (Minn. Stat.) section103E.215. The Board of Commissioners appointed Houston Engineering, Inc. (HEI) as project engineer and ordered the preparation of the Engineer's Preliminary Survey Report in accordance with Minn. Stat. § 103E.241, Subd. 1.

1.1 OVERVIEW OF EXISTING DRAINAGE SYSTEM

The Goodhue CD 1 public drainage system consists of an open channel and five branches of drain tile located in Sections 28, 29, 30, 31, 32, and 33 of Kenyon Township (T109N, R18W). The portion of the system being analyzed for this report is the Branch B drain tile. Branch B begins in the Southeast Quarter of the Southeast Quarter of Section 30 in a drop structure located on the west side of County Road 59; thence northwesterly through the Northeast Quarter of the Southeast Quarter and Northwest Quarter of the Southeast Quarter; then terminating in the Southeast Quarter of the Northeast Quarter at the boundary between the Northeast Quarter and Northwest Quarter of Section 30. Branch B-1 originates in the Northeast Quarter of the Southeast Quarter of Section 30 and terminates due west at the boundary with the Northwest Quarter of the Southeast Quarter. Branch B-2 originates in the Northwest Quarter of the Southeast Quarter of Section 30 and terminates due west at the center of Section 30.

The full length of Branch B and its two sub-branches are being analyzed as part of this improvement.


Branch B-2
Branch B
Branch B-1
Section 30
Branch A
510th St
Branch A
Branch A
Branch C
Branch D
CD 1 Main Trunk
Branch E
510th St
20th Av
Section 31
Section 32
Section 33
COUNTY 59 ROAD
Kenyon
Zumbro River, North Fork
Rice
Goodhue
Spring Creek
Zumbro River, North By Middle Fork
Rice
Goodhue
Steele
Dodge
Zumbro River, Middle Fork
Steele
Dodge
West Concord
Branch B Tile
Branches A,C,D,E Tile
CD 1 Open Channel Alignment
NWI Type 1 Wetlands
PLSS Sections
City Boundaries
County Boundaries
0
0.25
0.5
Miles
Figure 1 – Site Area
Scale: AS SHOWN
Drawn by: ZTS
Checked by:
Project No.: 6400-0005
Date: 4/26/2021
Sheet:
N
Houston Engineering Inc.
Maple Grove
P: 763.493.4522
F: 763.493.5572

1.2 PROJECT DESIGN AND SITE SURVEY

The landowners in the Branch B tile watershed have observed prolonged flooding of agricultural lands drained by Branch B of CD 1. A tile inspection report[1] of the CD 1 drain tile networks indicates the drainage issues are due to both insufficient capacity and disrepair of the tile system. Branch B was established in 1954 and has undergone no significant repairs during its service life. Televising survey of Branch B found a concrete pipe in disrepair near the outlet, and although the televising equipment was unable to move farther upstream, tile displacement and deterioration are likely present elsewhere in the system due to its age and similar characteristics found in the other branches.

On-site televising of Branch B was completed by Empire Pipe Services in September 2020, and on-site survey was obtained by Goodhue County in April 2021. The on-site survey determined the locations and elevations of the tile outlet near County Road 59 and all inlets and tile access locations for the public drainage system. LiDAR elevation data from the State of Minnesota was used in lieu of on-site survey to assess drainage patterns and map catchment boundaries. The project site survey is shown in **Exhibit B**.

Plan and profile drawings included as **Exhibit C** of this report provide a graphical representation of the current system and a recommended solution to correct existing flooding and drainage problems in the Branch B tile watershed. The proposed solution includes the replacement of existing tile with new tile sized to provide a drainage coefficient of approximately 1/2-inch to remove excess water from the surface and the root zone of the soil profile within a 24-hour period. The Natural Resource Conservation Service (NRCS) recommends a 1/2-inch drainage coefficient to support modern row crop production.

Existing tile diameters for the Branch B system range in size from 10-inches at the outlet to 6-inches at the upstream ends of Branch B and Branch B-2. Proposed pipe diameters have been selected based on drainage coefficients calculated for critical sections identified by pipe diameter. The project has been designed assuming proposed improvement tiles will be placed parallel to existing tiles, and the existing tiles will be abandoned in-place. Branches B, B-1, and B-2 each have several private tile connections, so no change in the system alignment or length is recommended.

Branch B outlets into a concrete outlet structure located west of County Road 59. Due to the age of the concrete structure, the new Branch B tile likely cannot be connected into the existing structure without replacement of the structure. This structure is planned to be replaced with the ordered repairs to Branch A (which are to be completed concurrently with the Branch B improvement if it is ordered). The cost of replacing the outlet structure is not included in the Opinion of Probable Cost for Branch B improvement.

[1] Goodhue County Ditch 1 Tile Inspection and Ditch Repair reported, dated January 15, 2021, prepared by Houston Engineering, Inc.

2 COMPATIBILITY WITH EXISTING PLANS AND STATE LAW

2.1 DRAINAGE LAW – MINN. STAT. CHAPTER 103E

Goodhue County is exercising authority over the petitioned action pursuant to Minn. Stat chapter 103E. Under Minn. Stat. chapter 103E, the County and its Board of Commissioners must give special attention to both the procedural requirements for establishment and construction of a drainage project as well as the policy requirements for establishment as specifically outlined in Minn. Stat. §§ 103E.015 and 103E.341.

2.1.1 DETAILED SURVEY REPORT (FINAL ENGINEER'S REPORT) REQUIRED CONTENTS

Minn. Stat. § 103E.265 requires the Engineer, if ordered by the drainage authority and following the filing of the preliminary hearing order, to make a detailed survey and submit a Detailed Survey Report. Minn. Stat. § 103E.285 requires the Detailed Survey Report to include the following information:

- Map: A complete map of the proposed drainage project and drainage system must be drawn to scale, showing:
  - The terminus and course of each drain and whether it is ditch or tile, and the location of other proposed drainage works.
  - The location and situation of the outlet.
  - The watershed of the proposed drainage project and the subwatershed of main branches, if any, with the location of existing highway bridges and culverts.
  - All proposed affected, with the names of known owners.
  - Public roads and railways affected.
  - The outline of any lake basin, wetland, or public water body affected.
  - Other physical characteristics of the watershed necessary to understand the proposed drainage project and the affected drainage system, and
  - The area to be acquired to maintain a grass strip under Section 103E.021.
- Profile of drainage lines.
- Bridge and culvert plans.
- Tabular statement of excavation, construction, and cost. A tabular statement must be prepared, showing:
  - The number of cubic yards of excavation, linear feet of tile, and average depth of each tile line.
  - The bridges, culverts, and works to be constructed under the plans for the drainage project, and
  - The estimated unit cost of each item, a summary of the total cost, and an estimate of the total cost of completing the proposed project that includes engineering and other costs.
- Right-of-way acreage. The acreage must be shown that will be taken for ditch right-of-way on each government lot, 40-acre tract, or fraction of a lot or tract under separate ownership. The ditch right-of-way must include the area to be taken to maintain a grass strip under Section 103.E021.
- Drain tile specifications (if necessary).
- Soil survey report (if required).
- Recommendation for division of work.
- Other information on practicability and necessity of drainage project. Other data and information to inform the drainage authority of the practicability and necessity of the proposed drainage project

must be made available including a comprehensive examination and the recommendation of the Engineer regarding the environmental and land use criteria in Section 103E.015, Subd. 1.

This report meets the requirements as stated.

2.2 PERMITTING REQUIREMENTS

2.2.1 LOCAL

The project must comply with the Wetland Conservation Act (WCA) as administered by Goodhue County as the local government unit (LGU). The National Wetland Inventory (NWI) and Public Waters Inventory (PWI) was reviewed to determine the presence of wetland resources within the drainage system and is displayed on **Figure 1**.

There are no NWI-mapped wetlands within the Branch B tile watershed. The construction of the new tile will not result in any drainage or fill wetland impacts.

2.2.2 STATE

The Minnesota state Public Waters Inventory (PWI) shows no public waterbodies or watercourses near the proposed project. A permit will not be required from the Minnesota Department of Natural Resources (DNR) since the proposed project does not involve working in any state-listed Public Waters.

A Stormwater Pollution Prevention Plan will be developed and a permit will be required from the Minnesota Pollution Control Agency (MPCA) if construction will disturb more than five acres of land as part of the project.

2.2.3 FEDERAL

Impacts to wetlands are regulated at the Federal level by the US Army Corps of Engineers implementing Section 404 of the federal Clean Water Act (CWA). The proposed work may be authorized under Nationwide Permit 40 (NWP 40), as issued by the U.S. Army Corps of Engineers in 2017. This permit authorizes the construction of drainage tile for agricultural activities. The construction of the tile is authorized under NWP 40, and the project will be designed such that no wetland drainage will result from the project. Therefore, no mitigation will be required for the project.

The Swampbuster provision of the 1985 Farm Bill was aimed at reducing the conversion of wetlands for agricultural purposes. Farmers who drain, fill, level, clear stumps or otherwise alter a wetland may lose eligibility for U.S. Department of Agriculture (USDA) program benefits. As a result of the proposed improvement to CD 1 Branch B, farmers wishing to receive, or continue to receive, USDA program benefits or payments may need to complete Form AD-1026, which is available at the local Farm Service Agency (FSA) office.

2.3 EXISTING WATER MANAGEMENT PLANS

Several local water management plans address water quantity and quality concerns at the county and watershed level which are inclusive of this project area. The following sections summarize water management issues, goals, and activities identified in each of the relevant water plans.

2.3.1 GOODHUE COUNTY WATER PLAN

The 2010-2020 Goodhue County Comprehensive Local Water Management Plan contains a number of priority areas and implementation plans to address water issues that are relevant to the proposed improvement of CD 1. Relevant priority areas include erosion and sediment control and management of impaired waters for improvement of rural and agricultural water quality.

Implementation actions for erosion control and reducing turbidity in impaired waters overlap, and both recommend pursing the implementation of drainage BMPs to reduce the runoff and the quantity of sediment leaving agricultural fields. Implementing such BMPs often relies heavily on external funding and voluntary landowner participation, though some design considerations (such as alternative intakes) can be accomplished with little or no added cost.

2.3.2 TMDL & WRAPS

The Zumbro River, Middle Fork is the receiving waterbody downstream of the outlet of CD 1. It is listed on the MPCA's Impaired Waters List for aquatic recreation and aquatic life. The Zumbro River, Middle Fork is part of the Zumbro River watershed that has a completed and approved TMDL for TSS. The Zumbro River, Middle Fork was added to the Clean Water Act Section 303(d) impaired waters list in 2008. MPCA prepared a Restoration and Protection Strategies (WRAPS) report for the Zumbro River Watershed. Watershed-wide priorities related to the agricultural drainage proposed in this report included reducing nitrogen and phosphorous loadings to streams and increasing soil infiltration and water holding capacity. The proposed project will increase soil infiltration and will help decrease sediment and phosphorus delivery downstream via installation of alternative (Hickenbottom) intakes.

2.3.3 CONSISTENCY WITH WATER PLANS

Under current conditions, the condition of the Branch B tile watershed contributes to the impairment of the Zumbro River, Middle Fork receiving water. Poor field drainage produces excess surface runoff that delivers sediment and nutrients downstream, and the poor condition of the existing drain tile allows sediment to enter the tile system.

The proposed tile improvement will improve sediment and nutrient runoff conditions in two ways: 1) Improving subsurface drainage will increase the infiltration capacity of the soil, which will increase surface abstraction and thus reduce surface runoff during smaller, more frequent rainfall events, thus reducing total phosphorus and total sediment delivery downstream; and 2) Replacing the old, deteriorated sectioned drain tile with plastic pipe will decrease the amount of sediment that enters the tile and thus decrease the amount of sediment delivered downstream. Based on the impairments (aquatic life, aquatic recreation), the improvement is a reasonable TMDL implementation strategy and therefore consistent with the Goodhue County Comprehensive Local Water Management Plan.

2.3.4 COUNTY ZONING AND LAND USE PLAN

Land within the project area is primarily zoned as "Agricultural" according to the current Kenyon Township Zoning Map. The Goodhue County Zoning Ordinance has stated purposes that include encouraging farmers, residents, and businesses to protect the land from erosion, loss of wetlands, loss of water quality, and loss of woodlands; and protecting and preserving prime agricultural land by limiting the density of residential development in those areas. The proposed project falls within the purpose of protecting the land from erosion and loss of water quality.

3 CONSIDERATIONS

3.1 PROJECT COSTS AND PUBLIC AND PRIVATE BENEFITS

Minn. Stat. § 103E.015, Subd 1(1) requires the drainage authority to consider private and public benefits and costs of proposed drainage projects.

3.1.1 PRIVATE BENEFIT

The private benefits expected from the project accrue mainly to agricultural lands that lie adjacent to the proposed improvement. These private benefits would be experienced through reduced overland flooding, reduced seepage, and erosion prevention. A secondary benefit would be reduced maintenance cost, as the project will replace a substantial amount of aging tile.

3.1.2 PUBLIC BENEFIT

Benefits to public transportation systems include Goodhue County Road 59. The proposed project will reduce the duration of standing water and the volume of surface runoff adjacent to the road by improving the drainage capacity of the Branch B watershed. Additional public benefits include protection and preservation of the tax base and a reduction in impairments to public waters.

3.1.3 COSTS

A detailed breakdown of the project cost is included in **Exhibit D** to this report. In addition to economic costs, there are other non-quantifiable costs to be considered, including environmental, social, and cultural costs. Adverse impacts due to construction activities include inconveniences due to traffic impairment and rerouting and nuisances due to increased noise pollution and dust creation. The proposed project is located in a rural area and all construction activities are proposed to take place on private agricultural fields, so minimal additional impacts are anticipated.

3.1.4 DAMAGES

Damages are tabulated based on the estimated acreage impacted per parcel. A 100-foot working corridor was developed for the full alignment of Branch B (50 feet on each side), and then the damaged acreage was calculated per parcel (**Table 1**). Note that in some instances, there may be need to deviate from the intended alignment or complete work that is outside the limits of the working corridor, such as reconnecting a private lateral. Damaged locations will likely be out of crop production for one growing season and may have some reduction in crop yield the following growing season, depending on conditions. Total damages are estimated to be 12.6 acres, with associated costs to be assigned by viewers.

***Table 1** – Damages by Parcel*

Owner Name	Section	Quarter Section	Township, Range	Damaged Acres
Houglum, Jon and Christine	30	NE	T109N, R18W	3.7 ac
Houglum, Jon and Christine	30	SE	T109N, R18W	2.3 ac
Solberg, Jeffrey	30	SE	T109N, R18W	6.6 ac

3.2 ALTERNATIVE MEASURES

Alternative measures must be considered before establishing a drainage project per Minn. Stat. § 103E.015, Subd 1(2). The alternative measures considered must include elements to (i) conserve, allocate, and use drainage waters for agriculture, stream flow augmentation, or other beneficial uses (ii) reduce downstream peak flows and flooding (iii) provide adequate drainage system capacity (iv) reduce erosion and sedimentation and (v) protect or improve water quality. Listed below are the feasible alternatives and followed by the consideration given to each:

- Do Nothing – This alternative will maintain the status quo in terms of insufficient agricultural drainage which limits the economic viability of agriculture in the watershed. Due to the age of the system, it will continue to rapidly deteriorate, requiring significant cost to maintain until it is improved or repaired. Additionally, as described above in Section 2.3, the current drainage system contributes excessive sediment and nutrients to downstream impaired stream reach due to open water intakes and sectional tile. For these reasons, the Do Nothing alternative is not preferred.
- Repair– Repair of the drainage system would resolve the excessive contributions of sediment and nutrients to downstream impairments as well as bring the system back to the ACSIC but would not enhance the economic viability of agriculture due to standing water caused by poor drainage. Therefore, it is not a preferred alternative.
- Improvement– Improvement of the drainage system would resolve both the excessive contributions of sediment and nutrients to downstream impairments and enhance the agricultural economics on the drainage system by bringing system drainage in line with modern standards.

Technical analysis presented in subsequent sections of this report describes the effectiveness of alternatives and achieving drainage function and evaluating downstream flood and water quality impacts.

3.3 LAND USE

Per Minn. Stat. § 103E.015, Subd 1(3), the drainage authority must consider the present and anticipated land use including the compatibility of the project with local land use plans. The present land use within the project area is mostly agricultural. In general, land use will remain agricultural for the foreseeable future. The project is compatible with the Goodhue County Zoning Ordinance which aims to maintain and enhance agricultural land in the County as described in Section 3(A.1).

3.4 CURRENT AND POTENTIAL FLOODING

Per Minn. Stat. § 103E.015, Subd 1(4), the drainage authority must consider the current and potential flooding characteristics of property in the drainage project or system and downstream for the 5-, 10-, 25- and 50-year flood events, including the adequacy of the outlet for the drainage project.

3.4.1 HYDROLOGIC AND HYDRAULIC CONDITIONS IN SYSTEM

The proposed drain tile improvements were chosen to provide a minimum 0.5-inch drainage coefficient for each segment of Branches B, B-1, and B-2. Increases in flow due to the tile improvements were added to the existing conditions peak flows to determine the post-project flows in CD 1. Existing and proposed drainage coefficients for critical locations in the tile network are shown in Tables 1 through 3.

Table 2 – Drainage Coefficient – Main Trunk

Location	Cumulative Area	Tile Diameter		Drainage Coefficient (in/day)		Maximum Flow Capacity
		Existing	Proposed	Existing	Proposed	
Branch B-1 Junction to Outlet (STA 0+00 to 14+44)	217.9 ac	10"	18"	0.11	0.58	5.4 cfs
STA 20+00 to Branch B-1 Junction (STA 14+44 to 20+00)	98.1 ac	8"	15”	0.15	0.91	4.7 cfs
STA 20+00 Branch B-2 Junction (29+07)	95.5 ac	8"	15”	0.15	0.93	3.7 cfs
Branch B-2 Junction to Upstream End (STA 29+07 to 37+85)	26.2 ac	6"	10”	0.07	0.97	1.1 cfs

Table 3 – Drainage Coefficient – Branch B-1

Location	Cumulative Area	Tile Diameter		Drainage Coefficient (in/day)		Maximum Flow Capacity
		Existing	Proposed	Existing	Proposed	
B-1 - (STA 0+00 to 5+97)	60.1 ac	8"	10"	0.37	0.73	1.8 cfs

Table 4 – Drainage Coefficient – Branch B-2

Location	Cumulative Area	Tile Diameter		Drainage Coefficient (in/day)		Maximum Flow Capacity
		Existing	Proposed	Existing	Proposed	
B-2 - STA 0+00 to 13+05	17.8 ac	6"	8"	0.24	0.78	0.6 cfs

3.4.2 HYDROLOGIC AND HYDRAULIC CONDITIONS AT CR-59 OUTLET

Branches A and B of the CD 1 public tile system outlet into a drop structure located adjacent to County Road 59 and then flow to a 36-inch culvert that discharges at the upstream end of the open channel portion of CD 1. Flow from the tile discharges under County Road 59 through 36-inch reinforced concrete culvert with a headwall and into the upstream end of the CD 1 open channel. The open channel portion of CD 1 ultimately discharges to the Zumbro River, Middle Fork. Per the original Engineer’s Report for the

CD 1 system, the typical section of the upstream reach of CD 1 has a 4-foot bottom, 2:1 horizontal to vertical side slopes, and a depth of approximately 5 feet.

The USGS regression equation obtained from the StreamStats program was used to model peak stormflows through the 36-inch culvert and at upstream end of the CD 1 open channel. Peak flows were modeled for the 2-, 5-, 10-, 25-, 50-, and 100-year stormflow events.

Increases in flow to the culvert and ditch due to increased capacity in the drain tile were calculated based on the proposed pipe sizes, slopes, and Manning's roughness values.

For this analysis, the impacts on both the County Road 59 culvert and the open channel of CD 1 were assessed. The modeling shows the proposed improvements will increase the flow rate to both the culvert and the CD 1 open channel, as the increased capacity of the tile will decrease flooding durations on the field surface but increase the total flow to the culvert and channel.

Table 5 *– County Road 59 36-Inch Culvert Hydraulic Calculations*

Flood Frequency	Flow (cfs)		Water Surface Elevation (ft)		
	Existing	Post-Improvement	Existing	Post-Improvement	Change in WSEL
2-Year	34	38.1	1237.5	1237.7	0.2
5-Year	64	68.1	1239.6	1240.0	0.4
10-Year	89	93.1	1242.7	1243.3	0.6
25-Year	126	130.1	1243.6	1243.6	0.0
50-Year	158	162.1	1243.6	1243.6	0.0
100-Year	195	199.1	1243.7	1243.7	0.0

Table 6 *– CD 1 Open Channel Hydraulic Calculations*

Flood Frequency	Flow (cfs)		Channel Velocity (ft/s)		
	Existing	Post-Improvement	Existing	Post-Improvement	Change in Velocity
2-Year	34	38.4	2.2	2.3	0.1
5-Year	64	68.4	2.7	2.8	0.1
10-Year	89	93.4	3.0	3.0	0.0
25-Year	126	130.4	3.3	3.4	0.1
50-Year	158	162.4	3.6	3.6	0.0
100-Year	195	199.4	3.8	3.8	0.0

The hydraulic model for the 36-inch culvert shows increases in upstream elevations of 0.2 to 0.6 feet for the 2-, 5-, and 10-year flood events. The existing conditions model shows the road overtops at a

discharge of approximately 95 cfs, and thus the proposed improvements will not cause the road to overtop where it did not in the existing conditions.

The model of the CD 1 open channel shows the proposed improvements are projected to increase the peak flow to CD 1 by 4.4 cfs for the design events, which correlates to a maximum channel velocity increase of 0.1 feet per second for the design events. This increase in not projected to cause any adverse impacts to the public drainage system or its ability to serve its designed function.

Given the small potential impact on overtopping of County Road 59 and downstream peak flood elevations in the CD 1 open channel, the proposed improvement of CD 1 is considered to have an adequate outlet.

3.5 WETLANDS

Minn. Stat. § 103E.015, Subd 1(5) requires the drainage authority to consider the effects on wetlands. The National Wetland Inventory (NWI) database shows a Type 1 wetland in the CD 1 open channel east of County Road 59 (see **Figure 1**). The proposed project does not discharge directly to the wetland, and no work is being proposed within the mapped wetland boundaries. The modeling done for Section 3.4 shows minimal elevation increases for design events that are not expected to significantly affect the hydroperiod of the wetland.

3.6 WATER QUALITY

Minn. Stat. § 103E.015, Subd 1(6) requires that the drainage authority consider the effects of the proposed drainage project on water quality. The occurrence of an extreme runoff condition during project construction could cause an increased sediment load into the downstream channel system. However, a Stormwater Pollution Prevention Plan will be prepared for the project, which will minimize the likelihood of a substantial sediment discharge following rainfall events. The downstream water quality following completion of the project will change little from the current condition. The improved tile will be clean and free of sediment blockages. Cleaning and inspection ports will be incorporated into the project design. The project will not drain new lands downstream, and thus the discharge of nutrients will remain similar or decrease in volume from an increase of infiltration potential but will arrive in downstream watercourses earlier in the hydrograph following a rainfall event.

3.7 FISH AND WILDLIFE RESOURCES

Minn. Stat. § 103E.015, Subd 1(7) requires the drainage authority to consider the effects of the proposed project on fish and wildlife resources. The proposed improvement project does not contemplate any major excavation in any existing natural watercourse or lakes, and as a result will have insignificant effects on fish resources. The proposed work will occur on fields currently used for agricultural practices, so there is no proposed destruction of prairie or wooded wildlife habitat. The project incorporates replacement of deteriorating drain tile, new tile intakes, and other project components that are consistent with current BMPs. Therefore, the quality of the water exiting Branch B into CD 1 will be improved and have a net positive affect on fish and wildlife resources.

3.8 GROUNDWATER

Minn. Stat. § 103E.015, Subd 1(8) requires the drainage authority to consider the effects of the proposed drainage project on shallow groundwater availability, distribution and use. Review of the SSURGO soil database indicates the presence of soils susceptible to poorly drained conditions. The existing drain tile

was installed to draw down saturated soils following rainfall events and thus allow the soil to function in a “drained” condition for cultivation. The proposed improvement will install perforated tile at a depth similar to existing conditions, and thus the improvement will not substantively affect the seasonal groundwater table or shallow groundwater resources in the project area.

3.9 ENVIRONMENTAL IMPACT

Minn. Stat. § 103E.015, Subd 1(9) requires the drainage authority to consider the effects on the overall environmental impact of the proposed drainage project. The project engineer and project sponsors for this project envision that the overall impact of the project will contain no long-term adverse effects on the environment beyond the potential for wetland drainage. While construction operations have an inherent adverse effect on the environment, these effects are temporary in comparison to the long-term benefits anticipated from the project operation.

3.10 EXTERNAL FUNDING

In accordance with Minn. Stat. § 103E.015, Subd. 1a., the Engineer on behalf of Goodhue County investigated the potential use of external sources of funding to facilitate the purposes of Minn. Stat. § 103E.011, Subd. 5., which are for wetland preservation or restoration or creation of water quality improvements or flood control. The Goodhue County SWCD was not aware of any available external sources of funding for the project and thought it unlikely that the project would apply for grant funding from the Clean Water Fund grant program administered by the MN Board of Water and Soil Resources. The types of projects that meet the Minn. Stat. § 103E.011, Subd. 5, purposes of wetland, water quality or flood control improvements include wetland restoration, grass waterways, water and sediment control basins, alternative tile intakes, denitrifying bioreactors, drainage water management, and several other types.

4 PUBLIC UTILITY, BENEFIT OR WELFARE

In accordance with Minn. Stat. § 103E.015, Subd 2, consideration was given to the conservation of soil, water, forests, wild animals, and related natural resources, and to other public interests affected, together with other material matters as provided by law in determining whether the project will be of public utility, benefit, or welfare, the project engineers provide the following observations.

- The area drained by Branch B consists of private property, and none of the land is used for public purposes. Significant changes in land use are not anticipated in the foreseeable future, with or without the proposed improvements.
- Recreational activities are currently limited within the project area. There is no anticipated adverse effect on recreation in this area.
- Since the drainage system improvement project consists entirely of drain tile, there is no anticipated public navigation potential.
- The project elements as proposed in this report include no drainage opportunities of existing lakes, wetlands, or other protected water environments. Therefore, the proposed project will have little or no effect on fish resources. All new tiles will be solid with no perforations.
- There do not appear to be any cultural or archaeological resources which would be affected by the proposed project.
- Regarding the federally listed threatened Northern Long-Eared Bat, there are no known roost trees or hibernacula located within the project area. Additionally, no tree removals are proposed, therefore the project will not result in a taking of this federally listed species.

The proposed improvement will be of public utility and benefit and will promote the public health and welfare. Public utility and benefit are achieved by providing more efficient drainage to agricultural properties within the drainage area. The improvement will protect property values and improve the economy of agricultural production. Public health and welfare are achieved by reducing the frequency of wet and overflowed land which, will improve the general sanitary condition of the community, relieve low wet or stagnant and unhealthful conditions, and protect the overflowed property, all of which were goals of the original proceedings to establish the CD 1 public drainage system.

5 OPINION OF PROBABLE CONSTRUCTION COST

The estimated total project costs for the improvement described in this report are as follows:

Table 7 *– Opinion of Probable Construction Cost Summary*

Category	Cost
Construction Costs*	$244,500
Engineering and Viewing**	$49,900
Legal and Administrative	$15,000
Total Improvement Project Cost	**$309,400**

*Includes 20% construction contingency.
**Engineering based on work done to date plus 15% of construction cost and Viewing estimated at $6.00/acre

A detailed breakdown of the project costs is included as **Exhibit D** of this report. These costs assume the improvement will generally follow the existing tile alignment and include costs for materials, labor, engineering, and project management.

6 SEPERABLE MAINTENANCE

In its order initiating proceedings and appointing the engineer to prepare a preliminary survey report, Goodhue County instructed the engineer to include in this preliminary survey report an investigation of the current condition of the portion of the drainage system proposed to be improved and provide a recommendation on the propriety of a separable maintenance allocation of project costs.

A repair report prepared by HEI dated January 15, 2021 found the existing tile is in poor condition and given the system has not undergone any major repairs since it was established in 1954, the report recommended the existing tile be repaired, independent of an improvement proceedings. The cost to repair the existing Branch B tile by replacement at its current sizing was estimated separately from the improvement cost, and the cost was found to be **$264,600** (See **Exhibit D)**. It is recommended the Viewers consider these as separable maintenance costs relative to the improvement in further ditch proceedings.

7 RECOMMENDATIONS

In the opinion of the Project Engineer, the proposed project outlined herein is necessary, feasible, and practical. It is recommended that the County Board order the Improvement of the Goodhue County Branch B drain tile. This improvement sizing is feasible and will not result in substantive environmental impacts. We further recommend that the Board order the development of plans and specifications as part of a bid package to be publicly bid in the fall/winder of 2021 for construction in 2022.

The repair report dated January 15, 2021 indicates that the tile Branches A, C, and D of CD 1 are also in need of complete replacement. To provide the greatest economy of scale for the necessary work, we recommend that these repairs be incorporated into the bid package for the Branch B improvement and bid out as a single project.

EXHIBIT A – IMPROVEMENT PETITION

STATE OF MINNESOTA
Before the
GOODHUE COUNTY BOARD
SITTING AS THE DRAINAGE AUTHORITY FOR
GOODHUE COUNTY DITCH 1

In the Matter of: **The Petition for Improvement to Goodhue County Ditch 1 Branch B**	**PETITION FOR IMPROVEMENT TO Goodhue County Ditch 1 Branch B**

Pursuant to Minn. Stat. § 103E.215, Petitioners seek an improvement of Goodhue County Ditch 1. For their Petition, the undersigned Petitioners state and allege the following:

1. Petitioners seek the improvement of Goodhue County Ditch 1 Branch B located in Kenyon Township – Goodhue County.

2. Goodhue County Ditch 1 Branch B provides beneficial drainage to agricultural properties, public roadways, and other lands located in Section(s) <28, 29, 30, 31, 32, & 33 Township 109N, Range 18W, Goodhue County, Minnesota.

3. County Ditch 1, including Branch B is in need of repair. Branch B has remained in service since its original construction. Other than minor repairs, no major repairs have been made to Branch B since it was constructed.

4. Even in a repaired state, Goodhue County Ditch 1 Branch B is inadequate to support beneficial drainage for current farming and drainage practices. Goodhue County Ditch 1 Branch B has insufficient capacity and needs enlarging to furnish sufficient capacity.

5. The proposed improvements include: enlarging the existing tile on Branch B of Goodhue County Ditch 1 to meet modern drainage requirements.

6. The following is a description of a starting point, general course, and terminus of the proposed improvement:

   <u>Main</u>

   Commencing at a point in the SE 1/4, Section 30, Township 109, Range 18W, Kenyon Township , Goodhue County , Minnesota; thence northwest to the border between the SE and NE ¼ of Section 30, thence west approximately 925 feet

before terminating at the center of Section 30, Township 109N, Range 18 W, Kenyon Township, Goodhue County, Minnesota.

Lateral B-1

Commencing at a point in the SE 1/4, Section 30, Township 109, Range 18W, Kenyon Township, Goodhue County, Minnesota; thence <northwest approximately 1300 feet; terminating at the border of the NE and NW ¼, Section 30, Township 109N, Range 18W, Kenyon Township, Goodhue County, Minnesota.

Lateral B-2

Commencing at a point in the NE ¼, Section 30, Township 109N, Range 18W, Kenyon Township, Goodhue County, Minnesota; thence west approximately 650 feet; terminating at a point located in the SE ¼, Section 30, Township 109N, Range 18W, Kenyon Township, Goodhue County, Minnesota.

The 40-acre tracts or government lots and property where the proposed improvement passes over, including the names and addresses of the property owners from the records in the county assessor's office, is as follows:

Property Description	Property Owners	Address
1.NE ¼ SE1/4 Section 30 T109N, R18W	Jeffrey Solberg	50851 County 59 Blvd. Kenyon, MN. 55946
2.SE ¼ SE ¼ Section 30 T109N, R18W	Jeffrey Solberg	50851 County 59 Blvd. Kenyon, MN. 55946
3.NW ¼ SE ¼ Section 30 T109N, R18W	Jon Houglum	50243 County 59 Blvd. Kenyon, MN. 55946
4. SW ¼ NE ¼ Section 30 T109N, R18W	Jon Houglum	50243 County 59 Blvd. Kenyon, MN. 55946

7. The proposed improvement will be of public utility and promote the public health.

8. Petitioners will pay all costs of the proceedings if the proceedings are dismissed or the contract for construction of the proposed drainage system is not awarded.

9. A bond in the amount of $10,000 is attached hereto, payable to Goodhue County conditioned to pay the costs incurred if these proceedings are dismissed or a contact is not awarded to construct the improvement proposed in the petition. Petitioners acknowledge and agree that additional bonds may be required as additional costs are incurred in the proceedings.

10. Petitioners are the owners of 4 of the 4 40-acre tracts or government lots and property, at least twenty-six percent of the owners of property that the proposed improvement passes over.

11. Because Branch B of CD 1 is in need of repair, Petitioners request, to the extent practicable, that the drainage authority consider, under Minn. Stat. § 103E.215, subd. 6, the separable maintenance portion of the work when determining benefits and assessing costs of the improvement.

12. This Petition may be signed in counterparts.

Respectfully submitted this 16th day of Feburary, 2021 by: Jon Houghum

[Note: All signatories to the Petition must indicate the capacity in which they sign, i.e. owner, co-owner, corporate official, or government lot. In the case of a partnership, only one general partner needs sign. In the case of a corporation, only one corporate official need sign. In the case of co-ownership, all co-owners must sign. In the case of a trust, all trustees must sign. Be sure all signature blocks are fully completed. If you are unsure of whom must sign please contact the petitioner's attorney.]

OWNER SIGNATURE	***PROPERTY OWNED***	***MAILING ADDRESS***	***DATE***
Jon Houglum	Sect-30 Twp – 109 Range 018 NE ¼ SEC 30 109 18	50243 County 59 Blvd Kenyon MN 55946	2-13-21
	Sect-30 Twp 109 Range 018 W ½ of SE ¼ SEC 30 109 18		
Larry Lurken	Sect-30 Twp 109 Range 018 NW ¼ SEC 30 109 18	420 500th St Kenyon MN 55946	2-13-21
LyTana Derscheid	Sect-30 Twp 109 Range 018 S ½ of SW ¼ SEC 30 109 18	159 510th St Kenyon MN 55946	2-13-21
	Sect 30 Twp 109 Range 108 N ½ of SW ¼ SEC 30 109 18		
Jeffrey Solberg	Sect-30 Twp 109 Range 108 NE ½ of SE ¼ SEC 30 109 18	50581 County 59 Blvd Kenyon MN 55946	2-15-21

EXHIBIT B – SITE SURVEY

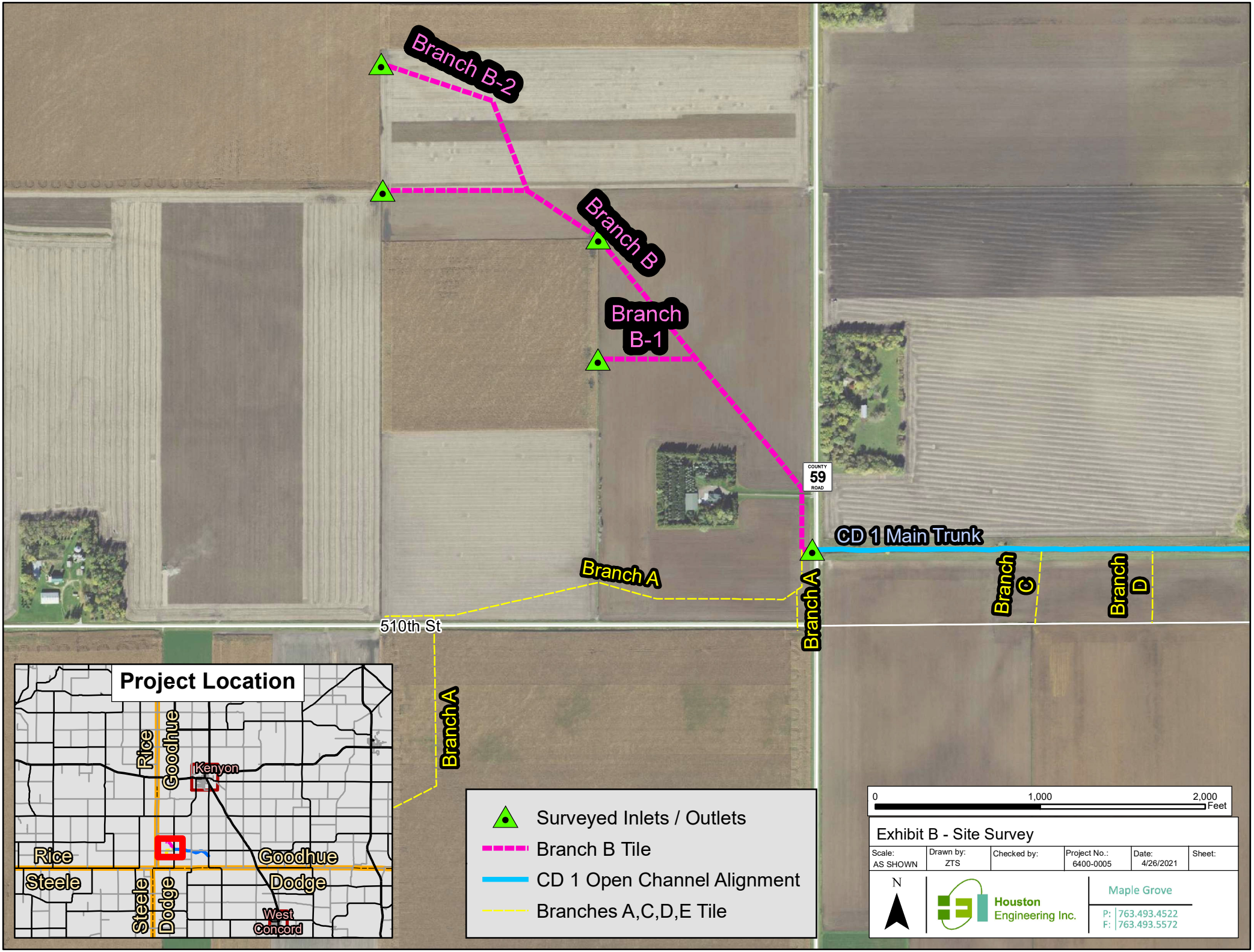
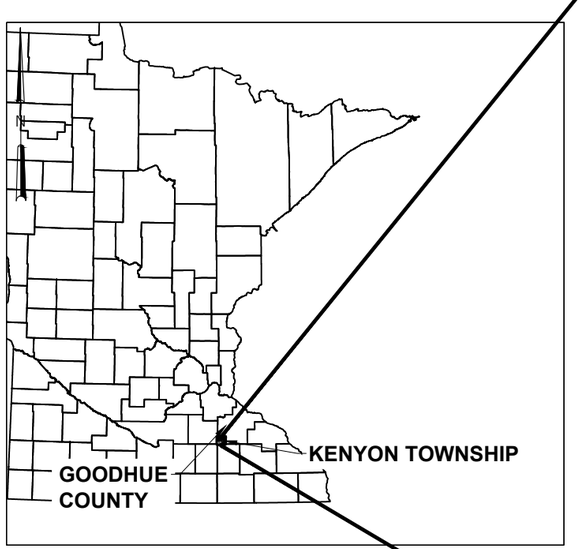
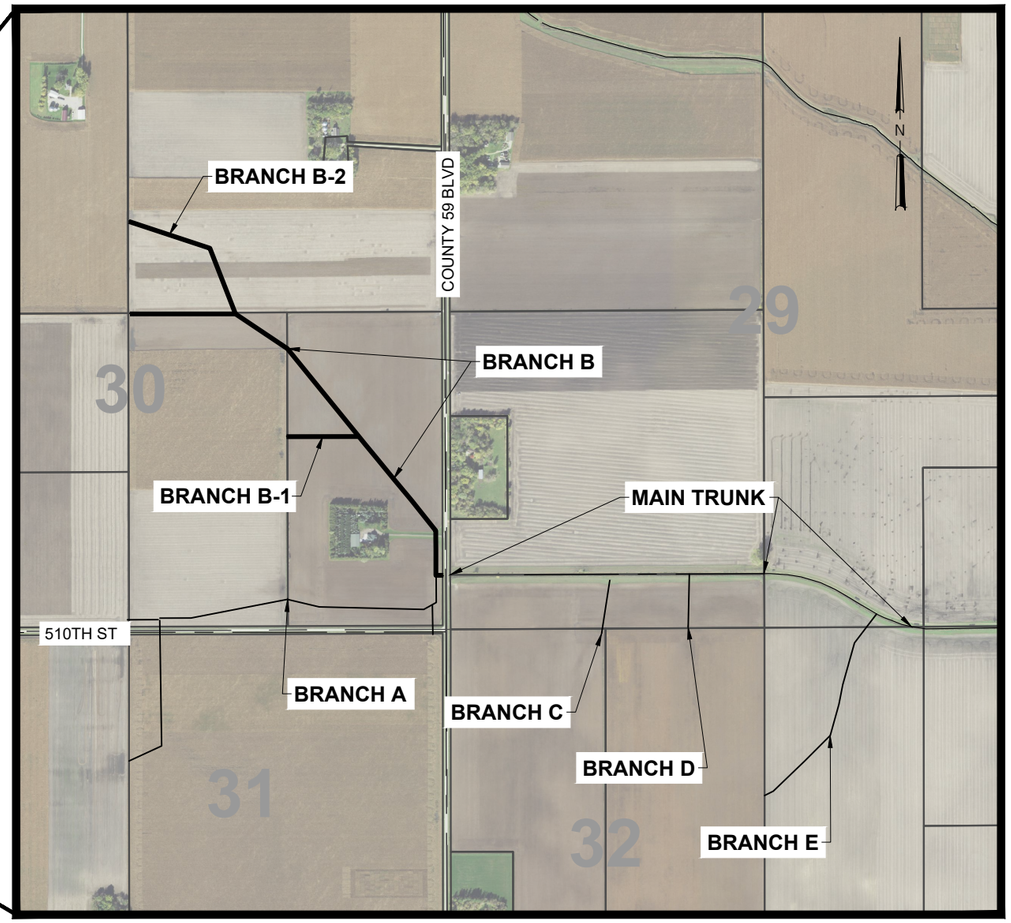

Branch B-2
Branch B
Branch B-1
COUNTY 59 ROAD
CD 1 Main Trunk
Branch A
Branch A
Branch C
Branch D
510th St
Branch A
Project Location
Rice
Goodhue
Kenyon
Rice
Goodhue
Steele
Dodge
Steele
Dodge
West Concord
Surveyed Inlets / Outlets
Branch B Tile
CD 1 Open Channel Alignment
Branches A,C,D,E Tile
0
1,000
2,000
Feet
Exhibit B - Site Survey
Scale: AS SHOWN
Drawn by: ZTS
Checked by:
Project No.: 6400-0005
Date: 4/26/2021
Sheet:
N
Houston Engineering Inc.
Maple Grove
P: 763.493.4522
F: 763.493.5572

EXHIBIT C – DESIGN PLAN / PROFILE

GOODHUE COUNTY DITCH 1 BRANCH B IMPROVEMENT

GOODHUE COUNTY
KENYON TOWNSHIP
AUGUST 2021





DRAWING INDEX	
SHEET #	SHEET TITLE
1	COVER
2	BRANCH B STA 0+00 TO 28+00
3	BRANCH B STA 28+00 TO 37+85
4	BRANCH B-1
5	BRANCH B-2
6	DETAILS-1
7	DETAILS-2

NOTES:

1. **GEODETIC CONTROL**

   HORIZONTAL: NAD83 MINNESOTA DOT: GOODHUE COUNTY, US FOOT

   VERTICAL: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

   BENCH MARK: EPSOM MNDOT, NE QUARTER, SECTION 1, TOWNSHIP 109N, RANGE 19W

   2.5 MILES WEST-NORTHWEST OF KENYON, 2.8 MILES WEST ALONG TRUNK HIGHWAY 60 FROM THE JUNCTION OF TRUNK HIGHWAY 60 AND TRUNK HIGHWAY 56 IN KENYON TO TRUNK HIGHWAY 60 MILEPOINT 160.90, THEN 0.7 MILE NORTH ON GOODHUE AVENUE, THEN 0.3 MILE WEST ON 210TH STREET, 27.5 FEET SOUTH OF 210TH STREET, 60.0 FEET SOUTH-SOUTHEAST OF A POWER POLE, 58.2 FEET SOUTH-SOUTHEAST OF A WITNESS POST, 59.19 FEET SOUTH-SOUTHEAST OF EPSON MNDT 1, 39.98 FEET WEST-NORTHWEST OF EPSON MNDT 2, 11.0 FEET EAST OF AN ENTRANCE, 2.4 FEET WEST OF A WITNESS POST.

2. **UTILITY**

   PRIOR TO ANY EXCAVATION WORK, THE CONTRACTOR IS RESPONSIBLE UNDER MINNESOTA STATE STATUTE 216D AND MINNESOTA RULES CHAPTER 7560 TO CONTACT GOPHER STATE ONE CALL FOR THE LOCATION OF UNDERGROUND UTILITY FACILITIES IN PROXIMITY TO THE EXCAVATION SITE.

   THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D. THIS UTILITY QUALITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED "STANDARD GUIDELINE FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA".

   CONTACT "GOPHER STATE ONE CALL" FOR LOCATIONS OF BURIED UTILITIES.
   CALL (651) 454-0002 OR (800) 252-1166.
   ALSO CONTACT AT www.gopherstateonecall.org

3. **SOURCE OF SURVEY**

   GOODHUE COUNTY, SOIL AND WATER CONSERVATION DISTRICT, OBSERVED OCTOBER 2020, APRIL 2021

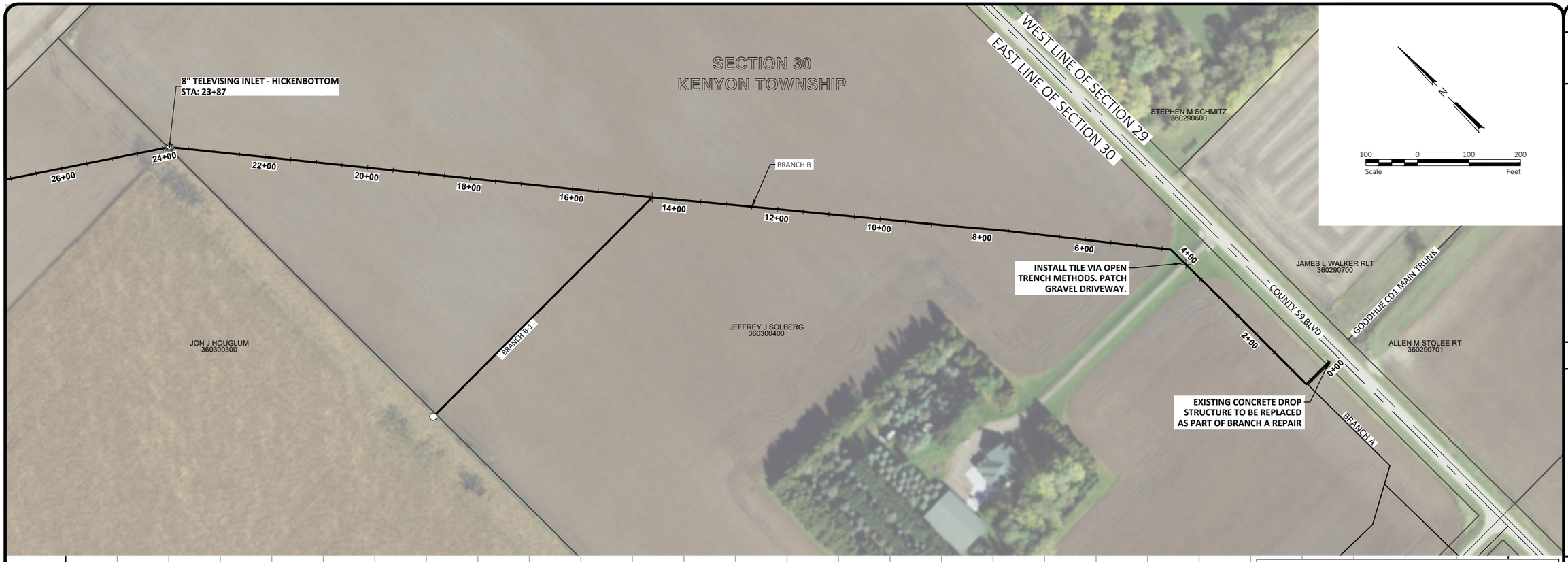
PRELIMINARY
Not for Construction

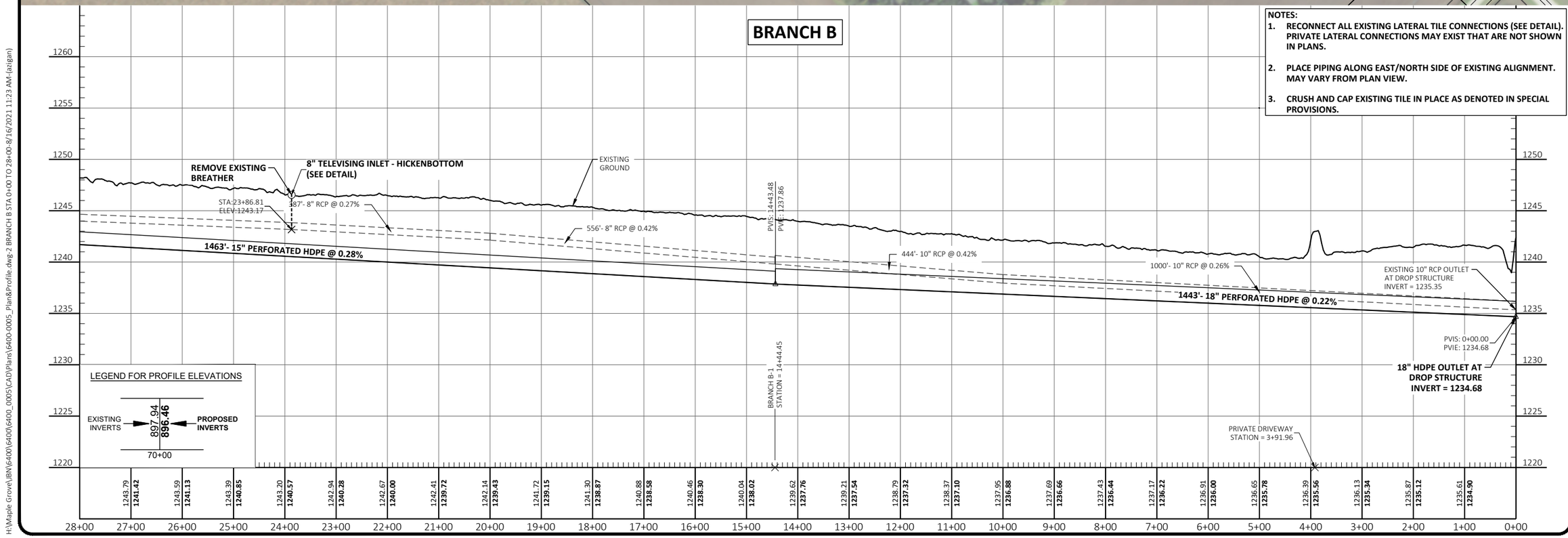
PREPARED BY:

HOUSTON ENGINEERING INC.

MAPLE GROVE, MINNESOTA

H:\Maple Grove\JBN\64000\64006400_0005\CAD\Plans\6400-0005_COVER.dwg-Layout1-8/16/2021 11:23 AM-(azigan)





PRELIMINARY
NOT FOR CONSTRUCTION

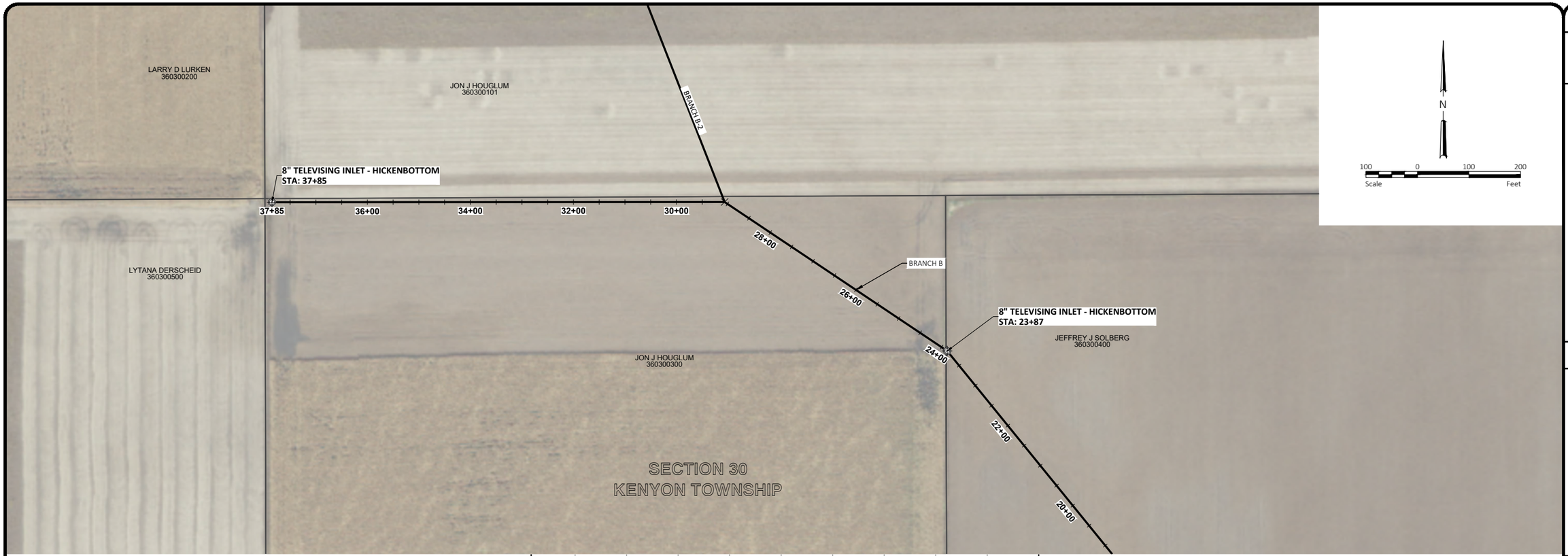
No.	Revision	Date	By

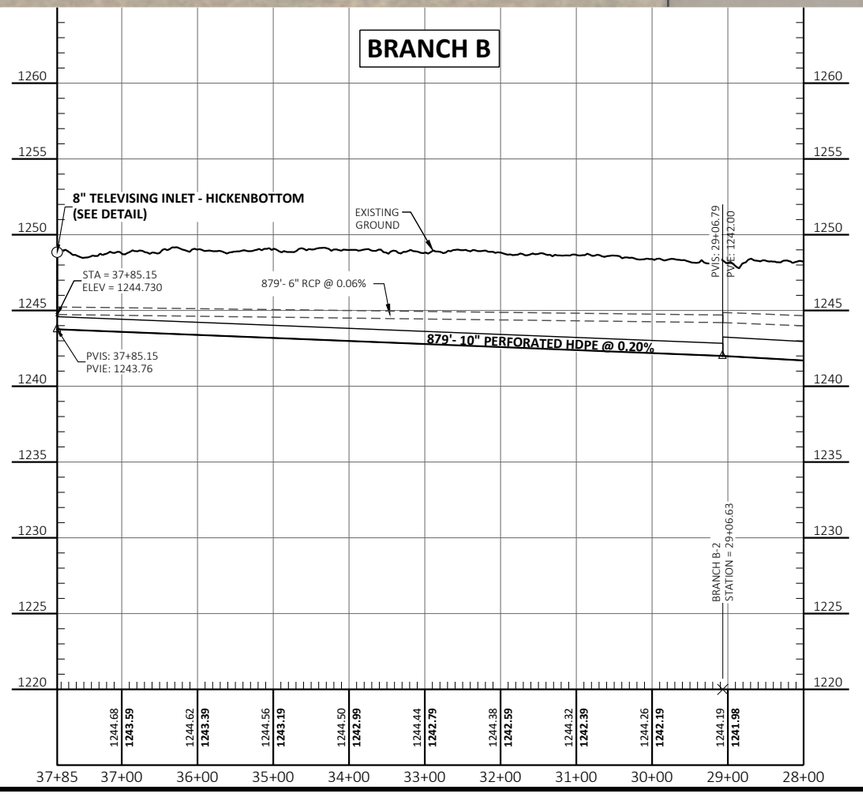
GOODHUE CD1 BRANCH B IMPROVEMENT
GOODHUE COUNTY
KENYON TOWNSHIP
BRANCH B STA 0+00 TO 28+00

HOUSTON engineering, Inc.

Drawn By	AMZ
Checked By	CCO
Date	8-12-2021
Scale	As Shown
Project No.	6400-0005
SHEET	2 OF 7

H:\Maple Grove\JBN\6400\6400\6400_0005\CAD\Plans\6400-0005_Plan&Profile.dwg-2 BRANCH B STA 0+00 TO 28+00-8/16/2021 11:23 AM-(aziganl)





NOTES:

1. **RECONNECT ALL EXISTING LATERAL TILE CONNECTIONS (SEE DETAIL). PRIVATE LATERAL CONNECTIONS MAY EXIST THAT ARE NOT SHOWN IN PLANS.**
2. **PLACE PIPING ALONG EAST/NORTH SIDE OF EXISTING ALIGNMENT. MAY VARY FROM PLAN VIEW.**
3. **CRUSH AND CAP EXISTING TILE IN PLACE AS DENOTED IN SPECIAL PROVISIONS.**

No.	Revision	Date	By

PRELIMINARY
NOT FOR CONSTRUCTION

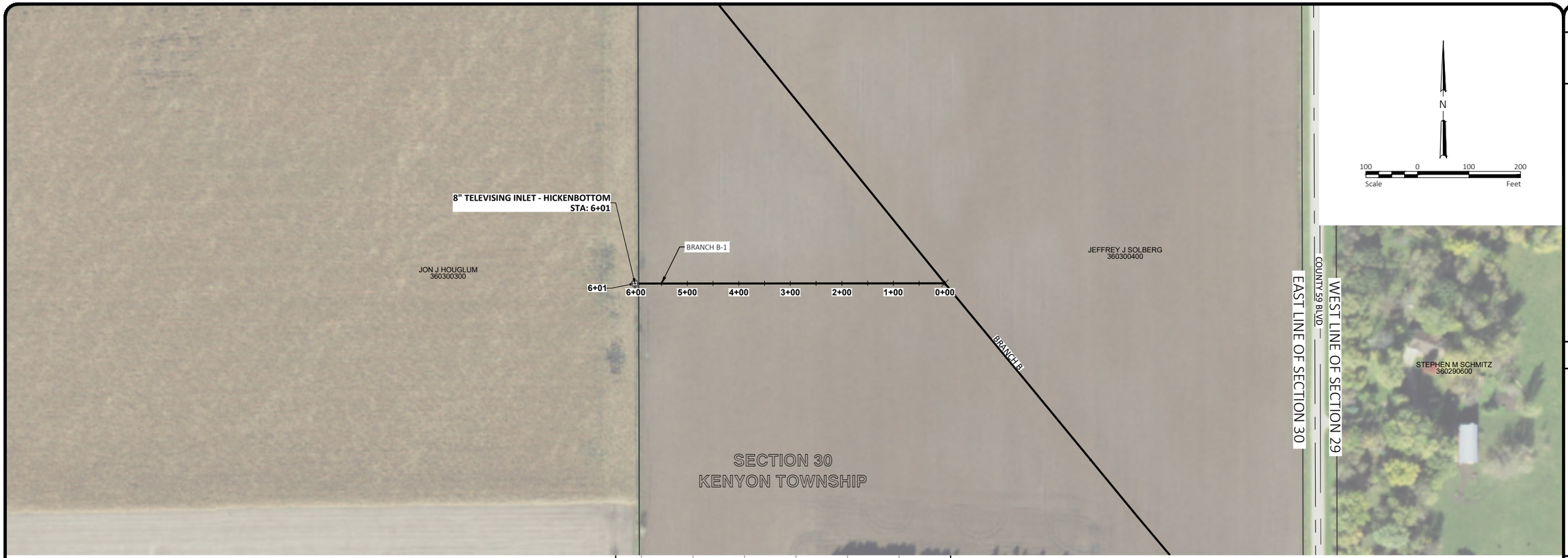
GOODHUE CD1 BRANCH B IMPROVEMENT
GOODHUE COUNTY
KENYON TOWNSHIP

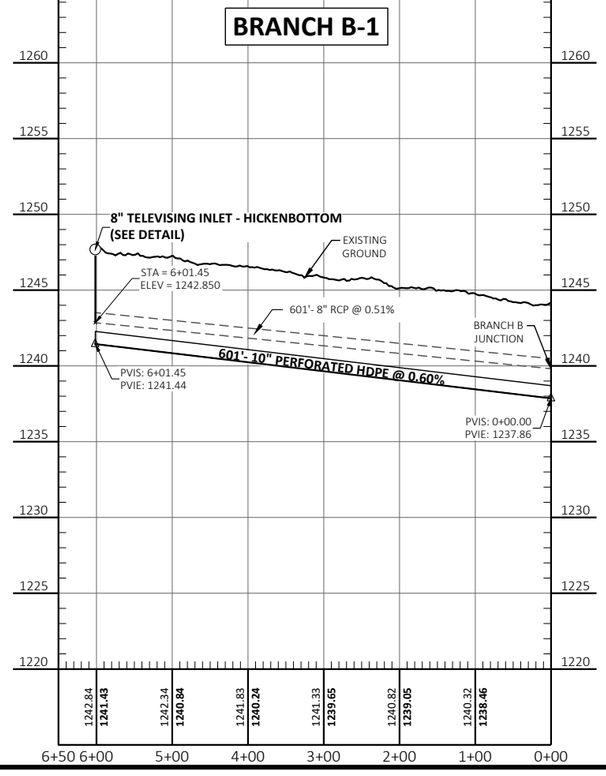
BRANCH B STA 28+00 TO 37+85

HOUSTON engineering, Inc.

Drawn By	AMZ
Checked By	CCO
Date	8-12-2021
Scale	As Shown
Project No.	6400-0005
SHEET	3 OF 7

H:\Maple Grove\JBN\6400\6400\6400_0005\CAD\Plans\6400-0005_Plan&Profile.dwg-3 BRANCH B STA 28+00 TO 37+85-8/16/2021 11:23 AM-(azigan)





PRELIMINARY
NOT FOR CONSTRUCTION

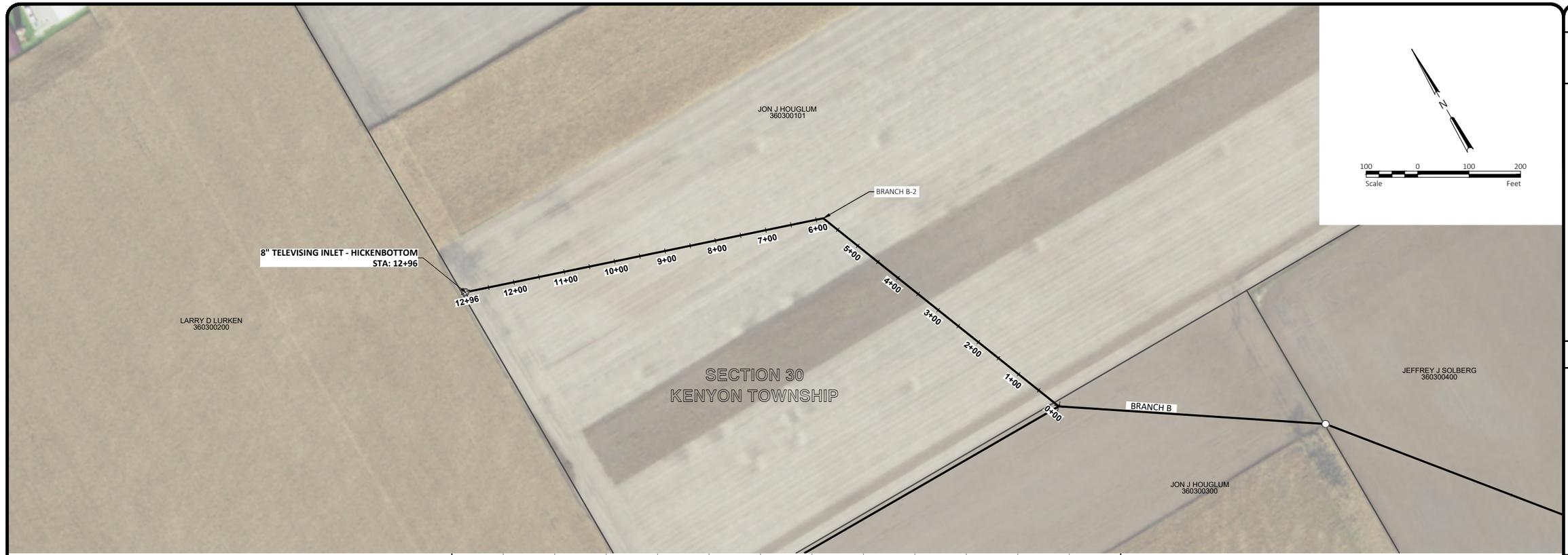
No.	Revision	Date	By

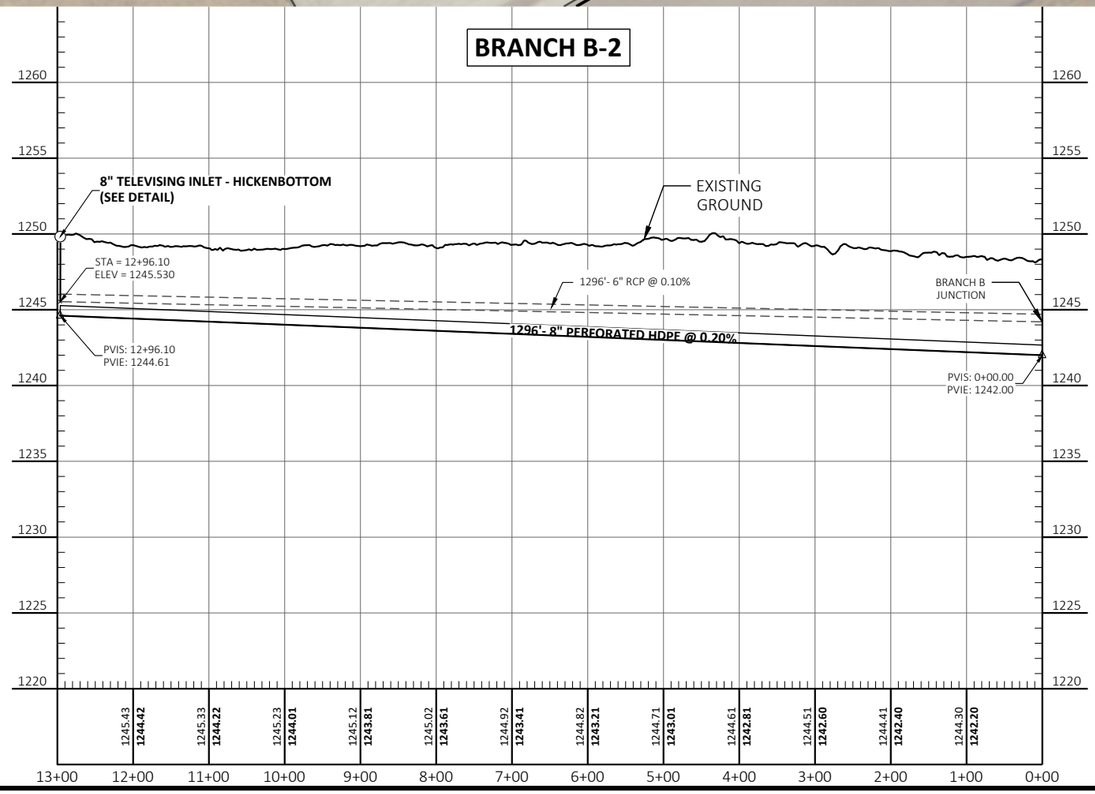
GOODHUE CD1 BRANCH B IMPROVEMENT
GOODHUE COUNTY
KENYON TOWNSHIP
BRANCH B-1

HOUSTON engineering, Inc.

Drawn By: AMZ
Checked By: CCO
Date: 8-12-2021
Scale: As Shown
Project No.: 6400-0005
SHEET: 4 OF 7

H:\Maple Grove\JBN\6400\6400\6400_0005\CAD\Plans\6400-0005_Plan&Profile.dwg-4 BRANCH B-1-8/16/2021 11:24 AM-(azigan)





PRELIMINARY
NOT FOR CONSTRUCTION

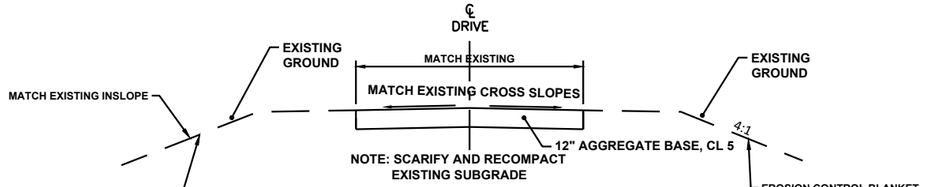
No.	Revision	Date	By

GOODHUE CD1 BRANCH B IMPROVEMENT
GOODHUE COUNTY
KENYON TOWNSHIP
BRANCH B-2

HOUSTON engineering, Inc.

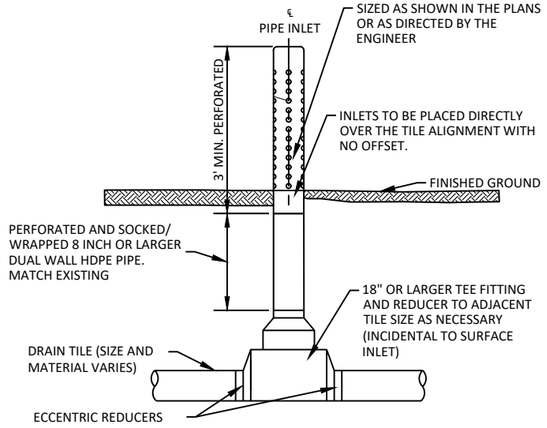
Drawn By: AMZ
Checked By: CCO
Date: 8-12-2021
Scale: As Shown
Project No.: 6400-0005
SHEET 5 OF 7

H:\Maple Grove\JBN\6400\6400\6400_0005\CAD\Plans\6400-0005_Plan&Profile.dwg-5 BRANCH B-2-8/16/2021 11:24 AM-(azigan)



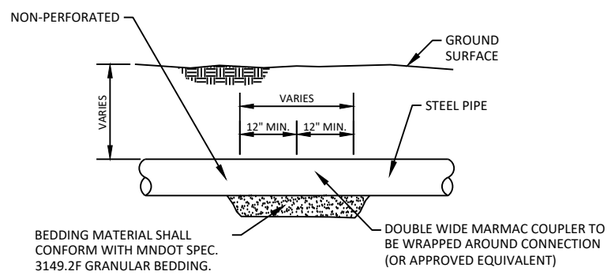
TYPICAL GRAVEL ROAD PATCH SECTION

NOT TO SCALE



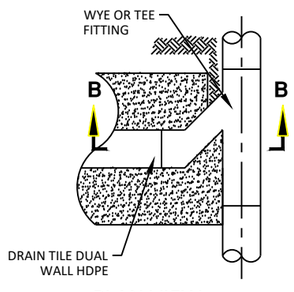
TELEVISING INLET DETAIL-HICKENBOTTOM

NOT TO SCALE



DISSIMILAR MATERIAL PIPE CONNECTION (MARMAC) DETAIL

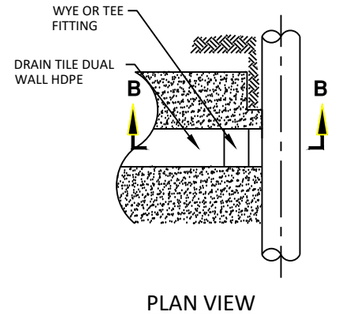
NOT TO SCALE



PLAN VIEW

LATERAL CONNECTION DETAIL FOR PIPE 24" AND SMALLER

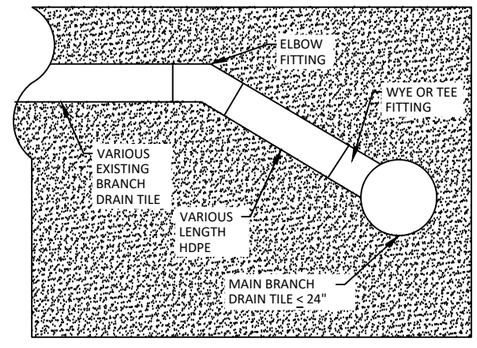
NOT TO SCALE



PLAN VIEW

LATERAL CONNECTION DETAIL FOR PIPE LARGER THAN 24"

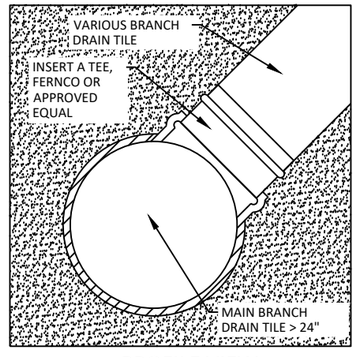
NOT TO SCALE



PROFILE VIEW

LATERAL CONNECTION DETAIL FOR PIPE 24" AND SMALLER

NOT TO SCALE



PROFILE VIEW

LATERAL CONNECTION DETAIL FOR PIPE LARGER THAN 24"

NOT TO SCALE

NOTE:
1. DETAIL CONNECTIONS ARE SPECIFIC TO PRIVATE LATERAL ONLY

No.	Revision	Date	By

PRELIMINARY
NOT FOR CONSTRUCTION

GOODHUE CD1 BRANCH B IMPROVEMENT
GOODHUE COUNTY
KENYON TOWNSHIP
DETAILS-1

HOUSTON engineering, Inc.

Drawn By: AMZ
Checked By: CCO
Date: 8-12-2021
Scale: As Shown
Project No.: 6400-0005
SHEET: 6 OF 7

TABLE 1

ACCEPTABLE SOIL CLASSES FOR BACKFILL & EMBEDMENT

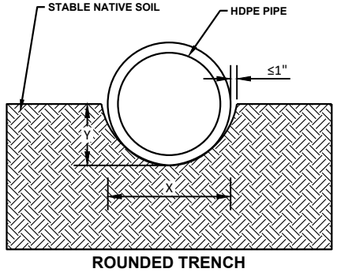
Soil Description	Soil Classification	
	ASTM D2321	ASTM D2487
Graded or crushed stone Crushed gravel	Class I	-
"Well-graded sand, gravels, and gravel/sand mixtures; Poorly graded sand,gravels and gravel/sand mixtures; little or no fines"	Class II	GW GP SW SP
"Silty or clayey gravels, Gravels/sand/silt or gravels and/clay mixtures, silty or clayey sands, sand/clay or sand/silt mixtures"	Class III	GM GC SM SC
"Inorganic silts and low to medium plasticity clays; gravelly, sandy, or silty clays; some fine sands"	Class IVA	ML CL

TABLE 2

ROUNDED TRENCH DIMENSIONS

"Pipe Diameter in (mm)"	"Maximum* Width "X" in (mm)"	"Depth "Y" in (mm)"
10 (250)	13.5 (343)	5.7 (145)
12 (300)	16.5 (419)	7.3 (185)
15 (375)	19.6 (498)	8.8 (224)
18 (450)	23.3 (592)	10.6 (269)
24 (600)	29.9 (759)	14.0 (356)
30 (750)	37.2 (945)	17.6 (447)
36 (300)	43.2 (1097)	20.6 (523)
42 (1050)	49.8 (1265)	23.9 (607)
48 (1200)	55.7 (1415)	26.9 (683)
60 (1500)	68.6 (1742)	33.3 (846)

MAXIMUM WIDTH BASED ON <1" GAP ON EITHER SIDE OF THE PIPE AT THE SPRINGLINE. WIDER TRENCH WIDTHS MAY ADVERSELY AFFECT PIPE PERFORMANCE



ROUNDED TRENCH INSTALLATION

TABLE 3

MAXIMUM FILL HEIGHT, FT (M) FOR ROUNDED TRENCH CONSTRUCTION

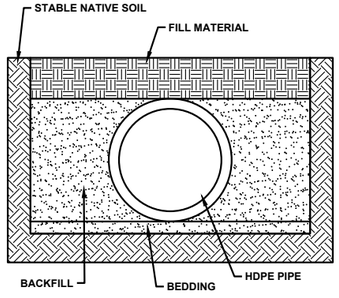
Pipe Diameter in (mm)	Soil Classification (see Table 1)	
	"Class 2 (GW, GP, SW, SP) @ 85%"	"Class 4A (ML, CL) @ 80%"
10 (250)	20 (6.1)	9 (2.7)
12 (300)	21 (6.4)	11 (3.4)
15 (375)	20 (6.1)	10 (3.0)
18 (450)	21 (6.4)	12 (3.7)
24 (600)	18 (5.5)	10 (3.0)
30 (750)	19 (5.8)	10 (3.0)
36 (300)	15 (4.6)	8 (2.4)
42 (1050)	16 (4.9)	8 (2.4)
48 (1200)	14 (4.3)	7 (2.1)
60 (1500)	11 (3.4)	6 (1.8)

TABLE 4

MAXIMUM FILL HEIGHT FOR RECTANGULAR TRENCH CONSTRUCTION

Pipe Diameter in (mm)	Class 2 (GW, GP,SW, SP) @ 95% ft (m)
4 (100)	26 (7.9)
6 (150)	30 (9.1)
8 (200)	23 (7.0)
10 (250)	27 (8.2)
12 (300)	27 (8.2)
15 (375)	29 (8.8)
18 (450)	25 (7.6)
24 (600)	21 (6.4)
30 (750)	18 (5.5)

Pipe Diameter in (mm)	Class 2 (GW, GP,SW, SP) @ 95% ft (m)
36 (300)	20 (6.1)
42 (1050)	19 (5.8)
48 (1200)	18 (5.5)
60 (1500)	20 (6.1)



RECTANGULAR TRENCH INSTALLATION

TABLE 5

MAXIMUM PIPE COVER (per AASHTO), FT (M)

"Diameter in (mm)"	Class 1	Class 2			Class 3		Class 4
	Compacted	95%	90%	85%	95%	90%	95%
12 (300)	"39 (11.9)"	"27 (8.2)"	"20 (6.1)"	"9 (2.7)"	"21 (6.4)"	"12 (3.7)"	"11 (3.4)"
15 (375)	"42 (12.8)"	"29 (8.8)"	"21 (6.4)"	"10 (3.0)"	"22 (6.7)"	"12 (3.7)"	"11 (3.4)"
18 (450)	"36 (11.0)"	"25 (7.6)"	"18 (5.5)"	"9 (2.7)"	"19 (5.8)"	"12 (3.7)"	"11 (3.4)"
24 (600)	"31 (9.5)"	"22 (6.7)"	"16 (4.9)"	"7 (2.1)"	"16 (4.9)"	"11 (3.4)"	"10 (3.0)"
30 (750)	"33 (10.1)"	"23 (6.7)"	"17 (5.2)"	"9 (2.7)"	"17 (5.2)"	"11 (3.4)"	"10 (3.0)"
36 (900)	"32 (9.8)"	"22 (6.7)"	"16 (4.9)"	"7 (2.1)"	"16 (4.9)"	"11 (3.4)"	"10 (3.0)"
42 (1050)	"32 (9.8)"	"22 (6.7)"	"15 (4.6)"	"7 (2.1)"	"16 (4.9)"	"11 (3.4)"	"10 (3.0)"
48 (1200)	"31 (9.5)"	"21 (6.4)"	"15 (4.6)"	"6 (1.8)"	"15 (4.6)"	"10 (3.1)"	"9 (2.7)"
60 (1500)	"34 (10.4)"	"23 (6.7)"	"16 (4.9)"	"6 (1.8)"	"16 (4.9)"	"11 (3.4)"	"10 (3.0)"

TABLE 6

MINIMUM RECOMMENDED COVER TO PREVENT FLOTATION OF THERMOPLASTIC PIPE

Nominal Diameter in. (mm)	Minimum Cover in. (mm)
4 (100)	3 (77)
6 (150)	4 (102)
8 (200)	5 (127)
10 (250)	7 (178)
12 (300)	9 (228)
15 (375)	11 (280)
18 (450)	13 (330)
24 (600)	17 (432)
30 (750)	22 (559)
36 (900)	25 (635)
42 (1050)	29 (737)
48 (1200)	33 (838)
60 (1500)	40 (1016)

NOTES:
1. FOR STRUCTURAL PURPOSES, A MINIMUM COVER OF 12" (0.3M) SHALL APPLY FOR 4"-48" (100-1200MM) PIPE, AND 24" (0.6M) FOR 60" (1500MM) PIPE.
2. WHEN INSTALLING PIPE UNDER SATURATED SOIL CONDITIONS, MINIMUM COVER DEPTH SHALL BE BLINDED ON TOP OF THE PIPE IMMEDIATELY UPON INSTALLATION AND PRIOR TO SETTING THE NEXT PIPE SECTION.

TYPICAL DUAL WALL HDPE PIPE INSTALLATION DETAILS

NOT TO SCALE

No.	Revision	Date	By

PRELIMINARY
NOT FOR CONSTRUCTION

GOODHUE CD1 BRANCH B IMPROVEMENT
GOODHUE COUNTY
KENYON TOWNSHIP
DETAILS-2

HOUSTON engineering, Inc.

Drawn By: AMZ
Checked By: CCO
Date: 8-12-2021
Scale: As Shown
Project No.: 6400-0005
SHEET: 7 OF 7

EXHIBIT D – OPINION OF PROBABLE COST

IMPROVEMENT COST – BRANCH B

Item	Item Description	Unit	Quantity	Unit Cost	Extension
1	Mobilization	LUMP SUM	1	$25,000	$25,000
2	Crush Tile and Leave in Place	LIN FT	440	$2	$880
3	Water Control	LUMP SUM	1	$5,000	$5,000
4	Connect to Existing Lateral	EACH	12	$1,200	$14,400
5	Remove Existing Breather	EACH	1	$500	$500
6	8" Hickenbottom Inlet	EACH	4	$1,200	$4,800
7	8" Perforated HDPE Tile	LIN FT	1296	$22	$28,512
8	10" Perforated HDPE Tile	LIN FT	1480	$24	$35,520
9	15" Perforated HDPE Tile	LIN FT	1463	$28	$40,964
10	18" Perforated HDPE Tile	LIN FT	1444	$32	$46,208
11	Gravel Driveway Repair	EACH	1	$2,000	$2,000

Construction Total		**$203,784**
Contingency	20%	$40,800
Engineering + Viewing		$49,910
Legal		$15,000
Total		**$309,494**

**Engineering costs equal to cost to-date plus 15% of construction cost*

***Viewing equal to $6/acre of area tributary to Branch B system*

REPAIR COST – BRANCH B

Item	Item Description	Unit	Quantity	Unit Cost	Extension
1	Mobilization	LUMP SUM	1	$25,000	$25,000
2	Crush Tile and Leave in Place	LIN FT	440	$2	$880
3	Water Control	LUMP SUM	1	$500	$500
4	Connect to Existing Lateral	EACH	12	$1,200	$14,400
5	Remove Existing Breather	EACH	1	$500	$500
6	8" Hickenbottom Inlet	EACH	4	$1,200	$4,800
7	6" Perforated HDPE Tile	LIN FT	2175	$20	$43,500
8	8" Perforated HDPE Tile	LIN FT	2064	$22	$45,408
9	10" Perforated HDPE Tile	LIN FT	1444	$24	$34,656
10	Gravel Driveway Repair	EACH	1	$2,000	$2,000

Construction Total		**$171,644**
Contingency	20%	$34,300
Engineering	20%	$43,700
Legal		$15,000
Total		**$264,644**

**Engineering costs equal to cost to-date plus 15% of construction cost*

***Viewing equal to $6/acre of area tributary to Branch B system*

EXHIBIT E – SUBCATCHMENT BOUNDARIES

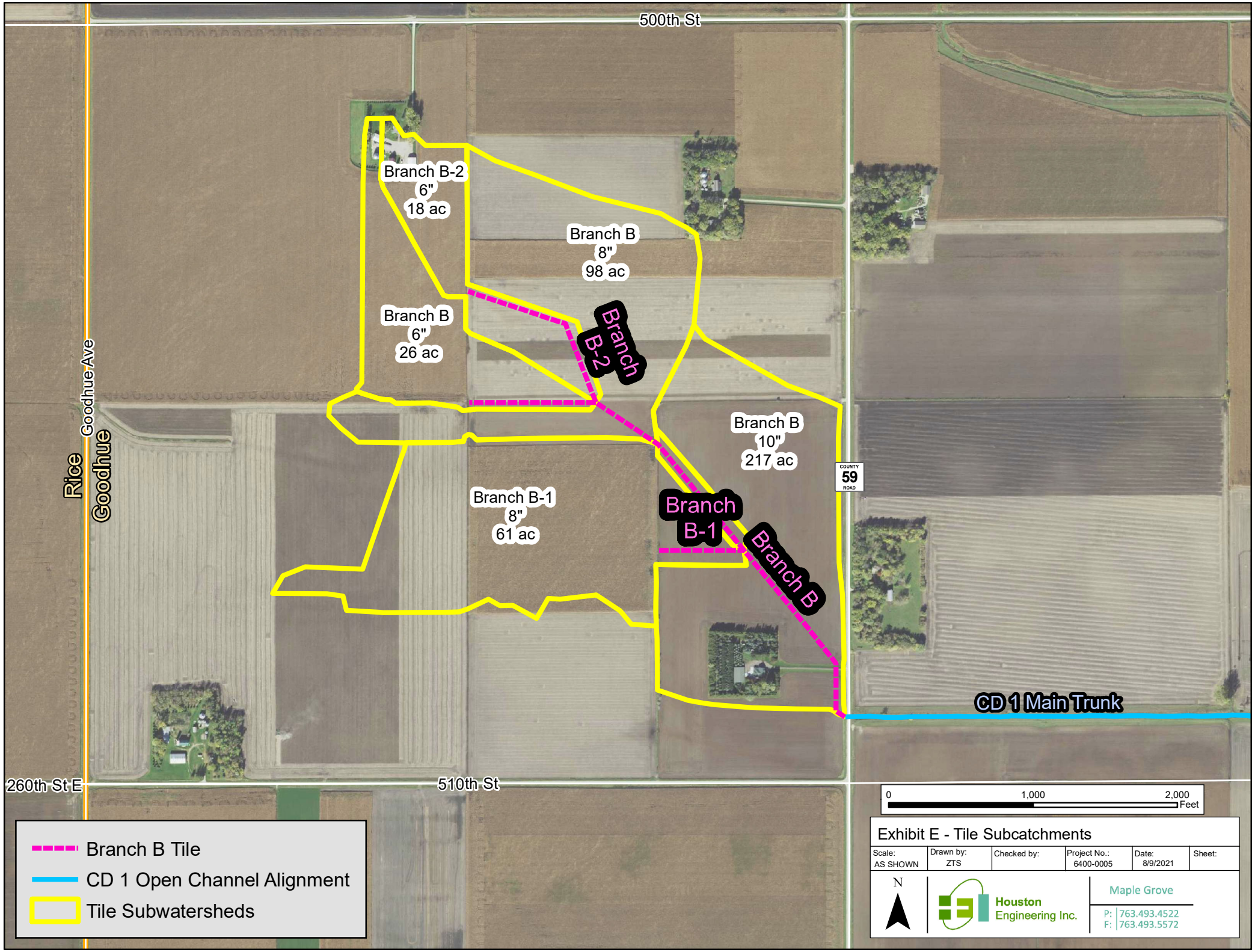

500th St
Branch B-2
6"
18 ac
Branch B
8"
98 ac
Branch B
6"
26 ac
Branch B-2
Branch B
10"
217 ac
COUNTY
59
ROAD
Branch B-1
8"
61 ac
Branch B-1
Branch B
Rice
Goodhue Ave
Goodhue
CD 1 Main Trunk
260th St E
510th St
0
1,000
2,000
Feet
Branch B Tile
CD 1 Open Channel Alignment
Tile Subwatersheds
Exhibit E - Tile Subcatchments
Scale: AS SHOWN
Drawn by: ZTS
Checked by:
Project No.: 6400-0005
Date: 8/9/2021
Sheet:
N
Houston Engineering Inc.
Maple Grove
P: 763.493.4522
F: 763.493.5572

EXHIBIT F – SPECIAL PROVISIONS

SECTION 01120
SPECIAL PROVISION

PART 1 – GENERAL

1.01 RELATED DOCUMENT

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 and 2 Specification Sections, apply to this Section.

B. The Mn/DOT Standard Specifications for Construction, 2018 Edition.

C. The City Engineers Association of Minnesota, (CEAM), *STANDARD UTILITIES SPECIFICATIONS*, 1999 Edition.

1.02 EXISTING UTILITIES

A. It shall be the Contractor's responsibility to verify the location of all existing utilities prior to the commencement of any excavation operations, including by use of Gopher State One Call locate services. Any utilities damaged or disturbed by the Contractor's operation shall be repaired by the Contractor, at its expense, to the satisfaction of the Utility Owner and the Engineer.

1.03 RIGHT OF WAY PERMITS

A. It shall be the Contractor's responsibility to comply with all conditions of applicable right-of-way "ROW" work permits from the various government agencies (City, County & State) having jurisdiction over the road ROW's adjacent to the project limits. ROW work permits will be administered by OWNER.

1.04 OTHER PERMITS

A. The CONTRACTOR shall utilize the "Gopher State One Call" excavation notice system as required under Minnesota Statute Chapter 216D, 48 hours prior to performing any excavation (Phone 651-454-0002). The CONTRACTOR shall contact the owners of the in-place utilities and make all arrangements for relocation as required due to the construction of this project. The work must be conducted pursuant to and in compliance with all required permits and approvals of all governmental bodies including OWNER.

B. The CONTRACTOR will submit and pay for all fees to apply for an NPDES Stormwater Permit for Construction for the project. The CONTRACTOR shall sign the permit and accept all terms of the permit as the project CONTRACTOR.

1.05 INSPECTION AND TESTING

A. The Owner may employ, and pay for, services of an independent testing laboratory to perform testing. The Contractor shall furnish at its own expense such labor, materials, and facilities as may be required by the Engineer for compaction and other inspection. This shall not include the expense of the project observer or representative of the Engineer.

B. Decision as to the quality of materials and workmanship shall rest with the Owner on the basis of the Engineer's evaluation and any portion of the work rejected shall be replaced by the Contractor with approved work at no additional cost to the Owner in accordance with the General Conditions.

C. Any inspections, tests, or approvals, or waiver of tests will in no way relieve the Contractor of full responsibility for meeting the guaranteed performance and requirements of the Contract.

D. TELEVISING

The Contractor shall perform televising of all installed tile. Televising shall be performed by an approved televising contractor. Unless otherwise approved, televising shall be performed using a crawler type in-pipe camera with sufficient lighting to be able to inspect the interior of the pipe. The Contractor shall provide a DVD of the testing in duplicate to the Engineer. The video shall be accompanied by a written report stating the location, length, and size of each tested segment, along with locations of all service wyes and fittings, as measured from a manhole. Televising shall commence at minimum, one freeze/thaw cycle after the Date of Completion (unless otherwise authorized by the Owner) but prior to the end of the three-year warranty period. Televising should be scheduled such that no crops are planted in the fields at the time of televising. At no point shall televising be delayed until after the warranty expiration. Televising shall be considered incidental, and no additional payment shall be made thereof. Pipe deformation shall be noted, and any deformation exceeding manufacturer's specification will require replacement at CONTRACTOR's expense.

1.06 BENCHMARKS AND CONSTRUCTION STAKING

A. ENGINEER will provide benchmark, staking, and site coordinate information necessary for construction of the Work. Once provided, it is CONTRACTOR's responsibility to protect the information. CONTRACTOR shall request such information from ENGINEER a minimum of two days prior to the time when such information is needed.

B. The Engineer will set construction stakes, as applicable, as follows:

- Control: The Engineer will provide a series of perimeter control points around the site sufficient for use with machine control.

- Pipe Alignment and Grade: The Engineer will furnish one set of line and grade stakes for segments of pipe between manholes and outlets. Alignment is approximated based on historic design plans and needs to be field verified during construction activities.

C. The contractor shall give the Engineer 48-hour notice of its need for establishment of line or grade so that the Engineer may have time to provide stakes.

D. CONTRACTOR shall conduct operations so as to preserve benchmarks, survey reference points, and stakes existing or established by ENGINEER for the construction and so as to conform the Work to horizontal and vertical specifications in the Contract Drawings and Technical Specifications. CONTRACTOR will be charged the expense of repairing or replacing survey markers and shall be responsible for mistakes or lost time that result due to damage or destruction of survey markers due to CONTRACTOR'S operations.

E. It shall be the Contractor's responsibility to periodically check the stakes for accuracy of alignment and grade as construction proceeds, and to construct the Work in conformance with alignment and grade stipulated in Contract Drawings and Technical Specifications.

F. Before clearing activities begin, the Contractor shall contact the Engineer to determine the limits of clearing for the project.

1.07 OWNER SUPPLIED EQUIPMENT

This section is not applicable to this project.

1.08 CONTRACTOR USE OF PREMISES

A. Definition of Site: The Site is defined as the area within the work limits shown on the Project Drawings. CONTRACTOR shall limit operations, including material and equipment storage, to within those work limits shown on the Project Drawings.

B. Hours of Operation: CONTRACTOR'S operations shall be limited to the hours allowed by the County, the City, and other applicable requirements.

C. Protection and Repair of Existing Utilities: CONTRACTOR shall perform operations carefully and in such a manner as to protect existing structures, underground facilities, and utilities. Obstructions not shown on the Project Drawings may exist and shall be

exposed by CONTRACTOR without damage. CONTRACTOR shall be solely responsible for damage to existing structures, underground Facilities, and utilities resulting from CONTRACTOR'S operations (unless otherwise noted within the project plans and specifications) and shall repair or replace damaged items to OWNER'S satisfaction. Special care should be taken to protect existing bituminous trails and roadways. The CONTRACTOR is also responsible for calling Gopher One for project utility locations before starting construction.

D. Unfavorable Construction Conditions: When unfavorable weather, soil, drainage, or other unsuitable construction conditions exist, CONTRACTOR shall immediately notify ENGINEER and confine operations to work which will not be adversely affected by such conditions. No portion of the Work shall be constructed under conditions that would adversely affect the quality of the Work, unless special means or precautions are taken to perform the Work in a proper and satisfactory manner. All CONTRACTOR vehicles leaving and entering the site will comply with all local regulation concerning tracking mud and other construction debris onto public or private properties. Nothing in this paragraph alters CONTRACTOR's responsibility to timely and properly complete the work as provided for by the Contract Documents.

E. The CONTRACTOR is fully responsible for control and protection of the site until Final Completion of the Work.

1.09 HEALTH AND SAFETY REQUIREMENTS

A. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for job site conditions and safety procedures and programs, including safety and health of all persons and property, on those portions of the site affected by or used by Contractor, Contractor's employees, subcontractors, agents, and others during performance of the Work. This requirement will apply continuously and not be limited to normal working hours. Observation of the Work and Contractor's performance by Owner and Engineer is not intended to include review of the adequacy of the Contractor's safety and health procedures and programs on or near the construction site. The Contractor is solely responsible for the protection of property and the safety and health of its employees, Subcontractors, Suppliers, agents and others on or near the site.

B. Contractor shall submit three copies of a site health and safety plan (HASP) addressing the safety and health of all personnel involved in the Work. Safety plan shall be submitted a minimum of 7 days prior to Contractor's mobilization. **Submittal of the Contractor's HASP shall neither impose on the Engineer responsibility for adequacy of the HASP nor relieve the Contractor from the full responsibility for the HASP and HASP implementation.**

1.10 PROJECT ACCESS POINTS

A. The CONTRACTOR is solely responsible for damage to adjacent road surfaces, crops, vegetation and landscaping beyond the project identified "work limits."

B. The CONTRACTOR may implement protective measures, at its own expense, to avoid damage(s) to adjacent road surfaces, vegetation and landscaping beyond the project identified "work limits." The ENGINEER will observe project access points before, during and after construction to determine if damage has occurred. Historically these damages include pavement cracking and cosmetic surface markings ("cat-tracks") as well as soil rutting. Acceptable protective measures include, but are not limited to, the following:

- Temporary placement of rubber and/or wood access mats
- Temporary placement of earthen berm(s)

Implementation of measures to protect the access points shall be considered incidental and no direct payment shall be made thereof.

1.11 DEMOLITION, REMOVAL, AND PROTECTION

A. The existing pipe is to be crushed in the location of each existing lateral, both public and private, and each existing intake. Pipe shall be crushed at each location for a minimum of twenty (20) feet, centered on the lateral or intake. At the downstream end of the project, the lowest 200-feet of existing tile must be crushed and/or removed to allow the installation of the new tile to outlet in the same location. The crushed pipe shall not be located within the bedding zone of the new pipe. The Contractor may alternatively remove the existing pipe.

At locations where the tile has been crushed or removed, the Contractor shall cap the existing draintile upstream and downstream tile segments. Capping shall consist of placing crushed tile pieces within the mouth of the remaining tile, grouting a minimum of one foot into the end of the tile, installation of fabric over the mouth of the tile, and backfill and compaction of clay material over the installed fabric. All work shall be contained within the project limits designated in the Plans. **Crushing and capping of tile shall be considered incidental, and no additional payment shall be made thereof.**

B. Removal of tile and other debris shall include off-site disposal of all portions of the structures. All such materials shall be property of CONTRACTOR on removal and disposed of in accordance with all applicable laws.

C. The Project Drawings show items that must be relocated temporarily ("Temporarily Relocate") or permanently ("Relocate") or protected ("Protect") within the work limits.

The Contractor is responsible for moving the items designated to be relocated to the edge of the work limits so contract work can be completed. Items designated for "temporary relocation" shall be reinstalled at the same location after completion of excavation operations. Items designated as "relocate" shall be moved to the edge of the work limits and not reinstalled after completion of the excavation operation. If the Contractor can complete excavation operations without relocating the items designated as "temporary relocate," the Contractor may leave these items in place in lieu of relocating them. Relocation of items marked for "relocation" or "remove" is mandatory.

Examples of the items to be relocated or protected, include but are not limited to:

Temporary Relocation

- Fencing (including barbed wire)

Relocation or Remove

- Existing debris
- Existing fences
- Trees

Protection

- Existing outlet structure
- Existing culvert
- Guy wires
- Gravel drives, trail crossings, and features adjacent to project access points

D. Removal of the tile, debris, and fences shall include off-site disposal of all portions of the structures. All such materials shall be property of CONTRACTOR on removal and disposed of in accordance with all applicable laws.

1.12 TRAFFIC CONTROL

A. Access must be maintained to all public roadways. This allows for the temporary closure of a road provided access is maintained through an alternate route. The Contractor shall be responsible for all traffic control within areas subject to construction operations. **The Contractor must submit a traffic control plan to the Engineer for review and approval prior to start of construction. Failure to submit a plan or non-compliance with the approved plan will result in a forfeiture of payment of the Traffic Control bid item**.

B. A sufficient number of barricades, direction and warning signs shall be in place at all times to adequately accommodate free and safe passage of pedestrians and vehicles.

Signage shall include signs denoting "Construction Ahead" for any active access point in the project corridor. Barricades and signage shall be placed in accordance with the provisions of the Minnesota Manual of Uniform Traffic Control Devices.

C. The Contractor may temporarily close a lane of traffic in a public roadway only for off-loading of construction equipment, replacement of culverts, and patching of the roadway surface. Once equipment is off-loaded, the Contractor shall immediately remove all vehicles from the roadway travel lanes. No equipment shall be left in the public road right-of-way (including road shoulders and ditches) overnight.

1.13 TEMPORARY EROSION CONTROL

A. Silt fencing and erosion control blanketing shall be installed in locations as directed by the Engineer. Silt fence and erosion control blanket shall meet requirements of Mn/DOT 3886 and Mn/DOT 3885, respectively. Silt fence must be removed after project completion.

1.14 DRAIN TILING AND APPURTANENCES

A. SCOPE

This section of the specifications covers the work related to furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with the construction or repair of subsurface drains, installed to drain ground water and surface water, as shown on the plans or as directed by the Engineer.

B. Guarantee: The Contractor must guarantee the tile work under the contract for three years after the date of substantial completion against any fault or negligence on the part of the Contractor.

C. MATERIALS

a. Corrugated Polyethylene Pipe and Corrugated Polypropylene Pipe:

Tile shall be dual wall smooth interior Corrugated Polyethylene Pipe or Corrugated Polypropylene Pipe. The Pipe, along with couplings and fittings shall conform with MnDOT 3247 and meet the requirements of AASHTO M294, and Design Section 18 of AASHTO Standard Specifications for Highway Bridges. Joints shall be bell and spigot push-on type, soil-tight joints in accordance with ASTM D3212 and ASTM F477. Tile perforations shall be slotted, except for sizes which are not commercially available, in which case circular perforations may be acceptable if the tile is encased in fabric.

b. Granular Bedding and Encasement

Material furnished for Granular Bedding and Encasement shall conform to the specifications of MnDOT 3149.2F. Granular Bedding and Encasement will be used as shown in the bedding, backfill and trench details and tables in the plans or as directed by the Engineer. No adjustment in unit price will be made for increases or decreases in quantities of Granular Bedding and Encasement. Granular Bedding and Encasement is considered incidental to the installation of draintile and other drain features.

c. Surface Inlet

Material furnished for Standard Surface Inlets shall include the Tee fitting on the subsurface tile, the inlet riser pipe of the size specified, a metal trash rack/rodent guard and a tile inlet marker flag. The Tee fitting material shall be the same as the subsurface tile.

Hickenbottom Inlets shall be constructed as indicated in the plans. Material furnished for the Hickenbottom Surface Inlet shall include the Tee fitting on the subsurface tile, the pipe inlet and riser pipe and other components as shown in the plans.

d. Connect to Existing Private Pipe Drain:

Material furnished for the item "Connect to Existing Private Pipe Drain" shall include the Tee or Wye fitting on the subsurface tile, CPP pipe of the size of the existing private pipe drain, and a coupler as shown in the plans. The Tee or Wye fitting material shall be the same as the subsurface tile.

e. Geotextiles: Drain Tile Sock shall be MnDOT 3733 Geotextile Fabric Type I or approved equal.

D. INSTALLATION OF SUBSURFACE DRAINS

a. Handling: All materials for subsurface drains will be new and unused. All foreign material will be cleaned from inside the pipe and joints will be clean prior to installation.

b. Excavation: Where open trenches will be excavated, topsoil to a depth of 1 foot must be salvaged and stockpiled prior to trench excavation. Topsoil must be replaced following backfilling. Once topsoil has been replaced, all excavated areas must be tilled to smooth the surface, break up soil clods and restore the seed bed. This tillage shall include 2 passes with a field cultivator, disk, or similar ag implement.

Unless otherwise specified, excavation for and subsequent installation of each tile line shall begin at the outlet end and progress upstream. The trench or excavation for the tile shall be constructed to the depths and cross-section shown on the plans.

The trench width may be increased at the point 1 foot above the top of the tile, at the option of the Contractor.

Trench boxes or shields, shoring and bracing, or other methods, necessary to safeguard the workers and the work and to prevent damage to the existing improvements, shall be furnished, placed, and subsequently removed by the Contractor incidental to the tile item.

c. Preparing the Drain Bed: Rock encountered within the excavation shall be removed to a minimum width equal to the outside diameter of the pipe plus 4 inches, and to a minimum depth of 4 inches below the pipe. The backfill to foundation elevation may be made with suitable material removed from elsewhere in the excavation, which shall be compacted uniformly to provide a proper foundation.

If the bottom of the trench does not provide a sufficiently stable or firm foundation for the drain tile, dewatering shall be used to stabilize the bottom of the trench. Crushed Rock Bedding may also be furnished and installed to stabilize the foundation as directed by the Engineer.

In stable soils, the tile shall be firmly and uniformly bedded throughout its entire length to the specified depth and in the specified manner.

d. Trench Bedding

Corrugated Polyethylene Pipe or Corrugated Polypropylene Pipe shall be installed using either a shaped trench bedding method or a rectangular trench with granular bedding and encasement method, depending upon the depth of cover over the top of the pipe. The pipe trench shall be no more than 15 feet offset from the existing tile. Existing tile location must be field verified during construction. Offset placement of the new tile is recommended to be on the west and north side of the Main Trunk, on the north side of Branch 1, the north side of Branch 13, and on the west side of the branch 6 extension, relative to the existing tile. All pipe bedding shall comply with manufacturer's guidance unless otherwise noted.

Depending on pipe diameter, material, and soil classification, a shaped trench bedding method is preferred. Tables listing maximum fill height requirements for various pipe types (Polyethylene, and Polypropylene) and sizes are included in the plans. Contractor shall conform to the pipe material-specific bedding method as indicated on the plans and as required by the pipe manufacturer. In the shaped trench bedding method, the trench will be shaped as shown in the plans using either a tile plow or a "spoon" attachment for a backhoe bucket. It is acceptable to excavate to remove overburden to facilitate tile installation with a tile plow or a "spoon" attachment provided that excavation is completed with tracked equipment that does not overly compact the topsoil in the agricultural fields. However, if burial depths exceed maximum allowable, installation must follow standard rectangular trench methods with granular bedding and encasement. Contractor should consider

the merits of using either Polyethylene pipe or Polypropylene pipe for the site-specific conditions. Communication with the Engineer is required to confirm conditions are adequate for the pipe material chosen. It is the responsibility of the Contractor to confirm that bedding and cover depths conform to the requirements set by the tile manufacturer.

For deeper burial depths, and for road crossings, the acceptable installation method shall be the rectangular trench with granular bedding and encasement method. The granular bedding and encasement materials shall be installed as shown in the bedding, backfill and trench details and tables in the plans and compacted to either 85% or 90% Standard Proctor Density (SPD) depending upon the depth of cover over the pipe. Tables listing the SPD compaction required for various pipe sizes and depths of cover are included in the plans. Compaction of materials placed within the pipe bedding and encasement zones shall be accomplished with portable or hand equipment methods, so as to achieve thorough consolidation under and around the pipe and avoid damage to the pipe.

e. Laying Drains:

1. General: Drains shall be laid carefully to line and grade. All junctions and bends shall be made with wyes, tees, and bends fabricated from the same material as the pipe. 90-degree elbows shall not be permitted unless prior approval from the Engineer is obtained. Drain outlets to the surface shall be as shown on the plans with a rodent guard. The ends and inside surfaces of all tiles shall be kept clean during laying. All earth or other extraneous material in the tile shall be removed before laying the next tile. At the end of each day's work and when laying has been temporarily suspended, the inlet end shall be blocked so that earth, storm water or other extraneous materials will not enter the tile. The upper end of each tile line shall be blocked with permanent type materials on completion of the line.

2. The Contractor shall record the location of each tile connection and private tile connections including measurements from two permanent features. The Contractor shall provide all records, dimensions and sketches showing the locations of the tile and connections, to the Engineer.

3. Plowing of the tile in accordance with pipe manufacturer recommendations is permitted for drain tile with a diameter of 18-inches or less. All other installation requirements remain, except that the required granular backfill need not be compacted.

f. Backfilling: The backfilling of the trench shall be completed as rapidly as consistent with the soil conditions. Under saturated soil conditions, each pipe section must be backfilled to a depth of 3 feet of cover prior to proceeding with the next pipe segment. Tables listing minimum cover depth requirements for various pipe sizes are included in the plans. Above the cover zone material, the use of heavy

roller type compaction equipment shall be limited to safe pipe loading. Backfill materials shall be carefully placed in uniform loose thickness layers up to twelve inches thick spread over the full width and length of the trench section to provide simultaneous support on both sides of the pipeline. Compaction of trench backfill in agricultural fields is not required above the bedding and encasement zone and backfill shall extend above the ground surface in these areas and be well-rounded over the trench to provide for settlement of the trench backfill.

Compaction of backfill within roadbed areas shall meet the density requirements of MnDOT Specification 2105.3F2. Any settlement of road surfaces placed under this Contract and that are within the guarantee period that are in excess of one inch, as measured by a ten-foot straight edge—shall be considered failure of the mechanical compaction. The Contractor shall be required to repair such settlement without cost to the owner. Compaction of backfill in all other areas shall be as required in the Special Provisions.

g. Cleanout: All drains, at the time of final acceptance, shall be free of soil or debris accumulation, or other obstructions.

h. Lateral Connections: Connections shall be made as indicated in the plans, or as indicated in this section. All perforated laterals and connections shall be socked or wrapped in fabric that is physically secured to the tile, in locations where it is bedded in sand.

For lateral connections less than 6-inches, either an Inserta Tee, or approved equal, such as a "collared field fitting" may be utilized. This consists of a minimum 1 linear foot in length collar, made out of draintile with the same diameter of the lateral being connected, with a lengthwise cut to allow it to slip over the lateral being connected. Collars are layered with the opening at the bottom of the tile until they fill the receiving (6-inch) tile that will be connected to the mainline. The entire collar is to be inserted into the receiving tile and wrapped in fabric that extends a minimum of 3-feet upstream and downstream of the connection. The fabric is to be physically secured in place.

For dissimilar material pipe connections where commercially manufactured adapters are unavailable, a "concrete encasement" may be utilized. This consists of encasement of the pipe in quick-set concrete. The concrete is to extend a minimum of one linear foot in length along the pipe on both sides from the connection point. No excavation shall take place directly under the connection and the foundation below the connection must be stable and firm. The connection is to first be wrapped in fabric that is to be physically secured in place.

1.15 SEEDING & MULCH (MN/DOT 2575)

A. Seeding shall be performed in accordance with Mn/DOT 2575 and Mn/DOT 2007 Seeding Manual.

B. All disturbed areas shall be seeded and mulched (Type 1 straw or Type Bonded Fiber Matrix), with the following exceptions:

- Areas within cultivated cropland

C. Seeding

- Work shall include the following operations:

  a. Soil preparation.

  b. Broadcast seeding.

  c. Permanent Seed Mixture 25-121 at a rate of 61 pounds per acre

D. Mulch

- Work shall include the following operations:

  a. Type 1 Straw Mulch

     (i) Placement of mulch materials at rate of 4,000 pounds per acre

     (ii) Disc anchoring

  b. Type Bonded Fiber Matrix

     (i) Placement of mulch materials at rate of 4,200 pounds per acre

E. Temporary Seeding and Mulch

- To accommodate the Contractor's work schedule, Contractor shall provide temporary seeding and mulch as necessary to meet NPDES permit requirements. Temporary seeding and mulch shall be considered incidental, and no additional payment shall be made thereof.

1.16 SPREADING AND SMOOTHING OF BACKFILLED TRENCH

A. Final spreading and smoothing of backfilled trench shall occur during non-frozen conditions and shall result in finished grade even with surrounding ground.

PART 2 – PRODUCTS

2.02 GENERAL

A. Unless otherwise stated, all materials related to grading, erosion control, and turf establishment shall meet the requirements of DIVISION III, MATERIALS of the Mn/DOT *Standard Specifications for Construction,* 2018 Edition.

2.03 APPROVED EQUAL

A. Whenever, in any Contract Documents, an item of material or equipment is defined by describing a proprietary product or by using the name of a manufacturer or vendor, the term "or approved equal," if not inserted, shall be implied. The specified items of materials or equipment mentioned shall be understood as establishing a standard of type, function, efficiency, minimum basis of design and quality desired. Other manufacturer's products of comparable quality, design and efficiency and suitable for the service intended will be considered. No substitute materials or equipment shall be bid or ordered without the written approval of the Engineer who shall be the judge of equality.

B. A prospective Bidder may request "or equal" status for materials and equipment up to seven calendar days before the day set for the Bid Opening. The Bidder shall submit the request for "or equal" status to the Engineer with complete information that will demonstrate the item to be considered will fit within the provided space limitations. Detailed drawings and specifications will be required.

C. At least four calendar days before the day set for the Bid Opening, the Engineer may issue an Addendum to all plan holders wherein acceptable "or equal" materials will be listed. This Addendum will include only acceptable “or equal” materials and equipment and will not address unsatisfactory or non-approved items. The Bidder shall prepare and submit his/her bid using only originally specified materials and equipment or Engineer approved equals as stated in the Addendum.

D. By executing the Contract, the Contractor represents that he/she has understood the requirements of the Contract Documents.

PART 3 – EXECUTION (See Division 2)

****END OF SECTION****

SECTION 02105
EARTHWORK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Preparing of subgrade for walks and pavements.

2. Excavating and backfilling for underground utilities.

1.03 DEFINITIONS

A. Subgrade: The undisturbed earth or the compacted soil layer immediately below aggregate base, drainage fill, or topsoil materials.

B. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent backfill and/or disposal of materials removed.

C. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.

1. In locations under pavements, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

D. Subgrade Correction: When excavation has reached required subgrade elevations, notify Engineer, who will make an inspection of conditions. If Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Engineer. When the depth of unsuitable material exceeds two feet below subgrade elevations, any additional excavation below said two-foot level shall be considered subgrade correction. The Contract Sum may be adjusted by an appropriate Contract Modification.

1. Compensation for subgrade correction, as directed by the Engineer, will be paid on basis of Conditions of the Contract relative to changes in work.

E. Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

B. Testing and Inspection Service: Owner may employ and pay for a qualified independent geotechnical testing and inspection laboratory to perform soil testing and inspection service during earthwork operations.

C. Retests of materials failing initial testing shall be paid for by the Contractor.

1.05 PROJECT CONDITIONS

A. Site Information: Data provided in the project plans was used for the basis of the design and is available to the Contractor for information only. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.

B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.

    a. Provide minimum of 48-hour notice to Engineer and receive written notice to proceed before interrupting any utility.

C. Use of Explosives: Use of explosives is not permitted.

D. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.

2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

3. All barricades and traffic control devices required due to excavations in proximity to existing and/or newly constructed roadways shall be incidental to the site grading or common excavation quantities.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Aggregate Base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, and natural or crushed sand per Specification Section 01120 Special Provisions.

B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.

C. Control Fill: Material shall consist of well-graded natural earth materials that are free of organics and other deleterious materials. Controlled fill shall consist of soil materials classified as GW, GP, GM, GC, SC, SP, SM, SW, CL-ML, or CL under the Unified Soils Classification System, ASTM D2487, and having a plasticity index (PI) less than 20 (for cohesive soils). Controlled fill soils should be capable of producing a maximum dry density of not less than 100 pounds per cubic foot using the Standard Proctor effort (ASTM-D698). All Controlled fill shall be free of cobbles or boulders greater than 6-inches in any dimension and shall have an organic content that does not exceed 5% by weight. The Contractor will provide materials from on-site and/or off-site sources.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

3.02 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

3.03 DEWATERING

A. See Specification Section 02240 Control of Water

3.04 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

2. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

3.05 TRENCH EXCAVATION FOR PIPES AND CONDUIT

A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches of clearance on both sides of pipe or conduit.

B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

1. Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of crushed stone or gravel prior to installation of pipe.

2. For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple-duct conduit units, do not excavate beyond indicated depths. Hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.

3. For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom of pipe for 60 degrees (bottom 1/6 of the circumference). Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads ensure continuous bearing of pipe barrel on bearing surface.

3.06 SUBGRADE CORRECTION

A. The presence of unsuitable and/or saturated subgrade soils, not anticipated in the design process, will require removal if so directed by the Engineer. Compensation for subgrade correction will be based on a negotiated price in accordance Conditions of the Contract relative to changes in work.

B. Subgrade Correction is defined in paragraph 1.03D. In general, subgrade correction will consist of removal of unsuitable and/or saturated soils to a depth as directed by the Engineer, placement Type V geotextile fabric at the bottom of the excavation and replacement of unsuitable soils with granular soil to the prescribed subgrade elevations.

3.07 BACKFILL AND FILL

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section, and as noted in the Plans.

1. Under grassed areas, use excavated material.

2. Under piping and conduit and equipment, use aggregate materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 60 degrees of cylinder if rectangular trench is utilized.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.

2. Removal of concrete formwork.

3. Removal of trash and debris from excavation.

3.08 PLACEMENT AND COMPACTION

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

C. Control soil and fill compaction in accordance with the Method of Quality Compaction (Visual Inspection). Correct improperly compacted areas or lifts as directed by Engineer if soil density is inadequate.

1. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

    a. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

    b. Stockpile or spread soil material that has been removed due to moisture content too high for compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.09 GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.

2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.

3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section in accordance with the provisions of Mn/DOT 2105.

C. Compaction: After grading, compact subgrade surfaces in accordance with the Method of Quality Compaction (Visual Inspection).

3.10 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow ENGINEER or ENGINEER'S representative to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

3.11 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work and eliminate evidence of restoration to greatest extent possible.

3.12 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.

****END OF SECTION****

SECTION 02503
DRAINAGE TILE

PART 1 - GENERAL

1.01 SECTION INCLUDES

SCHEDULE 0 - Piping, inlets, and manholes.

SCHEDULE 1 - Riprap and other erosion control measures.

1.02 RELATED SECTIONS

A. Document: Minnesota Department of Transportation (Mn/DOT), "Standard Specifications for Highway Construction", 2016 Edition, including Supplements current as of bid date.

1.03 SUBMITTALS

A. Submit the following:

1. Manufacturer's Literature: Materials description and installation instructions for;

   a. Drain tile, fittings and bends.

   b. Inlet materials.

   c. Jacked pipe materials.

1.04 QUALITY ASSURANCE

A. Comply with all codes, laws, ordinances and regulations of governmental authorities including, but not limited to, local municipalities and sanitary districts having jurisdiction over this part of the work.

1.05 REFERENCES

A. Comply with the cited sections of the following codes, specifications and standards except where more stringent requirements are shown on the Drawings as specified herein:

1. City Engineers Association of Minnesota (CEAM), “Standard Utilities Specifications”, 1999 Edition
2. Minnesota Department of Transportation (Mn/DOT), "Standard Specifications for Highway Construction", 2016 Edition, including Supplements current as of bid date.

PART 2 - PRODUCTS

2.01.1 MATERIALS

A. Corrugated Polyethylene Pipe: Corrugated Polyethylene Dual-Wall Pipe shall conform to the requirements of AASHTO M-294 and Design 18 of the AASHTO Standard Specifications for Highway Bridges for storm sewer pipe sizes 12-inch through 36-inch. Joints shall be soil-tight . Pipe manufacture and installation shall conform to current Mn/DOT requirements and/or as indicated in the Plans, Specifications, and Special Provisions.

B. Granular Foundation and Bedding Material: Bedding and Foundation material shall be 3/4" to 1-1/2", 100 percent crushed rock.

PART 3 - EXECUTION

3.01 PREPARATION

A. Establishing Line and Grade

1. The primary line and grade will be established by the Engineer. For trench installation, line and grade stakes will be set parallel to the proposed pipeline at an appropriate offset as will best serve the Contractor's operations wherever practical. Location of existing pipe is approximate and shall be field verified during construction.

2. The Contractor shall arrange their operations to avoid unnecessary interference with the establishment of the primary line and grade stakes; and shall render whatever assistance may be required by the Engineer in accomplishing the staking.

3. The Contractor shall be responsible for preservation of the primary stakes and shall bear the full cost of any re-staking.

4. The Contractor shall be solely responsible for the correct transfer of the primary line and grade to all working points and for construction of the work to the prescribed lines and grades as established by the Engineer.

B. Protection of Underground and Surface Structures.

1. Temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers and other obstructions encountered in the progress of the work shall be furnished by the Contractor at their own expense. When necessary to determine the location of existing pipes, valves or other underground structures, the Contractor, after an examination of available records, shall perform all explorations and excavation for such purposes.

2. Whenever existing utility structures, main sewer, drains, or other conduits, ducts, pipes or other structures present obstructions to the grade or alignment of the pipe, such structures shall be permanently supported, removed, relocated or reconstructed by the Contractor through cooperation with the owner of the structures involved. In those instances where relocation or reconstruction is impractical, a change in line and/or grade will be ordered by the Engineer and the change shall be made in the manner directed. No deviation shall be made from the required line or grade except by written consent of the Engineer.

3. Obstructions such as street signs, guard posts, small culverts, and other items of prefabricated construction may be temporarily removed during construction provided that essential service is maintained in a relocated setting as approved by the Engineer and that non-essential items are properly stored for the duration of construction. Upon completion of the underground work, all such items shall be replaced at their proper setting at the sole expense of the Contractor.

4. In the event of damage to any surface improvements, either privately or publicly owned, in the absence of construction necessity, the Contractor will be required to replace or repair the damaged property to the satisfaction of the Engineer and without cost to the Owner.

5. The Contractor shall promptly repair at their expense any break or damage to other utility mains, or to house service connections for water, sewer, and gas caused by their work.

3.02 EXCAVATION AND PREPARATION OF TRENCH

A. The trench shall be dug to the alignment and depth shown on the Drawings and only so far in advance of construction as the Engineer shall permit. The sides of the trench shall be sloped and/or braced and the trench drained so that workers can work safely and efficiently. It is essential that discharge pumps be directed toward natural drainage channels or to drain sewers.

B. Excavated materials will be classified for reuse as being either Suitable or Unsuitable for backfill or other specified use, subject to selective controls. All suitable materials shall be reserved for backfill to the extent needed, and any surplus remaining shall be utilized for other construction on the project as may be specified or ordered by the Engineer. To the extent practicable, granular materials and topsoil shall be segregated from other materials during the excavating and stockpiling operations so as to permit best use of the available materials at the time of backfilling. Unless otherwise specified in the Plans, Specifications, and Special Provisions, material handling as described above shall be considered incidental with no additional compensation provided therefor.

C. All excavated materials reserved for backfill or other use on the project shall be stored at locations approved by the Engineer that will cause a minimum of inconvenience to public travel, adjacent properties, and other special interests. The material shall not be deposited so close to the edges of the excavations as would create hazardous conditions, nor shall any material be placed so as to block the access to emergency services. All materials considered unsuitable by the Engineer, for any use on the project, shall be immediately removed from the project and be disposed of as arranged for by the Contractor at no extra cost to the Contract.

1. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways, as far as practical. Gutters shall be kept clear or other satisfactory provisions made for street drainage at all times.

2. While any open excavations are maintained, the Contractor shall have available a supply of steel plates suitable for temporary bridging of open trench sections where either vehicular or pedestrian traffic must be maintained. Use of the plates shall be as directed or approved by the Engineer and where installed they shall be secured against possible displacement and be replaced with the permanent structure as soon as possible.

D. Trench excavating shall be to a depth that will permit preparation of the foundation as specified and installation of the pipeline and appurtenances at the prescribed line and grade, except where alterations are specifically authorized. Trench widths shall be sufficient to permit the pipe to be laid and joined properly and the backfill to be placed and compacted as specified. Extra width shall be provided as necessary to permit convenient placement of sheeting and shoring and to accommodate placement of appurtenances.

1. Where no other grade controls are indicated or established for the pipeline, the excavating and foundation preparations shall be such as to provide a minimum cover over the top of the pipe as specified. Trench widths shall allow for at least six inches of clearance on each side of the joint hubs. The maximum allowable width of the trench at the top of pipe level shall be the outside diameter of the pipe plus two feet, subject to the considerations for alternate pipe loading set forth below. The width of the trench at the ground surface shall be held to a minimum to prevent unnecessary destruction of the surface structures.

2. The maximum allowable trench width at the level of the top of pipe may be exceeded only by approval of the Engineer, after consideration of pipe strength and loading relationships. Any alternate proposals made by the Contractor shall be in writing, giving the pertinent soil weight data and proposed pipe strength alternate, at least seven days prior to the desired date of decision. Approval of alternate pipe designs shall be with the understanding that there will be no extra compensation allowed for any increase in material or construction costs.

3. If the trench is excavated to a greater width than that authorized, the Engineer may direct the Contractor to provide a higher class of bedding and/or a higher strength pipe than that required by the Plans, Specifications, and Special Provisions in order to satisfy design requirements, without additional compensation therefor.

E. Excavations shall be extended below the bottom of structure as necessary to accommodate any required Granular Foundation material. When rock or unstable foundation materials are encountered at the established grade, additional materials shall be removed as specified or ordered by the Engineer to produce an acceptable foundation. Unless otherwise indicated or directed, rock shall be removed to an elevation at least six inches below the bottom surface of the pipe barrel and below the lowest projection of joint hubs. All excavations below grade shall be to a minimum width equal to the outside pipe diameter plus two feet. Rock shall be removed to such additional horizontal dimensions as will provide a minimum clearance of six inches on all sides of appurtenant structures such as valves, housings, access structures, etc.

1. All costs of excavating below grade and placing foundation or bedding aggregates as required shall be included in the bid prices for pipe items to the extent that the need for such work is indicated in the Contract provisions and the Proposal does not provide for payment therefore under separate Contract Items.

2. If examination by the Engineer reveals that the need for placement of foundation aggregate was caused by the Contractor's manipulation of the soils in the presence of excessive moisture or lack of proper dewatering, the cost of the corrective measures shall be borne by the Contractor.

F. Ledge rock, boulders, and large stones shall be removed to provide clearance of at least 6" below outside pipe barrel and a clear width of 9" on each side of the pipe shall be provided.

1. The space between the bottom of the trench and rock and the bottom of the pipe shall be backfilled with suitable material thoroughly tamped.

2. Rock excavation shall include such rocks as are not decomposed, weathered, or shattered, and which will require blasting, barring, wedging, or use of air tools for removal.

3. Clay and hardpan will not be considered as rock, but included will be any concrete or masonry structure, except pavements, curbs, gutters and sidewalks. Any rock less than one cubic yard in volume shall be classified as regular or earth excavation, and no extra compensation shall be allowed.

G. Blasting: Blasting will not be allowed.

H. The Contractor shall be responsible for all on-site drainage and shall provide sedimentation basins to limit sediments from reaching the natural drainage course.

3.03 LAYING OF PIPE

A. Pipe shall be laid according to plan inverts and elevations. Maximum deviations from planned elevations is 0.15 feet. Communication from CONTRACTOR to the ENGINEER is essential to avoid costly errors or delays.

B. The interiors of the pipes shall be thoroughly cleaned of all foreign matter before being lowered into the trench and shall be kept clean during laying operations by means of tight plugs or other approved methods. No trench water shall be allowed to enter the pipes or fittings. At all times when work is not in progress, all open ends of pipes and fittings shall be securely closed.

C. Remove areas of poor soil and install Granular Aggregate material special foundation material.

D. Bedding shall be as specified in the project plans, and as required by the tile manufacturer.

3.04 BACKFILLING AND GRADING

A. All excavation in trenches shall be backfilled to the original ground surface or to such grades as specified or shown on the Drawings. The backfill shall begin as soon as practical after the pipe has been placed to avoid movement of the pipe and shall thereafter be carried on as rapidly as the protection of the balance of the work will permit. Site conditions, such as wet conditions, may require communication with ENGINEER to determine best approach. Backfilling shall be done as completely as possible so as to attain complete filling and using the best materials available for this purpose, free from boulders, rubbish, frozen lumps, and similar materials. Depositing of the backfill shall be done so the shock of falling material will not injure the structure. Grading over and around all parts of the work shall be done as directed by the Engineer.

B. The requirements for backfilling shall vary, depending on the portion of trench concerned. See the Construction Plans for details. Unless otherwise stated, requirements are as follows:

PRODUCT DATA SHEET 0 - Bottom Portion of Trench. For tile placed in a square bottom trench, granular material, free from rocks and boulders, shall be deposited in the trench simultaneously on both sides of the pipe for the full width of the trench to a height of at least 12 inches above the top of the pipe, shovel-placed and tamped to fill completely all spaces under and adjacent to the conduit.

In the event that natural, suitable granular material is not encountered during the normal excavation of the trench or when the material encountered is determined unsuitable by the Engineer for backfilling around the conduit as required above, the Contractor shall provide and place such approved material as required.

PRODUCT DATA SHEET 1 - Mid-Portion of Trench: This portion which lies between a level of 12 inches above the top of the pipe and a level of 36 inches below finished grade shall be backfilled only with suitable material as approved by the Engineer, such material to be obtained from the excavation of the same trench or from any other trench under excavation with the site. Backfill shall be accomplished in layers or lifts by backcasting or by filling and spreading. Placement shall be in 8 inch lifts, each lift being thoroughly compacted by pneumatic tamper, tamping rollers, vibrating rollers, or other means, in accordance with the "ordinary compaction" method as described in Mn/DOT Specification 2105.3F2. Where trenches cross areas outside of existing or proposed roadways and parking lots, backfill may be placed and compacted in 18-inch lifts.

PRODUCT DATA SHEET 2 - Top Portion of Trench: The disturbed area lying within the top 36 inches shall be restored in accordance with Section 01120, Special Provisions.

3.05 EROSION CONTROL

A. The Contractor shall provide erosion control for the entire project as shown on the plans, directed in the field and as required by the appropriate permitting agencies. The Contractor shall provide holding areas and settling basins as necessary to control the suspended solids in construction dewatering discharges as required by the regulating agencies. Payment for holding areas and settling basins shall not be made directly but shall be considered incidental to the project.

B. Riprap shall be installed as indicated in the plans and per Mn/DOT Spec. 2511.

3.06 INSPECTION

A. Upon completion of the piping construction all pipes shall be cleaned and ramped. All runs of pipe between fittings and bends shall be straight and true. The Contractor shall clean the piping to ensure that it is free of sand, rubble, and debris.

END OF SECTION